58th Annual Meeting

of the SOCIETY

FOR ECONOMIC BOTANY

BRAGANÇA - PORTUGAL

JUNE 4-9, 2017

Living in a global world:

local knowledge and sustainability

Book of abstracts

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SOCIETY FOR ECONOMIC BOTANY

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CIMO Centro de Investigação de Montanha

WLBC The William L. Brown Center — Missouri Botanical Garden

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58TH ANNUAL MEETING
of the SOCIETY FOR ECONOMIC BOTANY
BRAGANÇA - PORTUGAL
JUNE 4-9, 2017

Organizing Committee

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Robert Brandt – Society for Economic Botany Office, United States of America

Sandra Bogdanova – Society for Economic Botany Student Representative

Dear colleagues

It gives us great pleasure to welcome you to the **58th Annual Meeting of the Society for Economic Botany** (SEB) and the **2nd Hispano-Portuguese Meeting on Ethnobiology** (II EHPE), a joint event aiming at connecting economic botanists and ethnobiologists from all over the world.

The Society for Economic Botany (SEB) was established in 1959 and the annual meeting brings together people interested in the past, present, and future uses of plants, and the relationship between plants and human societies. SEB fosters and encourages scientific research and education in the transdisciplinary field of economic botany. With members from across the U.S.A. and more than 64 countries around the globe, SEB serves as the world's largest and most-respected professional society for individuals who are concerned with basic botanical, as well as, with agronomical, anthropological, phytochemical, ethnological and many others studies of plants known to be useful or those which may have potential uses so far undeveloped. Since 1960, SEB Annual Meetings provide a stimulating milieu for scientific exchange amongst SEB members and researchers from different countries and regions.

The Hispano-Portuguese Meeting on Ethnobiology (EHPE) highlights previous collaborations between Hispano-Portuguese ethnobiologists and aims to involve the global Hispanic-Portuguese-speaking communities to the greatest extent possible. Albacete, Castilla La Mancha, Spain, hosted the I EHPE in 2010, simultaneously with the 11th Congress of the International Society of Ethnopharmacology (ISE 2010). In Albacete, about 80 Hispano-Portuguese speakers with diverse backgrounds and interest, researching in Europe, South America, Africa and Asia, presented their works and discussed wider importance of Ethnobiological research. Six years later, we promote a second meeting (II EHPE) aiming at updating and strengthening networks between different research groups, experts, students and any people interested in interdisciplinary ethno biological approaches.

In 2017, the 58th SEB Annual Meeting and the 2nd Hispano-Portuguese Meeting on Ethnobiology are held in the city of Bragança, Portugal within an ecological and culturally fascinating environment, organized by the Mountain Research Centre (CIMO) of the Polytechnic Institute of Bragança (IPB) and the Society for Economic Botany (SEB) with the active involvement of local, national and international entities.

Several institutions sponsored a comprehensive programme: the William L. Brown Center (USA), Springer Nature (UK), Regional Northern Culture Directorate (DRCN, Portugal), Bragança Municipality (CMB, Portugal), Centro Ciencia Viva de Bragança (Portugal) and Fundação Caixa CA, Bragança (Portugal).

The conference theme **Living in a global world: ethnobotany, local knowledge and sustainability** gathered 230 delegates from 41 countries of Africa, Americas, Asia, Europe and Oceania. A total of 230 abstracts were submitted: 12 plenary lectures and special addresses, 152 papers and 66 posters.

Bringing together the European community and a broader international community of scientists and stakeholders, this joint event creates a unique opportunity for individuals and institutions to share experiences and to establish information and collaboration networks, taking advantage of a multicultural, friendly and pleasant environment.

Thank you for your contributions and support! We are very grateful to those who helped and contributed to achieve this event.

Bragança, June 2017
The Organizing Committee

Programme

Sunday, June 4th, 2017
09h30-16h30 SEB Council Meeting
10h30-17h30 14th Biocultural Collections Meeting
17h00-19h00 Registration opens

Monday, June 5th
08h00 Registration opens
09h00 Opening ceremony
09h30 Biocultural Diversity in Trás-os-Montes: **Carlos Aguiar** & **João Azevedo**
10h00 Plenary lecture. Invited keynote speaker: **Ina Vandebroek**
10h45 Coffee break
11h15 Plenary lecture. Invited keynote speaker: **Rainer Bussmann**
12h00 Symposia 1, 2 and SEB Free topics
13h00 Lunch
14h30 Symposia 1, 2 and SEB Free topics
16h30 Coffee break
17h00 Symposia 1, 2 and SEB Free topics
19h30 Pause
19h45 Opening night reception: Porto de Honra

Tuesday, June 6th
09h00 Plenary lecture. Invited keynote speaker: **Victoria Reys-Garcia**
09h45 Plenary lecture. Invited keynote speaker: **Isabel Ferreira**
10h30 Coffee break
11h00 2nd Hispano-Portuguese Meeting on Ethnobiology (II EHPE), Symposia 3 and 4
13h00 Lunch
13h30 Mentorship Lunch.
14h30 Workshops W2 and W4 and II EHPE/Symposia 3 and 4
16h30 Coffee break
17h00 Workshops W1, W5, W6 and W7
18h00 ConSEPTFS Discussion Forum / Medicinal Plant Walk with Fernanda Botelho
19h30 Pause
20h00 Music, wine and local produce degustation
21h30 Student Social Event

Wednesday, June 7th
09h00-19h00 Field trips
- Exploring biocultural diversity, land use and resources management within Trás-os-Montes territory. Montesinho Natural Park.
  Ana Maria Carvalho & Carlos Aguiar.
- Tales of a border land: Terras de Miranda and Douro International.
  Isabel Sá & João Brandão Rodrigues.

Thursday, June 8th
09h00 Plenary lecture. Invited keynote speaker: **Cassandra Quave**
09h45 Plenary lecture. Invited keynote speaker: **Łukasz Łuczaj**
10h30Coffee break
11h00 Symposia 3 and 4
13h00 Lunch
14h30 Symposia 3 and 4
16h30 Coffee break
17h00 SEB business meeting
18h00 Distinguished Economic Botanist Lecture: Professor **Roy Ellen**
19h00 Pause
20h00 Gala Dinner and Awards. Closing Ceremony

Friday, June 9th and SaturdayJune 10th
Optional post conference tours:

- Douro River Cruise from Régua to Porto, Portugal – wine tourism
- Guided tour Salamanca, Spain.
- Cork Tour, Montados do Redondo, Alentejo, Portugal
- Fernanda Botelho Herbal Workshop, Alpedrinha, Portugal.

List of Symposia

- Symposium 1 **Ethnobotany of Mountain Regions**, Monday June 5
- Symposium 2 **Economic botany: approaches from Archaeobotany, Ethnography and History**, Monday June 5
- **SEB Free topics**, Monday June 5
- Symposium 3 **Ethnobotany, ethnopharmacology and natural products: challenges and trends**, Tuesday June 6 and Thursday June 8
- Symposium 4 **Agrobiodiversity and traditional knowledge: conservation strategies and sustainable development**, Tuesday June 6 and Thursday June 8
- **2nd Hispano-Portuguese Meeting on Ethnobiology** (II EHPE), Tuesday June 6

Cork and cork production
Markets and urban ethnobotany
Ethnobotanical linguistics and toponymy
Ecossystem services
Empowerment of traditional knowledge holders and politics
Traditional knowledge networks
Free topics

List of Workshops

W1 – Animal traction in sustainable agroforestry management
João Brandão Rodrigues (APTRAN)

W2 – Genesis of a natural skin care product: A journey with the Caribbean mango
Sonia Peter (Barbados Community College)

W4 – Traditional wheat and homemade couscous in Trás-os-Montes
Fernanda Afonso (Fresulfe) & Isabel Sá (ALDEIA)

W5 – CONECT-e: The Wikipedia of Spanish Traditional Ecological Knowledge
Vitoria Reis García (ICTA), Petra Benyei (ICTA) & Manuel Pardo de Santayana (UAM)

W6 – Advances in Economic Botany - A Publishing Opportunity for your Research
M. Balick, Ina Vandebroek & Brian Boom (New York Botanical Garden)

W7 – Portuguese Ethnobotany: Material Culture
Luís Mendonça de Carvalho (Botanical Museum of Beja)

14th Biocultural Collections Meeting

Museum Abade de Baçal tour
Biocultural tour of Ethnographic Museum Dr. Belarmino Afonso
Jan Salick (Missouri Botanical Garden, William L. Brown Center)
Ana Afonso (Museu Abade de Baçal)
Irene Queijo (Museu Abade de Baçal)
Amândio Felício (Direção Regional Cultura Norte)

Consensus Statement on Ethnopharmacological Field Studies – ConSEPTFS

Discussion Forum
Michael Heinrich, University College London, School of Pharmacy

Tuesday Medicinal Plant Walk with Fernanda Botelho

Fernanda Botelho, Independent writer and plant investigator
Organized on behalf of the SEB Meeting Students Event by the Students Committee

Mentorship Lunch

Organized on behalf of the SEB Meeting Students Event by the Students Committee

Mentors
Maria Fadiman (Florida Atlantic University, USA)
Patrick van Damm (Ghent University, Belgium)
Rick Stepp (University of Florida, USA)
Liz Olson (Southern Utah University, USA)
Trish Flaster (Botanical Liaisons, LLC, USA
Christian R. Vogl (University for Natural Resources and Live Sciences, Austria)
Robert Voeks (California State University, Fullerton, USA)
Ian Martin (Eden Project, United Kingdom)
Cassandra Quave (Emory University, USA)
Rajindra K. Puri (University of Kent, United Kingdom)

Table of contents

2017 Distinguished Economic Botanist

Plants as sociocultural objects: from economic botany to economic anthropology. 15
Thursday, June 8, 18h00 – Auditório Dionísio Gonçalves

Plenary lectures

Ethnobotany and the post-antibiotic era: Exploring an expanded toolkit for overcoming antibiotic resistance..... 16
Thursday, June 8, 09h00 – Auditório Dionísio Gonçalves

Ethnobiology in an increasingly multicultural world. 17
Monday, June 5, 10h00 – Auditório Dionísio Gonçalves

Plants and mushrooms as sources of value-added molecules for food applications.... 18
Tuesday, June 6, 09h45 – Auditório Dionísio Gonçalves

Discovering new wild edible plants in Europe. 19
Thursday, June 8, 09h45 – Auditório Dionísio Gonçalves

Twenty-five years of Ethnobotany around the globe – from magic to molecules, conservation and the Nagoya Protocol. 20
Monday, June 5, 11h15 – Auditório Dionísio Gonçalves

Traditional Ecological Knowledge dynamics. 21
Tuesday, June 6, 09h00 – Auditório Dionísio Gonçalves

Special Addresses

The vegetal landscape of Northeastern Portugal. 22
Monday, June 5, 09h30 – Auditório Dionísio Gonçalves

Landscape change and ecosystem services in the Bragança region. 22
Monday, June 5, 09h45 – Auditório Dionísio Gonçalves

The Natural Park of Montesinho, Bragança, Portugal: territory, ethnobotany and cultural identity. 23
Wednesday, June 7 – Parque Natural de Montesinho

Terra de Miranda: agrobiodiversity, cultural heritage and sustainable development. 23
Wednesday, June 7 – Vimioso, Terras de Miranda

Ethnobotany of Mountain Regions – Session 1

Chair: Fusun Ertug, Turkey
Monday, June 5, 12h00 – Auditório Pequeno

Ethnobotany of climate change in the greater Himalayan Region: a 3000km transect 25

Exploring local knowledge of agroforestry species for climate change adaptation: A case study from Apurímac, Peru. 25

Transhumance and medicinal plants: the case of Armenian Yezidis. 26

Quantitative ethnobotany of the Little Karoo, South Africa 26

Ethnobotany of Mountain Regions – Session 2

Chair: Christian R. Vogl, University of Natural Resources and Life Sciences, Vienna (BOKU), Austria
Monday, June 5, 14h30 – Auditório Pequeno

Changing markets: medicinal plant ethnobotany in the Andes of Bolivia, Peru and Colombia..... 28

Traditional knowledge in the Caucasus: changing knowledge patterns in Georgia after the end of Soviet occupation..... 28

Promoting sustainable use of Medicinal and Aromatic Plants for livelihood improvement and biodiversity conservation through Capacity Building training program in Himalaya mountain Swat District, Pakistan..... 29

Introduction of new analytical and quantitative approaches for the production and conservation of Medicinal and Aromatic Plants for economic development of Pakistan. 29

Sustainable Production and Ethnoecological Assessment of commercially important high altitude medicinal and aromatic plants in District Swat: A step toward sustainable resource conservation 30

Establishment of Global Observation Research Initiative in Alpine Environments (GLORIA) Plots in Pakistan 30

An updated review of Khoi-San ethnobotany. 31

Mobile Discovery of antimicrobial plants in Appalachian Mountains. 31

Ethnobotany of Mountain Regions – Session 3

Chair: Rainer Bussmann, Missouri Botanical Garden - William L. Brown Center, USA
Monday, June 5, 17h00 – Auditório Pequeno

Which traditional uses of wild plants persist in western rural societies? A case study in Sierra Norte de Madrid, Spain. 33

Plants species and techniques used for charcoal production in the Northeast of Portugal. 33

Cultural connections & ethnobotany: the cultural knowledge stored within Lisu plant names. 34

A quantitative survey of Venda ethnobotany. 34

Plant use intensification: the case of Enset (*Ensete ventricosum*) in Southwestern Ethiopia. 35

Patterns of contemporary plant use in Adjara, Georgia (Caucasus). 35

Cross-cultural Ethnobotany in Kailash Sacred Landscape, Nepal. 36

An investigation of "Mouse Foods" on the Russian and Alaskan sides of the Bering Strait. 36

Indigenous knowledge and the sustainable harvest of ramps (*Allium tricoccum*) in the Appalachian Mountains, USA. 37

Economic botany· approaches from Archaeobotany, Ethnography and History – Session 1

Chair: João Pedro Tereso, Universidade do Porto, Faculdade de Ciências, Portugal
Monday, June 5, 12h00 – Room G3-S5/01

Reinventing biocultural collections through the arts and humanities 39

José Quer and his work "Flora Española" (18th century) 39

Freelisting revisited: comments and critics based on in-depth ethnobotanical fieldwork 40

The role of culture in the selection and conservation of chilli pepper landraces in Mexico. 40

Economic botany· approaches from Archaeobotany, Ethnography and History – Session 2

Chair: Gayle Fritz, Washington University, St. Louis, USA
Monday, June 5, 14h30 – Room G3-S5/01

Basketry as a part of Anatolian Bio-cultural heritage 42

Smoke and mirrors: the global trade in fern (*Lygodium circinnatum*) fibre baskets. 42

Wetland basketry of La Mancha (Spain). 43

Wood for the gods: an anthracological study of an ancient Maya fire shrine at El Peru-*Waka'*, Guatemala. 43

Crops and agricultural fields in the Sabor Valley during the Bronze Age: carpological remains from Foz do Medal and Terraço das Laranjeiras. 44

Early botanical history of the genus *Washingtonia* 44

Traditional Medicinal Knowledge in Ireland in the 1930s – Exploring botanical treatments. 45

Using ethnography to understand ancient food pathways: elusive wild foods in Archaeobotany. 45

Conservation of Medicinal and Aromatic Plants through cultivation for economic improvement: an empirical study from Chure region of Nepal. 46

Economic botany· approaches from Archaeobotany, Ethnography and History – Session 3

Chair: Valentina Savo, Simon Fraser University, Canada
Monday, June 5, 17h00 – Room G3-S5/01

***Grünkern*: From famine food to delicatessen. 48**

Food plants, exchange and constitution of a common food heritage in the cultural area of the Rio Negro (Northwest Amazon). 48

Ethnobotany at the beginning – data on useful plants from Southwestern Angola collected at the Missão da Huíla (1889-1903). 49

Quantification of medicinal plant trade from Darchula District, Nepal. 49

Reflection of transhumance on agriculture: comparison of agriculture of Chalcolithic and modern transhumant communities from the territory of Armenia..... 50

The plants mentioned in the Hippocratic treaties - gynecologic theme. 50

Ethnobotany, ethnopharmacology and natural products· challenges and trends – Session 1

Chair: Michael Heinrich, University College London, School of Pharmacy, United Kingdom
Tuesday, June 6, 11h00 – Auditório Dionísio Gonçalves

Caribbean Medicinal Plants as potential sources of anti-aging cosmetic applications - an application of HPLC ESI MS MS. 52

Novel Ethnopharmacology of antibiotic plants from Medieval Celtic Herbal..... 52

Medicinal plant safety: an overview of the drug interaction screening program for popular Jamaican medicinal plants at the University of the West Indies. 53

Beating around the bush: how plant availability shapes Medicinal Plant Knowledge.... 53

Globe amaranth as an alternative source of natural red-violet colorants: an optimization study addressing current needs of the industrialized world..... 54

Incense plants: interdisciplinary approaches to species diversity and ethnobotanical uses. 54

From famine wild plants in mountain regions of Northeastern Portugal to gourmet foods in contemporary diets: a nutritional-based revalorization study. 55

An ethnobotanical review on uses of the Turkish *Salvia* species. 55

Ethnobotany, ethnopharmacology and natural products· challenges and trends – Session 2

Chair: Patrick Van Damme, Ghent University, Plant Production, Belgium
Tuesday, June 6, 14h30 – Auditório Dionísio Gonçalves

DNA barcoding associated with chemical analysis for the quality control assessment of wild and propagated individuals of the copalchi medicinal plant complex of Mexico. 57

Ethnobotany of Medicinal Plants in Clusiaceae of China. 57

Baobab (*Adansonia digitata* L.) and tamarind (*Tamarindicus indica* L.) value chains for greater income stability in (West) African rural communities: a SWOT analysis..... 58

Medicinal plants and sustainability : approaches to developing sustainable extraction and management of *Prunus africana* in Cameroon. 58

The chemical divergence of two geographically isolated genera of Cupressaceae: Australian *Callitris* and South African *Widdringtonia*. 59

Traditional knowledge protects the indigenous Pacific Banyan *Ficus prolixa* on the Society Islands (French Polynesia, Pacific Ocean)..... 59

How do value chains of cherimoya (*Annona cherimola* Mill.) work in the plant species' centre of origin ? 60

Ethnobotanic study on plant knowledge of Mapuche communities from Budi Lake (Araucania region, Chile): historic comparison and recent dynamics. 60

Foraging and pollinating behaviour of *Apis mellifera adansonii* Latreille (Hymenoptera: Apidae) on *Lophira lanceolata* Van Tiegh. ex Keay (Ochnaceae) flowers in Meiganga (Adamawa, Cameroon). 61

Ethnobotany, ethnopharmacology and natural products· challenges and trends – Session 3

Chair: Joan Vallés, Universitat de Barcelona, Laboratori de Botànica Facultat de Farmàcia i Ciències de l'Alimentació, Spain
Thursday, June 8, 11h00 – Auditório Dionísio Gonçalves

Sustainability of traditional ecological knowledge: importance, distribution, endemicity and conservation of Spanish medicinal plants. 63

Multi-functionality and domination: salience of the use of wild plants in Belarus..... 63

Unlearning debt in the context of the use of wild food plants. 64

The value of ethnobotany for multi-species landscape conservation. 64

Ethnomedicinal plant diversity in Thailand. 65

Edible wild flora of Guinea-Bissau (West Africa) – plants used and species with valuation possibilities..... 65

The research of Josip Bakić on nonconventional sources of food at the coast of ex-Yugoslavia (1962-1986 and after)..... 66

Biomass production and nutrient concentration on potted *Stevia* in response to N, P, K or B fertilization. 66

Ethnobotany, ethnopharmacology and natural products· challenges and trends – Session 4

Chair: Sonia Peter, Barbados Comunity Colleage, Bardados
Thursday, June 8, 14h30 – Auditório Dionísio Gonçalves

Invasive weed to WMD: episodes in the remarkable culture history of the Castor Bean..... 68

Quilombo ethnomedicine: how 'Africanized' are Brazilian Maroon Pharmacopoeias?..... 68

Should LEK be shared in a changing world? Evidences from an ethnobotanical survey in Morocco..... 69

Quantitative ethnobotany of Namaqualand, South Africa. 69

Patterns in medicinal plant knowledge and use in a Maroon village in Suriname..... 70

An ethnobotanical review on uses of the Turkish *Gundelia* genus..... 70

Assessing the abundance of non-timber forest products in relation to forest succession on the Wild Coast, South Africa..... 71

Onopordum species of Turkey and their ethnobotanical uses. 71

The "Plants and People of Vanuatu" Project [*Plants mo Pipol blong Vanuatu*]: a long term multidisciplinary study..... 72

Agrobiodiversity and traditional knowledge· conservation strategies and sustainable development – Session 1

Chair: Laura Aceituno-Mata, Instituto Madrilleno de Investigación y Desarrollo Rural y Alimentário (IMIDRA), Spain
Tuesday, June 6, 11h00 – Auditório Pequeno

Plant use, globalization and tradition in Palau: The Ngasech (First Born) ceremony and food. 74

Traditional plant-based remedies used to treat wolf bite injuries in Portugal and Spain: phytotherapeutic sources and cultural values for the conservation of an emblematic animal species..... 74

Denominations of origin and other related formal tools: relations with local knowledge, genetic resource conservation, product development and public awareness in Italy. A preliminary approach. 75

Agrobiodiversity and Sustainability in the 21st Century: necessary as the analytic nexus or the next anthem of future agroecology and food systems?..... 75

Seeds of transition and local knowledge in Cuban organic agriculture. 76

Drivers of biological and biocultural diversity in Pacific Island agroecosystems..... 76

Narragansett Food Sovereignty Initiative and climate change (NE Coast USA). 77

The politics of food research: plant genes, patents, and political sense-making. 77

A pot full of memories: merging biocultural diversity and organic farming in Sierra Norte de Madrid, Spain..... 78

Agrobiodiversity and traditional knowledge· conservation strategies and sustainable development – Session 2

Chair: Zbynek Polesny, Czech University of Life Sciences, Czech Republic
Tuesday, June 6, 14h30 – Auditório Pequeno

Local ecological indicators for the conservation of wild populations of *Sideritis raeseri* Boiss. & Heldr. in Prespa National Park, Albania..... 80

Consumption of wild edibles by Vasava tribals: implications for sustenance and conservation of indigenous nutritional knowledge..... 80

Diversity of wild edible plants in Hani terraced paddy rice agroecosystem in Honghe prefecture, Yunnan, China..... 81

Trends in agrobiodiversity for quinoa and some wild relatives: underutilized crops and wild species for sustainable agricultural production in Peru..... 81

Diversity of edible plants in food systems of Bugis, Mandar, Minang and Acehnese cocoa farmers in Indonesia..... 82

Local ecological knowledge as a tool for a sustainable territorial management in Gorbeialdea (Biscay, Basque Country)..... 82

Assessing the contribution of wild plants to organic food systems in Austria. 83

Strategies for traditional knowledge retention and adaptation in a migrating world: a case study of Bosnian refugees in St. Louis, Missouri, USA..... 83

Varietal crop research as a tool to engage with agrobiodiversity: an open door to interdisciplinary learning for STEM and farmer training programs..... 84

Agrobiodiversity and traditional knowledge· conservation strategies and sustainable development – Session 3

Chair: Tinde van Andel, Naturalis Biodiversity Center, Netherlands
Thursday, June 8, 11h00 – Auditório Pequeno

Socio-economic importance of the 'Queen of African plants': *Raphia* (Palmae/Arecaceae) species in Cameroon. 86

Pathways from the wild to cultivation: drivers of management schemes and prospects for spider plant (*Gynandropsis gynandra* L.) utilisation in Benin and Togo. 86

Cultivated plants in the Kaxinawá Indigenous Land of Nova Olinda, Acre, Brazil. 87

Remembering Mauka: biocultural diversity conservation and the case of the 'lost' Andean crop *Mirabilis expansa* (Ruíz & Pav.) Standl. 87

Biocultural impacts of climatically shifting plant distributions. 88

The case for folk valuation of Plant Genetic Resources. 88

Wild Food Plants in the Kaxinawá Indigenous Land of Nova Olinda, Acre, Brazil. 89

Morphological and genetic diversity of Hawaii's 'uala (*Ipomoea batatas*) cultivars in an effort to engage with cultural knowledge. 89

The varietal diversity of the fig (*Ficus carica* L.): biocultural interactions and social behaviors in traditional agroecosystems of the Rif in Morocco (case of Bni Ahmed). 90

Agrobiodiversity and traditional knowledge· conservation strategies and sustainable development – Session 4

Chair: Maria Fadiman, Florida Atlantic University, USA
Thursday, June 8, 14h30 – Auditório Pequeno

Tracing ancestor rice of Suriname Maroons back to its African origin. 92

Miombo woodlands: biodiversity and bioprospection. 92

Assessment of unexplored sugar beet wild relatives as new genetic sources for abiotic stress tolerance: how species' ecology can assist crop improvement..... 93

Improving Indonesian cinnamon (*C. burmannii*) value chains for greater farmer income. 93

Can legume cover crops be used for sustainable agricultural intensification and diversification in West African cashew orchards? 94

Horse sense: ethnoveterinary knowledge of Mongolian herders. 94

The Spanish inventory of traditional knowledge related to agricultural biodiversity..... 95

Traditional foods in modern society - leafy vegetables (quelites) in a Nahua community, Mexico. 96

Understanding local/traditional knowledge for developing conservation strategies in line with sustainable development: a framework approach. 96

***Pandanus* use in Micronesia: past, present and future. 97**

SEB Free Topics – Session 1

Chair: Anna Waldstein, University of Kent, School of Anthropology and Conservation, United Kingdom
Monday, June 5, 12h00 – Auditório Dionísio Gonçalves

The production and commercialization of palm wine from *Hyphaene coriacea* and *Phoenix reclinata* in Zitundo area, Southern Mozambique. 99

Uses, local knowledge and management of the Pepper-bark tree (*Warburgia salutaris*), a threatened medicinal plant species in southern Mozambique. 99

Redomestication of feral turnips in Mexico: phenotypic and genetic evidence. 100

Dendrochronological analysis of old-growth forest and the pre-European cultural landscape of the Appalachian region, USA..... 100

SEB Free Topics – Session 2

Chair: Ben Erik van Wyk, University of Johannesburg, South Africa
Monday, June 5, 14h30 – Auditório Dionísio Gonçalves

Ethnobotany and Global Literacy in the Classroom. 102

Tung-oil trees (*Vernicia cordata*): a component of a cultural landscape in Wakasa region, Japan Sea Coast, Central Japan..... 102

Legume diversity in Ethiopia: findings from an integrated research and education program. 103

Vision and change: using student plant family presentations to teach Botany..... 103

Magical plants for weather control in Southern Africa. 104

Older canoes, larger trees: reading the history of the forest through traditional boats. 104

Folk views of wild mushroom uses and their ecology in the Mazovia region, Poland. 105

Dayak biological classification system and the use of para-taxonomists in the inventory of tropical forest trees. 105

Explaining herder responses to the invasive species *Lantana camera* L. in southern India. 106

SEB Free Topics – Session 3

Chair: Cassandra Quave, Emory University, USA
Monday, June 5, 17h00 – Auditório Dionísio Gonçalves

Global analysis of adaptations to climate change among subsistence-oriented communities. 108

Roots, bushes and fruits: a preliminary report on Jamaican complementary and alternative medicine in London. 108

Plants as symbols in Christian Art at the National Museum of Ancient Art, Lisbon (Portugal). 109

Ethnobotany of the Crow Creek Reservation. 109

Evolutionary Imperialism: agricultural origins and invasive species. 110

Medicinal plants in the City of Brussels, Belgium. 110

Theory in Ethnobotany. 111

Folk medicinal plants mixtures: when the whole is greater than the sum of its parts. 111

Non-timber forest products as biocultural keystone species. 112

2nd Hispano-Portuguese Meeting on Ethnobiology (II EHPE) – Session 1

Chair: Manuel Pardo de Santayana, Universidad Autónoma de Madrid
Tuesday, June 6, 11h00 – Room G3-S5/01

What factors guide the selection of medicinal plants for a local pharmacopoeia? A case study in a rural community in a historically transformed Atlantic Forest landscape in Brazil. 114

Toward a new classification of use categories: an approach based on Peruvian communities. 114

Medicinal plants and practices in the Communitarian Marine Protected Area of Urok Islands, Guinea-Bissau. 115

Ethnomedicinal practices in the montane rainforests of northern Peru are gendered. 115

Traditional knowledge preservation assessment: what the data says. 116

The value of biocultural collections in the Rio Negro, Amazonia (Brazil). 116

Aromatic and medicinal plants in Trás-os-Montes on the eighteenth and nineteenth centuries: traditional network knowledge. 117

La dinámica del conocimiento local sobre el alcornoque y el corcho en el suroeste Español. 117

2nd Hispano-Portuguese Meeting on Ethnobiology (II EHPE) – Session 2

Chair: Amélia Frazão-Moreira, Universidade Nova de Lisboa, FCSH, Centro em Rede de Investigação Antropológica (CRIA)
Tuesday, June 6, 14h30 – Room G3-S5/01

Global and local in folk plant knowledge: allochthonous plants in Catalan ethnobotany. 119

Wetland ethnobiology of National Parks Tablas de Daimiel and Cabañeros (Spain). 119

The Calafito from Vale de Vargo, Serpa. 120

The plants cited in Cante Alentejano. 120

The taste of wild edibles in comparison to commonly consumed products. We prefer them or we discard them? 121

Adubação em olivais tradicionais: o caso do fósforo. 121

A longitudinal study of changes in the use and value of provisioning ecosystem services in a rural community in South Africa. 122

Local dwellers' perception on conflicts between human populations and wild animals in Quiçama National Park (Angola). 122

Working with local people for the conservation of chimpanzees in Guinea-Bissau. 123

Homegardens, biocultural diversity and ecosystem services in Mexico. 123

Poster Session

Tuesday, June 6 – 17h00 to 19h00

An ethnobotanical investigation of Gürpınar district and city center of Van (Turkey). 125

Traditional uses of the crab apple tree (*Malus sylvestris* Mill., Rosaceae) in Spain. 125

Contribution of conserved agrobiodiversity in local development: three experiences in the region of Madrid (Central Spain). 126

The religioness/spirituality matters: their influence on plant-based local medical systems. 126

Gender and its role in the resilience of local medical systems - effects on structure and functionality. 127

A landscape planning perspective on diverse economic approaches and land use structures of small scale farmers in Genalguacil (Andalusia, Spain). 127

How does human selection of ethnobotanical plants promote phenotypic variation? The case of the calabash trees in Caribbean islands. 128

Traditional knowledge and use of medicinal plants in Guinea-Bissau (West Africa). ... 128

Paleoethnobotanical and experimental analysis of *Geoffroea decorticans* (Gill. ex Hook. & Arn.) and *Sarcomphalus mistol* (Griseb.) fruits in Cerro Colorado, Córdoba Province, Argentina. 129

The use of wild and cultivated cacti in Northern province of Córdoba, Argentina. 129

Mechanical scarification overcome the dormancy and increase germination on Lala palm tree (*Hyphaene coriacea* Gaertn.). 130

Structural and functional dynamics of a traditional cultural landscape element: a diachronic comparison of homegardens in Sillian (Eastern-Tyrol, Austria)..... 130

African baobab trees (*Adansonia digitata* L.) recorded in Uganda. 131

Bayesian Networks for impact modeling of development interventions. 131

Testing the Doctrine of Signatures: are plants with milky sap galactogogues? 132

A quantitative review of the medicinal plants used in the Chocó biogeographic hotspot (Colombia and Ecuador). 132

The thousand-year history of fig tree and its wasp. 133

Einkorn and emmer wheat traditional processing: documentation and comparison from Italy, Turkey and Armenia. 133

Kales, underutilised traditional crops from Europe to the Caucasus. 134

Quality of Saint John's wort (*Hypericum perforatum* L.): an investigation of marketed products. 134

First record of Angola's medicinal animals: a case study on the use of mammals in local medicine in Quiçama National Park. 135

The folk medicinal plants of Dereli (Giresun - Turkey). 135

Guided wild plant tours and their contributions to the cultural transmission of knowledge in the city of Vienna (Austria). 136

Humulus lupulus L. analysis and comparison of volatile of spontaneous and commercial varieties: phytotherapeutic potentialities. 136

The folk medicinal plants of the surroundings of Lake Abant (Bolu-Turkey)..... 137

Geographic variation in ethnobotanical knowledge, value and practice related to *Castanea sativa* in Turkey. 137

Inchatoshi, *ivenki*, *ivinishi* - plants from the forest and the garden of the Asháninka people from the Peruvian Amazon..... 138

The tradition of using Devil Rib (*Cirsium oleraceum*) as a magical remedy in Poland. 138

Garifuna plant knowledge and natural resource management in the Sarstoon-Temash Region. 139

Magical-religious remedies for remove warts: an ethnobotanical study in the Arribes del Duero Natural Park (Salamanca-Zamora, Spain)..... 139

When we abandoned the cultivation of chestnut trees (*Castanea sativa* Miller) and began to collect wild chestnuts?..... 140

Traditional Use of wild plants in Samobor Area (Northwest Croatia) – loss of knowledge within a century. 140

"*The Virgin and Child with St. Anne, St. Joachim and a Donor*" - a botanical perspective. 141

Gastronomic ethnobiology of *Terites*: indigenous food specialty of Batak Karo people in North Sumatra, Indonesia. 141

Ethnobotany in the Sanabria region (Spain) and its potential in rural development..... 142

Herbal markets of the Pucallpa city, Peruvian Amazon. 142

Fruits and seeds diversity consumed by *Dipodomys phyllipsii* in Oaxaca, Mexico. 143

Comparative functional anatomy of three endangered woody species in Nigeria. 143

Join the Biocultural Collections! 144

Medicinal and other useful plants in *Historia Naturalis Brasiliae* (1648): have plant uses and names changed in Brazil over time? 144

Gathered food plants in the Northern of Morocco. 145

The neglected and/or underused forest tree species: case of the carob tree (*Ceratonia siliqua* L.) from picking to practice and use diversity..... 145

Traditional knowledge and valorization of low value fruit in the oasis of southern Morocco. 146

Traditional medicine in a modern world. 146

Bringing together technologies from past and present to discover the “food of the gods”, *Diospyros virginiana*, American persimmon. 147

Local ecological knowledge of the Kuy people in Prey Lang, Cambodia. 147

Global medicinal plant markets: panacea or disaster - a SWOT analysis. 148

Plant uses and shifts in two communities from a coastal environmental protected area in southern Brazil. 148

Population structure and productivity of pequi (*Caryocar brasiliense*) in the context of income generation and conservation of the Cerrado..... 149

Extractivism and commercialization of native fruits: the case of pequi *Caryocar brasiliense* in the state of Minas Gerais, Brazil. 149

The journal Mountain Research and Development anticipates the publication challenges of Future Earth’s vision. 150

Livestock breeding and forage production in Trás-os-Montes: Rural Development Policies and Measures supporting farmers' decisions and protecting biodiversity. 150

Bioactivity against prostate cancer discovered in a Caribbean medicinal plant. 151

Attracting & retaining minority students to Ethnobotany. 151

Evolutionary history of the *Allium ampeloprasum* L. polyploid complex and its crop relatives in Algeria (North Africa) based on karyological and molecular data..... 152

New chromosome number and taxonomic revision of the West Mediterranean *Allium baeticum* Boiss. polyploid complex. 152

Morphological characterization of tomato (*Solanum lycopersicum* L.) landraces accessions preserved at the Portuguese genebank..... 153

Effect of the microencapsulation of the natural pigment curcumin, from *Curcuma longa* L., on its chemical stability at different pHs. 153

Farmers’ seed production in organic horticulture in NW Portugal. 154

Enhancement of medicinal plant biodiversity in Lithuanian rural areas. 154

Big Picnic: Big Questions - Engaging the public with Responsible Research and Innovation on Food Security. 155

Could bio-cultural *refugia* safeguard important reservoirs of traditional plant knowledge in highly industrialized countries? A case study of the White Carpathians, Czech Republic. 155

Candidates Edmund H. Fulling Award

List of attendees

2017 Distinguished Economic Botanist

Thursday, June 8, 18h00 – Auditório Dionísio Gonçalves

Plants as sociocultural objects: from economic botany to economic anthropology.

Author: Ellen, Roy [1].

The Society for Economic Botany has increasingly defined itself as a context for fostering expertise in ethnobotany and its various applications. However, given that my own work as an ethnobotanist has been much influenced by my training as an anthropologist, there may be merit in re-examining the 'economic' in economic botany from the standpoint of anthropology. In this address I suggest that economic anthropology provides a useful framework through which to interrogate the notions of 'use' and 'value' attributed to plant resources, and to understand how plants move - by exchange and dissemination - through socio-economic systems, how plant knowledge informs decision-making, and how ethnobotanical knowledge is socially embedded. Each of these processes rests on the foundational idea that all plants with which humans interact are necessarily and simultaneously biological and cultural. Such perspectives may even help us rethink the still sometimes unresolved issues as to what 'theory' in ethnobotany actually entails.

Keywords: Economic botany, Sociocultural, Ethnobotanical, Anthropology.

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The award of "**Distinguished Economic Botanist** (DEB)" is bestowed annually by the Society upon an individual on the basis of outstanding accomplishments pertinent to the goals of the Society.

Prof. Roy Ellen is our 2017 Distinguished Economic Botanist recipient!

Roy Ellen is Emeritus Professor in the School of Anthropology and Conservation at the University of Kent at Canterbury, UK. He was trained in anthropology at the London School of Economics and Political science, where he completed his PhD in 1973 on swidden cultivation and patterns of settlement amongst the Nuaulu people of Seram, eastern Indonesia.

He has held permanent teaching positions at the LSE, and thereafter at the University of Kent until 2012, where he founded the programme in Ethnobotany with the Royal Botanic Gardens Kew, and was first Director of the Centre for Biocultural Diversity. He was elected Fellow of the British Academy in 2003, and was President of the Royal Anthropological Institute between 2007 and 2011.

He has published widely on environmental and cognitive anthropology, on ethnobiology (especially in the area of folk classification and the local management of domesticate diversity), on the theory of ethnoecological knowledge, on inter-island trading systems, and on the ethnography of eastern Indonesia. Of his 17 books and editions, his main publications relating to ethnobotany include: *Nuaulu settlement and ecology* (1976), *Environment, subsistence and system* (1982), *The cultural relations of classification* (1983), and *The categorical impulse* (2005). He has edited or co-edited, amongst others: *Social and ecological systems* (1979), *Classifications in their social context* (1979), *Redefining nature* (1996), *Indigenous environmental knowledge and its transformations* (2000), *Ethnobiology and the science of humankind* (2006), *Modern crises and traditional strategies* (2007), and *Understanding cultural transmission in anthropology* (2013).

Plenary lectures

Thursday, June 8, 09h00 – Auditório Dionísio Gonçalves

Ethnobotany and the post-antibiotic era: Exploring an expanded toolkit for overcoming antibiotic resistance

Author: Quave, Cassandra [1]

Widespread antibiotic resistance is on the rise and current therapies are becoming increasingly limited in both scope and efficacy. In effect, we are standing on the precipice of the post-antibiotic era. New solutions are desperately needed to face the mounting threat of untreatable infections, which if left unchecked, will cripple medical systems worldwide. In addition to focusing efforts on the discovery of new antibiotics, researchers are also exploring alternative approaches to restore the efficacy of existing antibiotics with resistance modifying agents, or antibiotic potentiators, as well as with compounds that diminish the virulence capacity of pathogens. A major barrier to success, however, is the lack of novel chemical entities (NCEs) for exploration.

I will discuss how ethnobotanical research on anti-infective medicinal plants can be leveraged to fill the gap in NCEs for study. Plant secondary metabolites (PSMs) often work in a synergistic fashion in defense of the plant against pathogens. Certain PSMs can also be deployed to mitigate the growth and fitness of human pathogens. I will present some of the major findings of my research group, including the discovery of novel virulence inhibitors for methicillin resistant *Staphylococcus aureus* (MRSA) from *Castanea sativa* Mill. and *Schinus terebinthifolia* Raddi, each used in traditional medicine for skin infections. I'll also discuss inhibitors of bacterial biofilm formation, such as *Rubus ulmifolius* Schott, used to treat skin abscesses in Italy, and which potentiate the ability of antibiotics to clear an intrinsically resistant infection. Lastly, I'll discuss some of our most recent work on the discovery of beta-lactam antibiotic potentiators, which restore the activity of otherwise non-functional antibiotics.

Our understanding of the mechanism of action and efficacy of medicinal plants used in the traditional treatment of infectious disease remains limited and the topic largely underexplored. However, the research toolkit has recently expanded, and new assays that allow for the examination of bioactivity other than simple growth inhibition are now available. Further research in this arena will not only lead to an improved understanding of how anti-infective traditional medicines work, but may also ultimately provide key solutions for combatting antibiotic resistance in the future.

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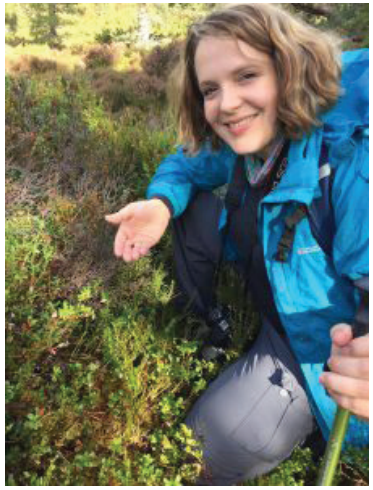
Cassandra Quave



Emory University, USA

Cassandra Quave, PhD, is Curator of the Emory University Herbarium and Assistant Professor of Dermatology and Human Health at Emory University, where she leads antibiotic drug discovery research initiatives and teaches undergraduate courses on medicinal plants, food and health. Trained as a medical ethnobotanist, her research is focused on the documentation and biochemical analysis of botanical remedies used in the traditional treatment of infectious disease in the Mediterranean and Balkans.

To date, she has authored more than 50 publications, 2 edited books and 3 patents. C. Quave is a Past President of the Society for Economic Botany. Her work has been profiled in the New York Times Magazine and featured on NPR. Learn more about her research by visiting her website or following her on Facebook or Twitter.

Monday, June 5, 10h00 – Auditório Dionísio Gonçalves

Ethnobiology in an increasingly multicultural world.

Author: Vandebroek, Ina [1].

Cultural traditions are important determinants in communities' interactions with their environment. In increasingly multicultural societies, these traditions are in constant flux. Ethnobiological studies can help understand the changing interactions between cultures and their biological environments. Several studies report an alarming decline in traditional knowledge, often about local edible and medicinal plants, leaving communities vulnerable to cultural erosion and impacting the quality of their life and health in a negative way. Contemporary ethnobiology research can assist in identifying traditions that are most at risk, predict potential impacts of their loss, and recommend strategies to mitigate this loss. Alternatively, these studies can help develop a more nuanced view of the changes that ethnobiological knowledge systems undergo; not all change is deleterious and change is also the hallmark of cultural adaptation and resilience. A pivotal role of the study of culture in contemporary ethnobiology research, away from the utilitarian botanical approach, and a theory-driven ethnobiology, will be essential elements in maintaining resilient, culturally-sensitive communities in the face of globalization.

Keywords: Globalization, traditions, tansformation, cultural sensitivity.

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Ina Vandebroek
New York Botanical Garden, USA

Ina Vandebroek is the Matthew Calbraith Perry Assistant Curator and Caribbean Program Director at The New York Botanical Garden. She has more than fifteen years of experience in research and international cooperation projects in Bolivia, the Dominican Republic, Jamaica and New York City. Her research is at the intersection of plant diversity and community health. Ina studies the dynamics of medicinal plant knowledge and use for primary healthcare by local communities in remote rural areas, as well as by Latino and Caribbean immigrants in New York City.

Ina research shows that, even in times of general loss of biological and cultural diversity worldwide, the use of plants as medicines remains a popular healthcare practice in many communities today. Her work with Caribbean and Latino immigrants in New York City has important implications for healthcare delivery to underserved communities. Ina uses the results of her research to develop training activities with medical students and healthcare providers in New York City to help establish a better dialogue and trusted relationship with their Latino/Caribbean patients, and promote culturally sensitive healthcare. Ina's curriculum vitae and research articles can be accessed here.

Tuesday, June 6, 09h45 – Auditório Dionísio Gonçalves

Plants and mushrooms as sources of value-added molecules for food applications.

Author: Ferreira, Isabel C. F. R. [1].

The use of synthetic additives (preservatives and colourants) in the food industry is a current major concern, from both the human health and environmental points of view. Although considered a promising safer alternative, the use of natural additives still faces some drawbacks and limitations. A specific problem is the difficulty to find abundant natural sources, preferably based on sustainable cultivation, and adequate green and environmental friendly extraction technologies. Additionally, huge volumes of residues from the forestry and food industries, currently considered as low-value by-products, are underexploited in applications such as energy production and/or as compost. This context is emphasized also by an increasing consumer' awareness and interest in "chemopreventive nutrition", being highly receptive to functional foods with specific health-promoting components (nutraceuticals). The challenge to full exploit the potential of these high value-added ingredients derived from natural sources, including plants and mushrooms, requires the development of integrated multidisciplinary solutions that will consider issues from cultivation to extraction, separation and stabilization processes. All the implemented strategies must be supported by reliable and expedite chemical and biological analysis and methodologies for final products validation. Case studies with plants and mushrooms used for the production of functional ingredients (preserving, colouring and bio-active agents) will be discussed; for example the potential of *Gomphrena globosa* L. as a promising alternative source for obtaining natural coloring agents; *Arbutus unedo* L. fruits to obtain a natural preservative enriched in catechin; and *Agaricus bisporus* (Lange) Imbach to develop a new dairy product functionalized with mycosterols as hypocholesterolemic agents.

Keywords: plants, mushrooms, natural products, natural additives, food applications.

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Isabel C. F. R. Ferreira
Polytechnic Institute of Bragança, CIMO, Portugal

Coordinator Professor at Polytechnic Institute of Bragança (Portugal). She is director of the Mountain Research Centre (CIMO). She obtained her Degree in Biochemistry (1996) at the University of Porto (Portugal); Master in Sciences (1999), PhD in Sciences-Chemistry (2003), and "Aggregation" in Sciences-Chemistry (2011) at the University of Minho (Portugal).

She was awarded by different institutions such as Calouste Gulbenkian Foundation (2001), ISPROF (2013) for the achievements in helping the Portuguese Science to progress, COTNH (2014) for international cooperation, Women in Science (2016) by Ciência Viva and merit medal of Bragança (2017).

She supervised several post-doc, PhD and master students. Is an associate editor of Food & Function (a journal of the Royal Society of Chemistry), principal investigator of several financed research projects, and evaluator of international research projects (e.g., Eurostars and ERA-NET ARIMNet 2 from EU and National Science Foundations of Austria, South Africa, Chile, Croatia, Denmark, Czech Republic, Poland, Switzerland and Argentine), and national projects as well as post-doc and PhD grants from the Portuguese Foundation for Science and Technology (FCT; Coordinator in the area of Food Technology and Agricultural Biotechnology).

Isabel Ferreira is the editor of two international books and of the topical collection Bioactive Compounds in Molecules Journal, and has published several patents, 19 international book chapters and over 450 papers in refereed journals. She is a highly cited scientist (top 1%) in Agricultural Sciences (awarded by Thomson Reuters- 2015 and 2016). ORCID ID: 0000-0003-4910-4882.. H Index: 46; Researcher ID: E-8500-2013; SCOPUS ID: 7102135224. See more at BioChemCore.

Thursday, June 8, 09h45 – Auditório Dionísio Gonçalves

Discovering new wild edible plants in Europe.

Author: Łuczaj, Łukasz [1].

I would like to present a history of the discovery of new species of wild edible plants and ask the question - what else can we find in this domain?

In my presentation I will use the flora of Poland and some other European countries as examples. The edibility of plants has been discussed in old herbals and economic handbooks since the origins of written language. Inventories of wild edible plants were often created in the hope of alleviating famine and finding new sources of food. Nineteenth and early 20th century ethnography documented the use of wild foods in order to preserve traditions, but the memory of famine always lingered in these sources. Another source of knowledge of potentially edible species is archaeobotany.

Recently some experimentation has been made by fans of foraging and haute-cuisine chefs playing with recipes. Nowadays we describe the use of wild foods in ethnobotanical works in order to preserve Transitional Knowledge, to improve rural livelihoods, and to find species matching the local terroir, as it appears that most potentially edible plants in Europe are known. Are they really? Can we still find more species which could be included in the human diet?

I would like to discuss the scope, however limited, for inventing or re-inventing new uses of wild edibles. These are: 1. alien species; 2. species regarded as toxic with little-known detoxification procedures; 3. less common species from generally edible families e.g. Brassicaceae; 4. species from taxonomic groups with little-known edibility; and 5. “climbing” the spectrum of food and medicine – learning more about safe levels of food uses of these plants.

Keywords: edible, wild, edible plants.

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Łukasz Łuczaj
University of Rzeszow, Poland

Łukasz Łuczaj is associate professor and head of the department of Botany in the Institute of Biotechnology of the University of Rzeszow, Poland. His main interest is the traditional use of wild foods in Eurasia. His other ethnobiological interests include ceremonial plants and the knowledge of plants among children. He has carried out field research in Poland, Romania, Croatia, Bosnia-Herzegovina, Georgia (Caucasus) and China. In China he works both with Chinese and Tibetan communities of the Qinling Mountains and eastern part of the Tibetan Plateau. He is also interested in archival sources concerning plant uses – he worked extensively with archives concerning Poland, Slovakia, Ukraine and Belarus. He also co-edited a book entitled *Pioneers in European Ethnobiology* (with Ingvar Svanberg, Uppsala University Press). In 2011 Łukasz founded an open access Polish language journal Etnobiologia Polska. He is the editor of Ethnobotany section in Acta Societatis Botanicorum Poloniae (oldest Polish botanical journal) and associate editor in Journal of Ethnobiology and Ethnomedicine.

Apart from the work in Academia he runs an educational center and a wild garden in the Carpathians where he organizes cooking workshops with wild plants, fungi and insects (www.luczaj.com and www.lukaszluczaj.pl). Łukasz authored a few popular books on edible plants and insects and a few cooking television programmes (all in Polish), and runs a youtube channel devoted to wild foods. Łukasz also worked as a garden designer and plant ecologist. He popularized the issue of wildflower meadows in Poland and organizes the collection of wildflower meadow seeds.

Monday, June 5, 11h15 – Auditório Dionísio Gonçalves

Twenty-five years of Ethnobotany around the globe – from magic to molecules, conservation and the Nagoya Protocol.

Author: Bussmann, W. Rainer [1].

The focus of ethnobotanical studies, and the involvement of local stakeholders, have changed greatly over the last few decades. On the scientific side, research has moved from simple inventories of mostly medicinal plants, to detailed quantitative studies, often focusing on all useful plants. More importantly however, research has finally moved away from colonial-style investigations to modern ethnobotany based on the principles of the Protocol of Nagoya.

The ratification of the "Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity", has brought a huge boost to the recognition of the rights of indigenous and local communities, giving rise to new opportunities, and lots of challenges for the ethnobotanical community. SEB has addressed this new ethics environment by adopting a new code of ethics at its annual meeting in Plymouth in 2013.

Examples of twenty-five years of research from South America, Africa - Madagascar, the Caucasus and the Himalayas outline the development of ethnobotanical research over the last decades, the change in attitude and methodology during that time, and the growing role of local stakeholders as owners of traditional knowledge, providing ideas for the future development of the discipline.

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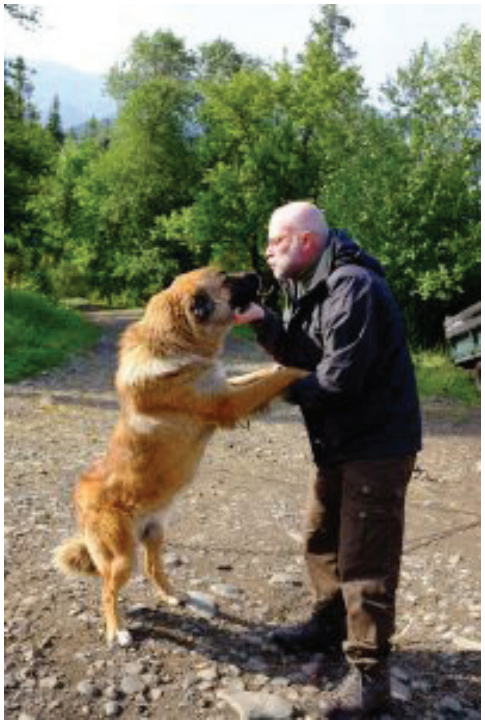

Rainer Bussmann
Missouri Botanical Garden, USA

Rainer W. Bussmann is an ethnobotanist and vegetation ecologist, and currently Director of William L. Brown Center at Missouri Botanical Garden, William L. Brown Curator of Economic Botany, and Senior Curator. Before accepting the directorship of WLBC, he held academic appointments as Research Fellow in Geography and the Environment at University of Texas at Austin, as Associate Professor of Botany and Scientific Director of Harold Lyon Arboretum at University of Hawaii, and as Assistant Professor at University of Bayreuth. He holds affiliate faculty appointments at Washington University St. Louis, University of Missouri St. Louis, Florida Atlantic University Boca Raton, and Universidade Federal de Paraíba, Brazil.

Rainer work focuses on ethnobotanical research, and the preservation of traditional knowledge, in Bolivia, Peru, Madagascar, the Caucasus, and the Himalayas. To date R. Bussmann has authored over 180 papers, 175 book chapters, and authored or edited 29 books. R. Bussmann is also a Past President of the Society for Economic Botany, and has served as Board / Council member of the International Society for Ethnopharmacology, Society of Ethnobiology, Botanical Society of America, and International Society of Ethnobiology. See more on his work on his website and download publications on Researchgate.

Tuesday, June 6, 09h00 – Auditório Dionísio Gonçalves

Traditional Ecological Knowledge dynamics.

Author: Reyes-Garcia, Victoria [1].

Given the potential role of traditional ecological knowledge in biodiversity conservation, researchers and policy makers have shown concern about its loss. The general argumentative line lamenting traditional ecological knowledge loss tends to downplay the dynamic and adaptive nature of traditional knowledge systems and limits our understanding of change and hybridization as processes that potentially allow adaptation to environmental, social, or economic changes.

I will draw on three case studies to analyze traditional ecological knowledge dynamics broadly. The first case study centers on the Tsimane', a hunter-horticulturalist society in the Bolivian Amazon which seems to maintain the capacity to generate and apply traditional ecological knowledge, notwithstanding changes in the specific content of the knowledge system. The second case study centers on traditional knowledge among farmers of the Doñana region, in SW Spain, where rural communities have suffered a disruption in the process of cultural and intergenerational transmission of traditional knowledge as their resource systems were modernized and integrated to global markets in the mid 20th century. The third case study explores the resilience of the traditional agricultural knowledge system of home gardeners in Spain, by analyzing the co-existence of agricultural information derived from traditional and modern agricultural knowledge systems.

Taken together, the three case studies suggest that traditional ecological knowledge (a) is not a frozen and static corpus of knowledge and (b) does not necessarily exclude other forms of knowledge, and (c) that change becomes erosion mostly when it affects the mechanisms that allow societies to regenerate and apply knowledge. Acknowledging the adaptive nature of traditional ecological knowledge helps moving the focus from analyzing specific bodies of knowledge lost to the more important question of where resides the system's capacity to adapt and update knowledge so as to maintain its capacity to address people's daily needs in the face of changing environmental and socio-economic conditions.

Keywords: Traditional knowledge, change, adaptation.

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Victoria Reyes-García
ICTA-UAB, Barcelona, Spain

Victoria Reyes-García (Ph.D in Antropology, 2001, University of Florida) is ICREA Research Professor at the Institut de Ciència i Tecnologia Ambientals (ICTA/Universitat Autònoma de Barcelona). Her research addresses the benefits generated by local ecological knowledge and the dynamic nature of these knowledge systems. She coordinates the Laboratory for the Analysis of Socio-Ecological Systems in a Global World at ICTA-UAB . Between 2010-15, she coordinated an *ERC Starting Grant* to study the adaptive nature of culture using a cross-cultural approach. Victoria's *curriculum vitae* and research articles can be accessed here.

Special Addresses

Monday, June 5, 09h30 – Auditório Dionísio Gonçalves

The vegetal landscape of Northeastern Portugal.

Author: Aguiar, Carlos [1].

Northeastern Portugal region is limited towards the west and south by the river Douro, to the north by the Spanish border, and to the west by the Galaico-Portuguese Mountains. Acid and phosphorous poor Palaeozoic schists intruded by various granitoids are the prevailing lithological types. Its relief is characterized by the widespread occurrence of uplifted planation surfaces, the majority between 600-900m of altitude, dissected by deep river valleys, sometimes interrupted by larger tectonic basins. The supratemperate or supramediterranean, mainly sub-humid to humid, plateaus are the climactic domain of climatophilous mesophilous deciduous forest of *Quercus pyrenaica*. Old forests are not only species richer, but share complex forest dependent vegetation mosaics. The meso-mediterranean upper dry to lower sub-humid valleys and basins harbour the most original forests of the study area: one association of semi-deciduous forests of *Q. faginea* subsp. *faginea* and six associations of perennial oak woodlands, three of them dominated by *Q. suber*, and other three by *Q. rotundifolia*. Heathlands and gorse heathlands are the most conspicuous substitution stage of *Q. pyrenaica* and *Q. robur* woodlands; *Cistus* srublands are serial of perennial leaf and semi-deciduous woodlands. Also diverse and with a clear-cut bioclimatic control are riparian and tempori-hygrophilous forests. The geobotanical interpretation of regional grassland vegetation complexes requires particular caution. They include several oligotrophic grassland types, dominated by terophytes, *Agrostis* sp.pl. or *Nardus stricta*, among other species. Mesoscale physiography, tree shading, grazing and hay cut have a strong effect in hay-meadows vegetation complexes. Recent changes in hay-meadow management are promoting grass abundance and the occupation area of *Arrhenatherion* grasslands. The mafic and ultramafic metamorphic rocks are, simultaneously, the most singular lithology and the habitat of the most original phytocoenosis of the study area. Herbaceous weed, ruderal and various vegetation reflect the widespread oligotrophy of regional soils.

Keywords: Northeastern Portugal, Portuguese *Quercus* forests, forest succession, Northeastern Potugal phytosociological communities.

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Monday, June 5, 09h45 – Auditório Dionísio Gonçalves

Landscape change and ecosystem services in the Bragança region.

Authors: Azevedo, João [1], Sil, Angelo [1].

Landscapes in the Bragança region (Northeastern Portugal) are complex socio-ecological mosaics resulting from a combination of physical, biological and management factors. These landscapes are interesting not just from a conservation point of view due to the biodiversity that they support but also for cultural reasons. Landscapes in the Bragança region have been socially recognized through the establishment of a series of conservation areas aiming to preserve simultaneously natural, anthropologic, architectonic, historical, and other cultural values but mostly socio-ecological interactions in these territories. Landscapes in the region have experienced a significant degree of change over the last decades. These changes have been driven by socioeconomic factors (e.g., demography, agriculture policy) that led to land abandonment in most of the rural areas, more significantly in marginal (mountain) areas. Shrublands and forests, either natural or planted, have expanded substantially at the expense of agriculture. Permanent crops such as chestnut orchards have also been increasing significantly in the region. These structural changes affected ecosystem and landscape level processes and increased risk. The concept of ecosystem services, linking ecological processes and societal values, provides a useful framework to address landscape change. In Bragança, we observed an increasing supply and value of regulation ecosystem services such as carbon sequestration, nitrogen retention, and sediment retention over the last decades and we estimate this trend to continue in the near future. Among provisioning services, agriculture production has been decreasing significantly and it is expected to decrease further in the future. Forest products (wood and non-woody) can become important provisioning services in the area shortly. Water supply is, however, the service with highest growth more over time. Overall, the processes of change taking place in the landscapes in Bragança don't seem to affect negatively the supply of ecosystem services or their value. On the contrary, recent landscape change increased the total supply of ecosystem services in the area, measured both biophysically and monetarily. Nevertheless, recent changes increased fire hazard in the landscape threatening the trend of ecosystem services supply urging decision makers to address landscape management focused on processes, functions, ecosystem services and risks in this region.

Keywords: Bragança Landscape, landscape changes, ecosystem services, socio-ecological systems.

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Wednesday, June 7 – Parque Natural de Montesinho

The Natural Park of Montesinho, Bragança, Portugal: territory, ethnobotany and cultural identity.

Author: Carvalho, Ana Maria [1].

The Natural Park of Montesinho is a natural protected area in the Northeastern Portugal created in 1979 in order to preserve the existing environmental qualities and enhance important biocultural patrimony, developed for a long interaction between humans and nature. A territory of 75000 ha that included 91 communities and nearly 8,000 residents in 2011, distributed by two municipalities (Bragança a and Vinhais). It is one of the largest natural parks of the 13 existing ones in Portugal. Two of the most important mountain ranges (Serras) are Serra de Montesinho (north of Bragança a) and Serra da Coroa (north of Vinhais). Elevation varies between 1486 meters in Montesinho and 438 meters in Mente riverbed (Vinhais). Geography, climate and soil conditions along with particular land management carried out over centuries have contributed to an extraordinary diversity of habitats, wildlife and plant communities, a differential biodiversity of great significance at national, Iberian and European levels. There is still a rich socio-cultural patrimony, combining ancestral traditions and some innovation, marked by festivals, religious ceremonies and many reasons for the reunion all over the year of families and neighbours. Some examples are the All Saints' Day and the pig slaughters, St. Stephen's Day and the winter solstice feasts. Traditional music and the sounds of bagpipes are other important aspects of the regional identity. Local architecture (e.g. stone roofs, water mills, dovecotes and forges), using the characteristic materials available according to particular knowledge and skills is also remarkable. Montesinho and the neighboring communities of França and Portelo are strongly connected by polychromatic landscape and the paths of shepherds, miners and smugglers. Rio de Onor is also an emblematic village with distinguished significant features: (i) the international border runs across the village dividing it in two sides. Rihonor de Castilla is the Spanish side, and Rio de Onor, the Portuguese one; (ii) a communitarian governance surviving to the end of XX century, based in collective resource management and mutual help among residents, controlled through a community board, where every household involved with the collective property was represented; (iii) an own dialect belonging to the Astur-Leonese linguistic group.

Keywords: Natural Park of Montesinho, Biocultural heritage, Montesinho ethnobotany, Rio de Onor, Northeastern Portugal.

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Wednesday, June 7 – Vimioso, Terras de Miranda

Terra de Miranda: agrobiodiversity, cultural heritage and sustainable development.

Authors: Sá, Isabel [1], Rodrigues, João Brandão Rodrigues [2].

The Miranda Plateau corresponds to one of the most remote but most beautiful regions of Portugal. In the border with the west Province of Zamora, Castilla y León, Spain, this mountainous region clearly suffered the effects of the rural exodus during recent decades, facing now a serious depopulation problem. The remaining population, largely composed of elderly people, is still dedicated to the primary sector, mainly based on subsistence farming systems. Technology improvement and mechanization of the agro-forestry sectors, together with the imposition of foreign production models, contributed to a significant loss of biodiversity, but also to the loss of historic, cultural and genetic heritage. The reduction of use of native breeds as working animals, such as the Mirandês donkey and the Mirandesa cow, is just an example to understand the current situation. A similar trend can be seen when referring to plants species and the traditional varieties' seeds, where the observed loss might be irreversible. However the region noted in the last decade an emerged growing association movement in different areas but focused in common goals. These Non-Governmental Organizations are nowadays responsible for different initiatives, promoting rural development through a contemporary perspective of traditional knowledge, practices and materials. Vimioso is one of the Municipalities where these NGO's find a bigger support, promoting and including these organizations in the municipal development strategy for this territory. Vila Chã da Ribeira is a small village, where the local old primary school was rebuilt and converted in one of the headquarters of ALDEIA, a NGO who developed since more than 10 years a wide range of activities directly focused on nature conservation and heritage promotion. For instance, the inventory of knowledge, practices and cultural traditions related to plants and the preservation of endangered traditional seeds. In Picote, at the top of the Arribas do Douro, another NGO – FRAUGA supports local cultural initiatives, such as those concerning the Mirandesa Language and the EcoMuseum Terra Mater. The old city of Miranda and its Ethnographic Museum enhance characteristic features of the Mirandese culture.

Keywords: Rural development, cultural heritage, Mirandese identity and features, Terra de Miranda, Douro International, Northeastern Portugal

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Symposium 1
Ethnobotany of Mountain Regions – Session 1

Chair: Fusun Ertug, Turkey
Monday, June 5, 12h00 – Auditório Pequeno

Ethnobotany of climate change in the greater Himalayan Region: a 3000km transect

Authors: Hart, Robbie [1], Salick, Jan [1], Fang, Zhendong [2], Ghimire, Suresh K. [3], Dema, Sangay [4], Sher, Hassan [5].

Climate change in the Himalaya brings temperature increases, changes in precipitation, and changes in permanent snows and glaciers. This threatens the exemplary biodiversity of the region, including plants of utilitarian and cultural value to the diverse Himalayan peoples. Our Himalayan subnetwork of the Global Observation Research Initiative in Alpine Environments (GLORIA) monitors climate change, alpine vegetation, and ethnobotany across a 3000km transect. The subnetwork spans the greater Himalayan region from Northern Pakistan, through Nepal and Bhutan to southwest China. At each monitoring area, we sample four mountain summits on an elevational gradient from the treeline ecotone to the uppermost limit of plant life (4000-5000masl). To this basic methodology, which we share with other researchers in GLORIA, we add ethnobotanical interviews to determine alpine plant uses. Intial resurvey data, from the three easternmost sites, shows useful plant diversity, species composition in general, and response to climate change over the seven-year period between surveys were all structured on a strong North-South aspect gradient. Understanding the importance of topography can inform our predictions for climate change effects on species composition in this biodiverse and culturally valuable flora. Across the subnetwork, we see high endemism, and a large proportion of ethnbotanically important indicator species. For these high alpine useful plants, we anticipate climate change threats both from increasing temperatures and from competition with lower-altitude plants extending their range. Indigenous Himalayan communities observe traditionally used and marketed medicinal and aromatic plants becoming harder to find and alpine pastures declining. Adaptation and mitigation strategies vary in each location. In China and Nepal, mountain villages are experimenting with new crops to take advantage of warming temperatures. In Nepal and Pakistan, we work with local medicinal and aromatic plant gatherers to evaluate procedures for the sustainable collection of wild plants and the possibilities for their cultivation. These data that will continue to emerge from this subnetwork will deepen the understanding of climatic factors in shaping medicinal and aromatic alpine vegetation in the Himalayan ecosystems, and contribute to national sustainable development measures and international efforts to understand and address climate change and its ethnobotanical impacts.

Keywords: Ethnobotany, Alpine, Himalaya, Asia, Climate Change.

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Exploring local knowledge of agroforestry species for climate change adaptation: A case study from Apurímac, Peru.

Authors: Mathez-Stiefel, Sarah-Lan [1], Valdivia-Díaz, Merelyn [2], Smith Dumont, Emilie [3], Reynel-Rodríguez, Carlos [4], Sinclair, Fergus [3].

Researchers and practitioners have increasingly recognized the importance of local knowledge for smallholders' adaptive capacity to climate change. This is especially true in mountain areas, where local people have developed knowledge systems and coping strategies to maintain productive systems in the face of extreme climatic conditions and high variability. This study assessed the potential application of local knowledge on agroforestry species as a response to current climate challenges faced by smallholders in the Andes. The study was conducted in three communities of a micro-watershed of the Southern Peruvian Andes that covers a diversity of ecological life zones and production systems. A combination of participatory and ethnobotanical tools was used for data collection, including workshops, focus groups, field walks, and in-depth interviews with 38 farmers. Local knowledge about agroforestry practices and species was documented and qualitatively analyzed using the Agroecological Knowledge Toolkit software (AKT5). The results showed that farmers have significant knowledge on the buffering role of shrubs and trees for increased temperatures and soil and water c onservation, including erosion control, promotion of soil fertility, and soil conservation. However, they lack knowledge on protection of their productive systems against extreme climatic events such as heavy rainfalls, hail, and strong winds. This research highlights the need for studies to test the role of woody plants to respond to extreme climatic events. The combination existing local knowledge and targeted scientific knowledge has potential to advance innovative solutions and inform agroforestry and climate change adaptation projects in the Andes and other mountain areas.

Keywords: Local knowledge, agroforestry, climate change adaptation, Andes.

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Transhumance and medicinal plants: the case of Armenian Yezidis.

Authors: Hovsepyan, Roman [1], Stepanyan-Gandilyan, Nina [2], Melkumyan, Hamlet [3], Harutyunyan, Lili [3].

Yezidis are the largest ethnic minority in Armenia (~1.24%). This ethnoconfessional group of Kurmanji (dialect of Kurdish) speaking people confess Yezidism. In the South Caucasus, particularly in Armenia, Yezidis traditionally are known as successful transhumant pastoralists (although nowadays many Yezidis already do not practice sheep husbandry and do not move to the mountains in summer season). In Armenia, there is a common stereotype that transhumant or nomadic people (including local Yezidis and Kurds) are specialized merely in animal husbandry, thus cannot be successful agriculturalists and that they are far from anything related to plants (including gathering). Probably this situation was the reason that until recently in the South Caucasus none of the scientists tried to investigate the ethnobotany of Kurmanji speaking people. Our investigations (started from 2013) showed that the Yezidis of Armenia have certain ethnomedicinal practices using gathered medicinal plants that are typical only for these people and comprise characteristic part of their everyday life, culture and identity. Tens of plant species are gathered and used by the Yezidis in Armenia. Having transhumant lifestyle in the mountainous regions is a challenge for the organism: it means to spend most of the time outside with animals, move all the time, face cold and humidity, repeatedly get injuries, and because of lack of proper hygienic conditions, deal with many infections. Corresponding to health problems that transhumant people regularly experience while live and work in the mountains, medicinal plants gathered and used by the Yezidis in Armenia may be divided into two main groups based on usage purposes. Plants from one group are being used to cure internal inflammations (e.g. gastroenteric, urogenital, respiratory), which are mostly caused by infections (species of *Tanacetum, Tripleurospermum, Anthemis, Mentha, Thymus, Hypericum, Achillea, Helychrisum, Teucrium*, etc). The other main group of plants is being used to cure and heal injuries (cuts, burns, scratches, etc) and external inflammations and infections (often post-traumatic) (species of *Echium, Alkanna, Plantago, Arctium*, etc). Yezidis often use medicinal plants also for preventive purposes, which help them to cope with severe conditions of mountains and recover faster in the case of sickness.

Keywords: Local knowledge, agroforestry, climate change adaptation, Andes.

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Quantitative ethnobotany of the Little Karoo, South Africa

Authors: Hulley, Isabel Margaret [1], Van Wyk, Ben-Erik [2], Schutte-Vlok, Anne-Lise [3].

The Little Karoo is a botanically diverse region with an estimated 3284 plant species. A checklist of useful plants of the Little Karoo was compiled, based on local popular literature and quantitative surveys. Since pastoralism has been the dominant culture of this relatively arid region for the last 2000 years, plant utilised by livestock were included in the study. The checklist includes 375 grazing plants from 67 families; 275 medicinal plants from 80 families, 77 food plants from 44 families and 38 craft plants from 26 families. This gives a total of 596 useful plants (18% of the flora). Quantitative ethnobotanical surveys were conducted in eight towns of the Little Karoo: three in the western part (Barrydale, Vanwyksdorp and Zoar) and five in the middle and eastern parts (Dysselsdorp, Haarlem, Prins Albert, Uniondale and Volmoed). The Matrix Method allowed us to determine the relative importance of the species that are used (by calculating the Species Popularity Index or SPI) but also the spatial distribution of traditional plant knowledge in the Little Karoo (by calculating the Ethnobotanical Knowledge Index or EKI). These indices enable future comparisons at local, regional and global level. Many new anecdotes, vernacular names and unusual and previously unrecorded uses were recorded during this study. Species that are scientifically poorly known were amongst the most popular remedies, e.g. for respiratory ailments (*Pegolettia baccharidifolia* Less.), stomach ailments (*Cadaba aphylla* (Thunb.) Wild) and wound healing (*Osteospermum calendulaceum* L.f.). Amongst unusual new records were *Nymania capensis* (Thunb.) Lindb. (roots are used to treat alcoholism) and *Rosenia humilis* (Less.) K.Bremer (the herb is considered to be a cure for infertility and female disorders). The study represents a novel contribution to Khoi-San ethnobotany and the conservation of indigenous plant use knowledge.

Keywords: Ethnobotany, Khoi-San, Indigenous knowledge, South Africa, Medicinal plants, edible plants, Craft plants, Pasture plants.

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Symposium 1
Ethnobotany of Mountain Regions – Session 2

Chair: Christian R. Vogl, University of Natural Resources and Life Sciences, Vienna (BOKU), Austria
Monday, June 5, 14h30 – Auditório Pequeno

Changing markets: medicinal plant ethnobotany in the Andes of Bolivia, Peru and Colombia

Authors: Paniagua-Zambrana, Narel Y. [1], Bussmann, Rainer W [2], Hart, Robbie E [3], Romero, Carolina [2], Moya Huanca, Araseli Laura [1].

Given the importance of local markets as a source of medicinal plants for both healers and the population, literature on market flows and the value of the plant material traded is rather scarce. This stands in contrast to wealth of available information for other components of Andean ethnobotany. The present study attempts to remedy this situation by providing a detailed inventory of medicinal plant markets in the La Paz-El Alto (Bolivia); Lima, Trujillo and Chiclayo (Peru) and Bogota (Colombia). Both species composition, and medicinal applications, have changed considerably over time. From 2001-2015, semi–structured interviews were conducted with hundreds of plant vendors in order to elucidate more details on plant usage and provenance. The results of the present study were then compared to previous inventories of medicinal plants in the region, as much as available, to elucidate changes over time and impact of interview techniques. Over the years we we encountered and documented over 800 plant species. This indicates a great wealth of ethnobotanical knowledge in the Andean region of South America. All markets show a considerable change over the last few decades, with new species being introduced into the market chain, and other species being replaced. In course of the present study it became apparent that even well known species might often be replaced by other apparently similar but botanically unrelated species due to environmental and market forces The present data indicate that, while the floristic composition of often remained relatively constant over the last decades, the number of indications for which certain species were used increased tremendously, and that profound differences exist even between markets in close proximity. The dramatic increase in previously not used species used per indication might pose serious risks for consumers. We found serious problems due to species replacements. Even plants that have a well established vernacular name, and are easily recognizable botanically, can be replaced by other species that can pose a serious health risk. Vendor education and stringent identification of the material sold in public markets are clearly needed.

Keywords: Medicinal plants, Markets, Globalization, Bolivia, Peru, Colombia.

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Traditional knowledge in the Caucasus: changing knowledge patterns in Georgia after the end of Soviet occupation

Authors: Bussmann, Rainer W [1], Paniagua-Zambrana, Narel Y [2], Sikharulidze, Shalva [3], Kikvidze, Zaal [4], Kikodze, David [3], Tchelidze, David [3], Khutsishvili, Manana [3], Batsatsashvili, Ketevan [3], Hart, Robbie E [5].

The territory of modern day Georgia has been continuously inhabited since the early Stone Age, and agriculture was developed during the early Neolithic era. In Georgian the name of the country is "Sakartvelo", and "Georgia" is semantically linked to Greek (γεωργία) meaning "agriculture". Due to its long tradition, agriculture in Georgia is characterized by a great diversity of landraces, and endemic species of crops. These show a high level of adaptation to local climatic conditions and often high disease resistance. Fieldwork was conducted in Khevsureti, Khevi, Samtskhe Javakheti, Tusheti, Svaneti, and Racha in July August 2013, July August 2014, and September October 2015. Interviews using semi structured questionnaires were conducted with over 175 participants after obtaining their oral prior informed consent.Our research indicates that while traditional crops like wheat, barley and rye have almost disappeared, a large number of species is traditionally also grown in home gardens, and a large part of the wild flora is used for food, medicine and cultural purposes. However, the related traditional knowledge is mainly held in the generation above 50, while younger people have started to loose traditional knowledge. No gender differences in knowledge could be observed. Overall, home gardens serve mostly as source for food, while wild plants are especially important fro medicine, and traditional pickles and jams. The main reason for genetic erosion of ancient crop varieties is the demographic decline in mountain regions due to harsh economic conditions and lack of modern infrastructure. The shift from ancient cultivars to modern high yielding crops such as maize and potato, began in mountain villages after the end of Soviet occupation, when local inhabitants who had been forced to the lowlands, returned to their original villages.

Keywords: Caucasus, Globalization, Traditional knowledge.

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Promoting sustainable use of Medicinal and Aromatic Plants for livelihood improvement and biodiversity conservation through Capacity Building training program in Himalaya mountain Swat District, Pakistan

Authors: Sher, Hassan [1], Bussmann, Rainer W [2], Hart, Robbie E [3].

Rural communities in Swat District, particularly those living in the mountain regions, use MAPs locally for medicinal purposes and for domestic food consumption. In addition, MAPs are traded in the urban markets to generate income. This paper reports on a project aimed at capacity building through awareness raising, training, exposure, and developing market linkages to promote the sustainable use of MAPs. The methodology of the survey focused on a series of consultation and coordination meetings with the local Forest Department. Additionally, Focus Group Discussions were held in each village with MAPs traders, collectors, and other participants of different age groups. This was followed by field surveys guided by community members. The study reported the twenty MAP species that had high market value and were used in indigenous medicine systems by all ethnic groups. These species were traded through formal and informal trade networks, including cross-border smuggling between Pakistan and Afghanistan. The project covered a range of interventions to foster sustainable use, and livelihood improvements, such as local awareness campaigns, capacity-building training, and community mobilization for conservation of threatened species, and formation of MAPs Producer Associations who are directly linked to big buyers to maximize net income. Capacity building of the target population was the main intervention undertaken to achieve the overall objectives of the project. Therefore, community participation at all levels of the project was ensured to enhance their knowledge and skills on sustainable harvesting and marketing of MAPs, which represent the prime 'engines of growth' for the local economy. The project has achieved all planned targets, and although it is too early to measure the impact of these activities, it is expected that the project will serve as a strategic investment for income generation through sustainable harvesting and marketing of MAPs for rural communities in remote northern parts of Swat District.

Keywords: Caucasus, Globalization, Traditional knowledge.

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Introduction of new analytical and quantitative approaches for the production and conservation of Medicinal and Aromatic Plants for economic development of Pakistan.

Authors: Sher, Hassan [1], Ali Khan, Imtiaz [2], Bussmann, Rainer W [3], Hart, Robbie E [4].

The current project has been evaluating opportunities to maximize farm income through introduction of high value medicinal and aromatic plants (MAPs) in the war-stricken district Swat of Pakistan, directly supporting new Framework for Economic Growth of the country. The hypotheses is the establishment of ex-situ experimental production plots, leading to the development of skills in horticultural production and marketing among people in the valley and help rebuild commercial connections between this area and the rest of Pakistan. This project has covered a range of interventions such as local awareness campaigns, capacity-building training, market survey, and MAPs production in the farms land of community. Local and indigenous communities have evolved traditional wisdom about the cultivation of conventional crops with very low economic return. This paper focuses on the cultivation of ten high value MAPs with farmers in three different locations/villages. This study also focus on the economic analysis and profitability of selected MAPs production and to explore the prospects of MAPs cultivation as a potential economic venture in the region and a way of ensuring the long-term conservation of these plants in the wild. The study has also incorporate evaluation of its performance in introducing standardized production technology and appropriate post-harvest management, which represent the prime 'engines of growth' for the local economy. These strategic economic development areas are entirely based upon, and closely interlinked, with the management and conservation practices of high value MAPs, and intact landscapes. It was suggest that the cultivation of important and threatened MAPs is very effective means to satisfy market demand, to provide income to communities dependent on the wild natural resource, and to reduce pressure on the wild population of plants species. Moreover, the available marginal, sub-marginal and cultivable wasteland can be developed and planted with selected MAPs species. It was also recommended that the farmers should be further guided through extension visits in order to educate them regarding the adoption of new technologies related to MAPs production and conservation.

Keywords: Medicinal plant production, Economic growth, Conservation, Livelihoods.

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Sustainable Production and Ethnoecological Assessment of commercially important high altitude medicinal and aromatic plants in District Swat: A step toward sustainable resource conservation.

Authors: Sher, Hassan [1], Saeed, Mian Abdal [2], Bussmann, Rainer W [3], Hart, Robbie E [4].

The overall goal of our study is to establish, sustainable and beneficial use of wild Medicinal and Aromatic plant populations, a goal that can only be reached through active engagement and support of local community members. The study focused on assessing the occurrence, abundance, diversity, and ecological distribution of these populations and determining their economic importance to the local communities. The surveys revealed that, compared with twenty years ago, collectors now have to put forth more effort and walk longer distances to collect the same amount of material. The study focussed on eight MAPs for which harvest limit/quotas have been established. The purpose of these limits is to ensure that the species will be a reliable source of income for the local communities. The survey showed that wild populations of MAPs were the major source of MAPs material being marketed. Collectors are rural people, prominent among them being women and children of Gujars or Middle Hill tribes and nomads. Collection of MAPs is generally the primary source of supplementary income. The individuals involved have not been formally trained in identify and how to distinguish their target species from similar species in the area and have little knowledge of the appropriate post-harvest treatment for the material they collect. Most material collected is sold to local middlemen at a very low price. Progress towards more sustainable use of wild MAPs can be assisted by identifying the appropriate harvest times for each species, times there the desired part can be harvested effectively while minimizing impact on the plant's ability to regrow. A proper mechanism of the implementation of collection quotas should be designed to enforce conservation and management efforts. It is also clear that local communities must be involved in setting and helping enforce adoption of such regulations if they are to be successful. In this context, the present project may be of high interest to rural development programs aimed at fostering community-based management strategies of natural resources in general and MAPs in particular.

Keywords: Conservation, Local community, Medicinal plants, Harvest quotas, Sustainibility, Livelihoods.

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Establishment of Global Observation Research Initiative in Alpine Environments (GLORIA) Plots in Pakistan

Authors: Sher, Hassan [1], Bilal, Hazrat [2], Bussmann, Rainer W [3], Hart, Robbie E [4].

The alpine region of the Greater Himalayas is rich in terms of biodiversity with high endemism, and at the same time supports livelihood of the indigenous peoples and of massive downstream populations. However, the alpine environments are among the habitats most vulnerable to environmental change. Of the alpine regions, these Himalayas are experiencing the fastest rate of climate change, with temperatures rising quickly. The Intergovernmental Panel on Climate Change projected the climate change in the Himalayas with high model agreement for temperature increases of 5-6 ºC and precipitation increases of 20-30%. The Global Observation Research Initiative in Alpine Environments (GLORIA) is an initiative towards an international research network to assess climate change impacts on mountain environments. In this context Missouri Botanical Garden, in collaboration with Centre for Plant Sciences and Biodiversity, University of Swat Pakistan have applied GLORIA strategy to establish permanent plots in different parts of Hindu-Kush- Himalaya in 2016 for monitoring the effects of climate change on alpine plant diversity. Additionally GLORIA ethnobotanical survey was conducted with the aim to gain detailed information on traditional plant use by indigenous populations and identify plants of greatest importance to people near each site. The identified GLORIA sites of Pakistan host a variety of ecosystems that are linked to life support systems in various ways. Some of the components of these ecosystems are so fragile and sensitive that they feel even little change in climate prior to any other component of the local environment. Glaciers and pasture are some of these. This way, since home to the largest glaciers and ice outside of polar region, and since home to numerous pastures with diverse flora and fauna, the Hindu-Kush- Himalaya are more like living laboratories to assess change in climate and its severity for various life-linked functions and our GLORIA plot will test different adaptation techniques to cope with the severe change, if it occurs so.

Keywords: GLORIA, Ethnobotany, Alpine, Hindu-Kush- Himalaya, Pakistan, Climate Change.

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An updated review of Khoi-San ethnobotany.

Authors: Van Wyk, Ben-Erik [1].

South Africa is home to one of the richest temperate floras on earth, namely the Cape Floral Kingdom. At the same time it is generally accepted as the place of origin of modern humans some 160 000 years ago. It is also well known that the southern African San and Khoi peoples, with their unique click languages, represent the most ancient human cultures on earth. This combination of botanical and cultural diversity and endemism resulted in unique patterns of indigenous plant use that have remained poorly documented. Recent quantitative ethnobotanical studies in the Cape region of South Africa have not only resulted in a comprehensive recording of many useful plants and their vernacular names but also provided important new insights into the possible origins of medicine. The extant patterns of plant use provide fascinating possibilities for making comparisons with historical data (from the early literature) as well as with prehistorical data (from the archaeological record). The results show that indigenous plant use is dynamic and adaptive, and that only a limited number of links can be established between ancient and modern uses of plants.

Keywords: Folk medicine, Ethnobotany, Khoi-San, Cape Floristic Region, Indigenous knowledge.

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Mobile Discovery of antimicrobial plants in Appalachian Mountains.

Authors: Alley, Jessica [1], Wagner, Charles [2], Rathinasabapathy, Thirumurugan [3], Esposito, Debora [4], Komarnytsky, Slavko [3].

The southern Appalachian Mountains, the historical homeland of the Cherokee people, are the oldest mountains in the world and formed more than 200 million years ago. These mountains are also home to one of the most botanically diverse temperate rain forests in the world. The Cherokee sought remedies to their ailments in this rich natural environment, and many of their medicinal plants are still used today throughout western North Carolina. In this study, we used Mobile Discovery approach to randomly screen 350 plants during the 5 months, 2190 miles long Appalachian Trail hike between Springer Mountain in Georgia and Mount Katahdin in Maine. We recorded 7 high scoring hits (2% hit rate) against bacteria naturally present in human saliva. One of the hits was subsequently identified as spotted wintergreen (dragon's tongue, pipsissewa, *Chimaphila maculata*) that inhibited *Staphylococcus aureus* and *Escherichia coli* bacterial growth with MICs in the range of 20-80 ug/ml. Using traditional healing knowledge of ethnic mountain communities to guide rigorous, evidence-based scientific investigation, therefore provides additional leads for developing new and alternative bioactive molecules to combat bacterial and infectious diseases.

Keywords: Ethnobotany, Medicinal plants, Microbial infections, Antibiotic resistance.

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Symposium 1
Ethnobotany of Mountain Regions – Session 3

Chair: Rainer Bussmann, Missouri Botanical Garden - William L. Brown Center, USA
Monday, June 5, 17h00 – Auditório Pequeno

Which traditional uses of wild plants persist in western rural societies? A case study in Sierra Norte de Madrid, Spain.

Authors: Aceituno-Mata, Laura [1], Tardío, Javier [2], Pardo-de-Santayana, Manuel [3].

In traditional societies, the interaction between human beings and plants is essential for survival in every realm of life. But what happens when the evolution of a society makes it less dependent upon the immediate environment? When need is not in the equation, which traditional uses of plants remain and which are left behind? In order to answer these questions we studied the use of wild plants in 'Sierra Norte', a mountain region located 80 km to the North of Madrid city. The objectives of the research were: a) to capture the cultural importance of different use categories of wild plants among the population that has lived in the study region before 1960, b) to evaluate the present relevance of wild plant traditional uses among and c) to compare and analyze both measures in order to give an insight of which traditional uses of wild plants persist despite biocultural erosion and why. We collected data from 276 informants between 50-90 years of age, through semi-structured interviews, group interviews and participant observation, during the period 2003-2006. The interviews included open questions about all the plant use categories: medicine, veterinary, human food, animal food, symbolic, technology and craft, fuel, ornamental and toxic. For each plant use, we asked whether the informant did still practice it or not. To assess the traditional knowledge and present use of wild plants we calculated the Cultural Importance Index. The results show that the most culturally important use categories in the study area are human food and animal food, followed by technology & craft and medicine. However, the present use in these categories is not correlated with their cultural importance: while human food and medicine were still in force in more than half of the use reports, the trend was opposite for animal food and technology & craft. Therefore, we conclude that the cultural importance of a plant use does not determine whether the use is abandoned or still practiced under a cultural erosion process. Changes in value systems and lifestyles determine new roles of plants: they provide identity and leisure instead of being the key for survival.

Keywords: Past and present use, Useful plants, Sierra Norte de Madrid, Traditional knowledge.

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Plants species and techniques used for charcoal production in the Northeast of Portugal.

Authors: Barreira, Isabel de Sá [1], Carvalho, Ana Maria [2].

Humanized landscapes are mosaics of great natural and anthropological values. People have been modeling the landscapes, and as closely linked, both evolved together. The forest and the scrublands provided the necessary woody resources for the most diverse human activities. For example, wood for the construction of structures and for the manufacture of objects, wood for lighting, heating and cooking. In this context, communities have developed many strategies to obtain the materials needed for their existence. These strategies, conditioned by regional availability, were also determined by skills and technical capacities as well cultural habits of each community. Charcoal has been following the path of societies since the earliest times, being a major energy product in many processes. The use of charcoal has made many advantages for social life such as heating houses, cooking, and also as fuelwood for mines and forges For decades, in Aveleda, a community in the mountainous Portuguese northeastern region of Trás-os-Montes, charcoal production represented the main source of subsistence for many families. Some experts used to make charcoal out of the combustion of wood from *Erica australis* L. (an Iberian heather species) and *Cistus ladanifer* L. (gum rockrose). The charcoal production required knowledge and a laborious manufacturing process. The most important skills were mainly concerned with the selection of the particular plant materials (e.g. heather roots and stems and gum rockrose trunks) and the precise moment to stop combustion. The charcoal was sold in the city of Bragança and, especially, after the Spanish Civil War was quite well paid, because the raw material was scarce due to overharvesting. Nowadays charcoal production is mainly used for domestic consumption, mostly to use in forges to manufacture tools and traditional handmade knives. This presentation focuses the plants species and techniques used for charcoal production and its social context, in rural communities of the Northeastern Portugal.

Keywords: Charcoal, Traditional knowledge, *Erica australis* L., Portuguese Ethnobotany, Northeastern Portugal.

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Cultural connections & ethnobotany: the cultural knowledge stored within Lisu plant names.

Authors: Sellers, Holly [1].

The Lisu are one of several non-Thai minority cultures residing in the mountainous northern region of Thailand, which borders Burma/Myanmar and Laos. In Thailand, Lisu speakers number approximately 40,000. There are more than a million Lisu speakers in the world, with significant numbers in China and Burma/Myanmar, and a very small number in India. Most Lisu in Thailand speak the Southern dialect which was the focus of this research.

Southern Lisu plant names encode a lot of information about the plants' uses and effects on both people and animals, as well as cultural information such as references to uses by other local minorities. A large number of names are based on metaphor and metonymy and there are many examples of use-related names, with a strong focus on medicinal uses. Topics included in the names are taste, smell, look (visual), plant behaviour and there is at least one collected that encodes a specific plant's germination process.

Although the language itself is not currently endangered, the Lisu's traditional knowledge of plant names and their uses is at substantial risk of being lost in the near future, despite being intrinsically linked to their cultural heritage and wellbeing. This loss is partly due to habitat destruction as well as the increasing use of modern medicine for both convenience and effectiveness. Younger villagers are also moving to the lowlands for work or study and are therefore unable to spend the lengthy time required to study detailed plant knowledge in their village.

Data for this project was collected from Lisu speakers over two field trips to northern Thailand in 2012 and 2013, and forms a new botanical corpus of more than 300 scientific plant identifications and their names in Southern Lisu. The data set as a whole includes plant specimens, photographs, voice recordings and translations of plant uses, stories, and scientific and Lisu names along with their folk taxonomic categories, where available.

Keywords: Ethnobotany, Lisu, Vernacular names, Local/traditional knowledge, Ethnobotanical knowledge, Linguistics, Northern Thailand.

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A quantitative survey of Venda ethnobotany.

Authors: Magwede, Khathutshelo [1], Van Wyk, Ben-Erik [2].

The Venda people (Vhavenda) are the traditional inhabitants of the Vhembe District within the Limpopo Province in South Africa. They have a rich material culture that involves at least 500 plant species. Documented information on Vhavenda ethnobotany is mainly descriptive, so that this study focused on quantifying the relative importance of all the species used as medicine, vegetables, edible fruits, beverages, firewood, building material, craftwork and several minor uses. Data was collected through formal interview surveys aiming to determine the relative popularity of plant species and to record knowledge of their uses amongst Vhavenda. Interviews were conducted in four villages using a flip-file with photos of 329 plant species. Interview results were analysed and quantified using the Matrix Method developed by De Beer and Van Wyk in 2011. The Species Popularity Index (SPI) of each plant, as well as the Ethnobotanical Knowledge Index (EKI) of each research participant was determined. Plants with highest SPI values were *Citrus limon* (L.) Osbeck (1, 0), *Musa paradisiaca* L. (0.99), *Adansonia digitata* L. (0.99), *Amaranthus hybridus* L. (0.98), *Momordica balsamina* Wall. (0.97), *Ipomoea batatas* (L.) Lam (0.97), *Obetia tenax* (N.E.Br.) Friis (0.97), *Sclerocarya birrea* (A.Rich.) Hochst. (0.97), *Bidens pilosa* L. (0.97), *Carica papaya* L. (0.97), *Cucurbita pepo* L. (0.97), *Vigna unguiculata* (L.) Walp. (0.97), *Corchorus tridens* L. (0.97), *Psidium guajava* L. (0.95) and *Vangueria infausta* Burch. (0.95). As expected, senior citizens had the highest average EKI value (0.58), followed by adults between the age of 35 and 59 years (0.53) and lastly the youth below 35 years of age (0.33). The quantitative data will allow for comparisons of Vhavenḓa plant use changes over time, as well comparison with other cultures. Some enigmatic Venḓa medicinal plants such as Mutavhatsindi (*Brackenridgea zanguebarica* Oliv.) and Muangaila (*Millettia stuhlmannii* Taub.) are facing local extinction because the traditional system of myths and taboos are no longer effective as conservation measures to ensure sustainable use.

Keywords: South Africa, Vhavenda, Ethnobotany, Indigenous knowledge, EKI, SPI, Traditional knowledge.

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Plant use intensification: the case of Enset (*Ensete ventricosum*) in Southwestern Ethiopia.

Authors: Fujimoto, Takeshi [1].

Plant use intensification is often discussed as a domain of wild resource use intensification among hunter-gathers. As to domesticated plants or crops, agricultural intensification is discussed mostly in terms of land use. It indicates that no plant use intensification occurs after plant domestication. Is it true? This study examines the case of enset (*Ensete ventricosum*) in southwestern Ethiopia. Enset is a perennial crop of the banana family. Although it grows wild throughout tropical highland Africa, it is cultivated as a food crop only in that small area. All plant parts are used, e.g. the leaf for wrapping material, the most important is the underground corm for food. The corm is huge, often weighing more than 30 kilograms. It is commonly cooked in two different ways. One is a simple method of steam-boiling. The corm is cut into pieces, stuffed into a pot with green vegetables and immediately steam-boiled for an hour or so on the same day it is harvested. The other is, on the contrary, involves more complex and labor-intensive pre-cooking treatment for fermentation by utilizing not only underground corm but also leafsheath pulp. The mixed substance is left for fermentation in the backyard for at least two weeks. Once fermented, however, it keeps long (for over months) and provides a wide variety of dishes after an elaborate post-fermentation tasks such as grating and crushing on a mortar. Obviously, this method of cooking needs longer time and larger labor for preparation. It can be said that this method is more intensive than simple steam-boiling as a plant use for food. Although most enset cultivators use more or less both methods of cooking, some prefer the former, others prefer the latter. Interestingly, those who prefer the latter are often large ethnic groups living densely in high population density and growing the crop in large number intensively i.e. with careful manuring and transplanting. Therefore, those who use the crop intensively for food are largely those who grow it intensively. In the presentation, why intensive enset users tend to be intensive enset growers as well will be considered.

Keywords: Intensification, Enset, Ethiopia.

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Patterns of contemporary plant use in Adjara, Georgia (Caucasus).

Authors: Tate, Richard W. [1], Kalatozishvili, Tatia [2], Kereselidze, Konstantin [3], Ozbetelashvili, Levan [4], Golubiani, Gocha [5], Bedinadze, Vazha [6].

Mountainous areas harbor the bulk of our planet's biological and cultural diversity. Thus, the ongoing extinctions of Earth's biota and traditional knowledge converge in montane zones. The country of Georgia (Georgian: Sakartvelo, საქა თველოო), found within the Caucasus ecoregion, is a bioculturally diverse nation. The level of vascular plant diversity in the country ranks among the highest in the planet's temperate zones, and many sociolinguistic communities are represented in its population. This study seeks explore the dynamic effects of culture and environment on current plant use in Adjara, a region in the Lesser Caucasus Mountains of Georgia.

Semi-autonomous Adjara, in southwestern Georgia, is home to a diverse set of peoples and a portion of the globally unique Colchis flora. Despite Adjara's limited extent (2880 km2, slightly smaller than the state of Rhode Island), elevations in the region range from sea level to nearly 3,000 m. Seven main vegetation assemblages can be found within the regional boundary, from lowland Colchic mixed forests to alpine grasslands. Adjara's complex political and cultural history has resulted in a large population of Muslim Georgians in the region. This represents a unique cultural situation, as the great majority of ethnic Georgians generally espouse Orthodox Christian belief.

This paper presents preliminary results from a series of semi-structured interviews held with Adjaran informants during the summer of 2016. Interviews were conducted by native speakers of Georgian in villages throughout Adjara. We integrated plant use data, environmental factors, and demographic information to examine the drivers of plant use in the region. In addition, our research team collected region-wide ethnomycological data.

While our preliminary results do not support religious affiliation being a significant variable affecting plant use in this geographic context, they do offer evidence of other important environmental and cultural drivers. Information gathered by our team will be integrated into a larger regional dataset, which will help place Adjaran ethnobotanical patterns into the broader geographic context. Data collected can used to inform economic programs, thereby helping to contribute to the development of sustainable landscapes in the Caucasus and other mountainous regions.

Keywords: Republic of Georgia, Caucasus, Traditional knowledge, Conservation.

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Cross-cultural Ethnobotany in Kailash Sacred Landscape, Nepal.

Authors: Kunwar, Ripu M [1], Sapkota, Prabhat [2], Dhami, Hira S [3], Joshi, Sangita U. [4], Fadiman, Maria [5], Bussmann, Rainer W [6].

Kailash Sacred Landscape Nepal contains diverse medicinal plant species composition and indigenous knowledge about resource management. It faces numerous conservation challenges resulting from the harsh climate, limited accessibility, and high level of poverty. Given these factors, the area has a strong dependency on natural resources which leads to excessive pressure on extant plant resources. We compared the knowledge of plant selection, collection and utilization of two culturally district groups that share the same landscape. We explained the purpose of the study and obtained verbal informed consent prior to conducting the semi-structured interviews to the traditional healers and plant collectors of two districts Baitadi and Darchula of the landscape. The use citation reference for each mention of a plant use given by an informant was used to compare use-specific differences and evaluate the extent of overlap between subject variables as well as for diachronic comparisons. Comparative analysis developed by Quave and Pieroni (2016) was used to reveal how use-values differ in two districts. We found that the ethnobotanical knowledge was less restricted to specific groups for health care and food strategies however it was homogenous for other emic use categories. Cross-cultural ethnobotanical study represents one of the important means in better understanding of human-nature interface and measuring the variability of knowledge on plant uses.

Keywords: Medicinal plants, Accessibility, Ethnobotany, Socioculture, Kailash Sacred Landscape.

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An investigation of "Mouse Foods" on the Russian and Alaskan sides of the Bering Strait.

Authors: Jernigan, Kevin [1], Belichenko, Olga [2], Kolosova, Valeria [3], Orr, Darlene [1], Poupynina, Maria [3].

The authors conducted a comparative ethnobotanical study with the Chukchi, Naukan and Central Alaskan Yup'ik peoples, from 2008-2016, with 126 indigenous participants, in 19 villages on the Alaskan and Russian sides of the Bering Strait. The work examines whether there are more similarities in plant uses traditions between two societies speaking similar languages and sharing a deep historical root (Naukan and Central Alaskan Yup'ik), or between two societies speaking unrelated languages, but sharing the more recent influence of the dominant Russian culture (Naukan and Chukchi). In this presentation, we focus on "mouse foods," a category of edible plants including tubers, root nodules and stem bases taken from caches of *Microtus* vole species in the fall. The practice of harvesting and consuming these foods has largely declined among the Chukchi and, especially, Naukan peoples on the Russian (Chukotkan) side of the Bering Strait. However, the practice is still very common among the Central Alaskan Yup'ik, particularly in the lower Kuskokwim region. Moreover, the number of plant species known to be harvested from vole caches is greater on the Alaskan side. Here, we explore possible reasons for this discrepancy, including the larger Russian influence on the food traditions of native Chukotkans.

Keywords: Beringia, Food.

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Indigenous knowledge and the sustainable harvest of ramps (*Allium tricoccum*) in the Appalachian Mountains, USA.

Authors: Baumflek, Michelle [1], Cabe, Tommy [2], Chamberlain, James [3].

Ramps (*Allium tricoccum* Aiton), a member of the Liliaceae family, are an iconic and dependable spring green of the Appalachian Mountains of North America. A beloved food, ramps are a symbol of Appalachian culture and identity. However, the recent rise in popularity of ramps as a forest delicacy have raised questions about their sustainable use. Understanding the impacts of different harvesting techniques and the cultural values underpinning them are integral to developing management approaches that ensure the long-term availability of ramps. Incorporating Native American traditional ecological knowledge about ramps and methods for their harvest may contribute to sustainable solutions. Specifically, Cherokee gatherers practice a harvesting method that is distinct from other cultural groups in Appalachia.

This paper will discuss an innovative partnership formed by the Eastern Band of Cherokee Indians, the US Forest Service, and other collaborators to integrate traditional knowledge into the sustainable management of ramps and other culturally significant plants. Our ethnobotanical research takes an interdisciplinary, participatory approach. In 2016, we implemented a series of experiments to understand the effects of three harvest techniques and intensities (0%, 50%, 100%) on ramps. Preliminary results from 2017 will be presented. Our botanical work is informed by over 40 Cherokee community interviews about ramps and other edible plants. Interviews revealed a remarkable consistency in gathering methods, and provided important insights into plant phenology, ecological conditions and cultural significance. Management implications will be discussed.

Keywords: Traditional knowledge, Cherokee, Ramps, Conservation.

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Symposium 2

Economic botany: approaches from Archaeobotany, Ethnography and History – Session 1

Chair: João Pedro Tereso, Universidade do Porto, Faculdade de Ciências, Portugal
Monday, June 5, 12h00 – Room G3-S5/01

Reinventing biocultural collections through the arts and humanities.

Authors: Nesbitt, Mark [1].

In the 19th century museums and galleries of useful plants (economic botany), appeared worldwide. They had a clearly defined utilitarian and educational purpose, facilitating the discovery of new uses of plants and the flow of the world's raw materials to industry. From the 1950s onwards such collections – which we would today term biocultural – began to disappear. A few were destroyed, some went to attics and basements, and many were split between natural history and ethnographic collections, reflecting the strong nature-culture divide of the 20th century. The decline in biocultural collections occurred for a number of reasons: a shift to oil-based products, new methods of natural product development, and embarrassment at the 'old-fashioned', often colonial ethos of such museums.

In the last two decades there has been a revival of biocultural collections, marked by the founding of new ones and refurbishment of old, and the publication in 2014 of Curating Biocultural Collections: a Handbook (ed. Salick, Konchar & Nesbitt). But what is the reason for existence of such collections today, if they no longer serve a colonial or bioprospecting purpose?

I argue that they are a rich resource for research in the arts, humanities and social sciences. Looking at biocultural collections through the eyes of other disciplines, they can support research on key questions such as the appropriation of indigenous knowledge, the creation and circulation of knowledge in the colonial world, the economic history of plants, and the development of medical systems. I will use recent work in Kew's Economic Botany Collection to explore how such research projects arise, including new work on Richard Spruce's Amazon collections, on barkcloth in the Pacific, and on the history of biocultural collections. In addition to their research outcomes, such projects bring major benefits in terms of funding, improved cataloguing, increased use of collections, and public engagement. Interdisciplinary collaboration is fundamental to this approach, and I will explore what makes it work – or not.

Keywords: Cultural history, Museums, Ethnobotany, Biocultural, Biocultural collections, Funding.

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José Quer and his work "Flora Española" (18th century).

Authors: Morales, Ramon [1], Aedo, Carlos [1].

José Quer (1695-1764) was a Spanish botanist, born in Perpignan. He studied Medicine and Surgery and during his work as militar chemist and surgeon in the Spanish army, he travelled along almost all Spain and also Italy, northern Africa and France. He collected plants in all his travels. As botanist he followed Tournefort. When the king Fernando VI established the Botanical Garden Madrid in Migas Calientes, he was his first director (1755-1764). His work "Flora Española o historia de las plantas que se crían en España" I, II, III and IV (1762-64), and the "Continuación de la Flora Española" V and VI (1784) published by Casimiro Gómez Ortega 20 years later, include 2350 species of the 6300 now known from the Spanish flora. Although his work has as most important purpose the phytotherapy and phytochemical analysis (analysis chymica) of plants, at the time where Chemistry was appearing as new science, very interesting and unknown uses of Spanish plants are included. He can be considered one of the most outstanding botanists of his century, at the time when the systematic botany and the knowledge about medicinal and other useful plants were studied together.

Keywords: José Quer, Outstanding botanists, Spanish Flora.

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Freelisting revisited: comments and critics based on in-depth ethnobotanical fieldwork.

Authors: Kujawska, Monika [1].

Freelisting has been by far the most explored field methods by ethnobotanists. It has many advantages: enables to produce long list of plants within a study domain in a relatively short time; provides crucial data, such as a number of informants for further analysis. Freelisting also gives bases to establish cultural salience of studied items (plant species) and helps to reveal variation in intra-cultural knowledge. This method well corresponds to the traditional approach in ethnobotany: production of lists of useful plants in native languages. It was furthered developed by cognitive ethnobotanists, who viewed free elicitation as a proper tool for exploring native plant categories and folk taxonomies. However, freelisting has several shortcomings, which have already been reported in the ethnobotanical literature. In this paper I focus on some particular cases, which bring more critics to this methods, yet not raised by other researchers. One of the assumptions claims that when people freelist, they tend to list terms in order of familiarity, which reveals psychological or cultural preeminence. Based on this premise, I discuss finding from the research performed among European and Paraguayan migrants in Misiones, Argentina. One case in particular I address quantitatively by testing whether Paraguayan migrants who suffer from chronic diseases and use medicinal plants in their treatment elicit these plants and in which order. Other evaluative examples of freelisting have more qualitative character, e.g. the negative relation between actual importance of plants and list of these resources by informants, who wish to impress a researcher or check his/her knowledge. All in all, I observe a better and safer application of freelisting among local groups who perceive a high status of science and understand the importance of rigorous and tedious methods, than in communities where the status of science is lower or not fully comprehended. I also propose some modification of using free lists, in which study participants are included in the process of assessing the importance of listed items. I suggest that freelisting should be triangulated or complemented by other field methods in gathering of information in relation to a studied topic.

Keywords: Free elicitation, Field methods, Intra-cultural variability, Indices of cultural salience, Pollination and food security.

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The role of culture in the selection and conservation of chilli pepper landraces in Mexico.

Authors: Katz, Esther [1], Aguilar Meléndez, Araceli [2], Vásquez Davila, Marco Antonio [3].

Chilli pepper (*Capsicum annuum*) has been used in Mexico since prehistoric times, first collected in the wild, then domesticated and declined in a wide range of varieties. Every category from wild to domesticated is still used all over the territory. Around 60 native ethnic groups, speakers of 291 languages, as well as mestizo population, cultivate and/or use around 90 ethno-races of chilli pepper. This plant is a key element of Mexican national and regional identities. It is the “flavoring principle” of Mexican food, present in most dishes and on the table, prepared according to a great diversity of recipes. But are chilli peppers used in other cultural settings? Can chilli be perceived as a powerful cultural icon that has held societies together or molded local identities? We will present here the state of the art as well as the blanks and the unresolved questions on these subjects, in relationship to a book we are editing. Through an interdisciplinary approach and with observations at local and regional scales, we aim to highlight the interconnectivity between chilli pepper and local cultural values, beliefs, practices and language. We intend to show how this link may be the main incentive for the conservation of landraces up to the present.

Keywords: Chilli pepper, Plant selection, Plant management, Conservation, Culture.

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Symposium 2

Economic botany: approaches from Archaeobotany, Ethnography and History – Session 2

Chair: Gayle Fritz, Washington University, St. Louis, USA
Monday, June 5, 14h30 – Room G3-S5/01

Basketry as a part of Anatolian Bio-cultural heritage.

Authors: Ertug, Zafer Fusun [1].

Anatolia's rich flora and multi-layered cultural accumulation has created a very rich bio-cultural heritage. The earliest remains of mats and baskets unearthed in early Neolithic excavations in Turkey go back 10-12,000 years. These inherited crafts are usually hidden and archaeologically invisible. A better understanding of this common, multi-functioned craft is only possible by discovering the various techniques and materials available to the early inhabitants of Anatolia. A recently established ethnographical collection has become a venue to study modern techniques and materials and has created a reference collection for students and archaeologists. It is a result of more than 20 years of random gathering, and searching for the objects, the masters, the materials, and the know-how. The collection has succeeded in getting a permanent exhibition space at Iznik, Turkey since 2010. Numerous people helped in cleaning, placing, measuring, cataloging, and photographing each piece. Some people donated their valuable baskets and mats, thus bringing the number of exhibits to 170-180 objects. Willow (*Salix* sp.), hazelnut (*Corylus* sp.), chestnut (*Castanea* sp.), olive (*Olea europea*), chaste tree (*Vitex*), common reed (*Phragmites australis*), giant cane (*Arundo donax*), rushes (*Juncus* sp.), bulrush (*Typha* sp.), leaves of corn cobs (*Zea mays*), wheat & rye stems (*Triticum*, *Secale* sp.) are among the species commonly used for basketry in Anatolia. Examples of five main techniques, including coiling, plaiting, twining, stake and strand, loop or netting and a mix of some of these are available within the collection. Tools to split branches, knives, awls used in coiling, and shaving horses are also included. In addition to the baskets for foraging, picking and carrying agricultural products, storage containers, bee hives, wool baskets, oil production containers, fish baskets, bird cages, brooms, fans, bags, and mats are witnesses to the multi-functional uses of these techniques. Hands-on studies, workshops to learn various techniques, and close observation of the materials provide new opportunities for understanding this long lasting biological heritage and revitalization of basketry and other plaiting crafts of Anatolia.

Keywords: Basketry, Turkey, Biocultural heritage.
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Smoke and mirrors: the global trade in fern (*Lygodium circinnatum*) fibre baskets.

Authors: Cunningham, A.B (Tony) [1].

Stems of the climbing fern *Lygodium circinnatum* are widely used in the Asia-Pacific region for basketry, but their trade little studied. Results of a study on the commercially successful and innovative fern basketry trade from Indonesia to global markets will be presented. Although just four types of baskets were made traditionally, this has diversified into a global trade with hundreds of types of baskets. Due to commercial depletion of large *L. circinnatum* stems in Bali, however, bundles of stems are wild harvested in montane forests of Flores, Sumbawa and Central Kalimantan then shipped to a village market in east Bali. These stems are split and woven into baskets sold in tourist centres of Bali or are exported (mainly to Japan (c.70%), but also to Europe and North America). Even with current non-selective harvesting of *L. circinnatum* stems, a harvester is able to collect ten bundles (each of 70-100 stems) per day, selling these for 5000 IDR per bundle (an income of A$5 per day), which is above the average daily income for the area. These are sold to traders who re-sell bundles of fern stems in Lombok and at the market in East Bali, where they are bought by local farmers who supplement their income by weaving fine quality baskets. Prices vary with the size and intricacy of basket design. Small baskets tend to have a higher mark-up than larger baskets. This reaches an extreme in the USA export market, where a "fruit basket" style basket for which the weaver is paid (50 000 IDR, around US$3.75) retails for US$90 in Alaska. Unlike the Japanese retail market, where *L. circinnatum* baskets from Bali are advertised as such, those sold in Alaska, USA are commonly marketed as "smoked grass" baskets "embellished" by Inuit people. No mention is made of basket origin. For these baskets, even the iconic "Alaskan" carved bone ornaments used as embellishments (such as salmon, bald eagle heads or hump-back whale tails) are carved in Bali. Recommendations are made on how to move forward to benefit local communities at each end of the value-chain.

Keywords: Value chains, Basketry, Lygodium.
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Wetland basketry of La Mancha (Spain).

Authors: Fajardo, Jose [1], Verde, Alonso [2], Rios, Segundo [3], Rivera, Diego [4], Obon, Concepcion [5], Laguna, Emilio [6], Ferrer, Pablo [6], Ruiz, Jose Reyes [7], Valdes, Arturo [8], Martinez, Vanessa [3], Barroso, Estela [7], Sanjoaquin, Luis [7].

In a project in course in National Parks of Tablas de Daimiel and Cabañeros (Castilla-La Mancha, Spain) we are studying the ethnobiology and traditional management of wetland natural resources. In this framework, there is a "wetland basketry", using some plants as raw material for very different crafts. There is a special typology in this basketry linked with traditional needs of population in this environment. Fishermen wove traps to catch fish or crabs and other baskets to maintain alive their catch. Wetlands in La Mancha have suffered a dramatic decline, most of them are today dry or very endangered. Nowadays, this craft have disappeared in common life, like many wetlands or traditional fisheries in fresh water, inland Spain. Some pieces are still made to sale as a souvenir for tourism. In this communication we show the preliminary results about species used in the basketry, techniques, typology and the context of use. Basketry techniques used in these wetlands included coiled, twined and plaited basketry. Specially, people used plants which grows in dense populations in these swamps. Main genera are *Arundo*, *Carex*, *Cyperus*, *Juncus*, *Salix*, *Scirpus* s. l. and *Typha*. Project: SPIP2015-01659. Etnobiologia de los Humedales de los Parques Nacionales de Tablas de Daimiel y Cabañeros, funded by Organismo Autonomo de Parques Nacionales (OAPN) Ministerio de Agricultura, Alimentacion y Medio Ambiente.

Keywords: Basketry, Fishery, La Mancha, Wetlands, Spain.

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Wood for the gods: an anthracological study of an ancient Maya fire shrine at El Peru-*Waka*', Guatemala.

Authors: Cagnato, Clarissa [1].

The ancient Maya are known to have carried out a multitude of rituals that involved the use of fire to burn plants as offerings to the gods. In turn, the gods ensured successful harvests and the continuity of time. In this paper, the results of an anthracological study— the identification of wood charcoal based on its anatomical structure— from a unique context, an eighth century A.D. fire shrine associated with this site's central civic-ceremonial structure in the heart of the site of El Peru-*Waka*' in northwestern Petén, Guatemala, are presented. Fortuitously, some of the fire shrine samples also yielded carbonized painted wood fragments, which suggest that decorated objects were also burnt during these rituals.

Preliminary assessment of these analyses indicates that wood pertaining to both hardwood and softwood tree species were placed in the fire shrine, either as fuel or in the form of objects that may have been ritually important. To contextualize these data, I will discuss the ecology of the tree species recovered in the fire shrine, the potential reasons that the ancient Maya may have had for choosing these taxa, and will compare these data with other anthracological studies carried out in the Maya region. Finally, I will also consider ethnobotanical studies carried out in this region, including the rituals and ceremonies performed by the present-day Maya. These archaeobotanical data further our comprehension of ancient Maya rituals and their views towards their rich natural environment.

Keywords: Ancient Maya, Archaeobotany, Anthracology, Rituals, Tree selection Charcoal, Painted wood, Guatemala.

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Crops and agricultural fields in the Sabor Valley during the Bronze Age: carpological remains from Foz do Medal and Terraço das Laranjeiras.

Authors: Tereso, João Pedro [1], Jesus, Ana [2], Gaspar, Rita [3].

The Middle Bronze sites of Foz do Medal (Mogadouro) and Terraço das Laranjeiras (Torre de Moncorvo) in the Sabor Valley provide relevant insights regarding agriculture, crop processing and settlement strategies. The sites are located in a wide valley plain where different types of negative features are the only archaeological evidence of human occupation. In order to understand the function of these features, soil samples were collected for archaeobotanical analyses. Although the initial interpretation of those negative features as storage pits and the plant remains as the result of such activities, the archaeobotanical analyses compared with ethnographic examples led to a different interpretation. The results show that naked wheat (*Triticum aestivum/durum*) is the predominant crop but barley (*Hordeum vulgare*) and poppy (*Papaver somniferum*) are also present. But, in both sites - Terraço das Laranjeiras and Foz do Medal - the plant remains that predominate are cereal chaff and weed seeds. Overall, the carpological remains in these sites seem to result from the initial stages of cereal processing. We argue that these stages are more likely to have occurred outside the settlement, that is, near the cultivated fields. Considering this hypothesis, an overview of the settlement strategy and its relation to agricultural production during the Bronze Age in the Sabor Valley is presented.

Keywords: Bronze Age, Agriculture, Northeastern Portugal.

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Early botanical history of the genus *Washingtonia*.

Authors: Villanueva-Almanza, Lorena [1], Sanders, Andrew [2], Garcillán, Pedro P. [3], Ezcurra, Exequiel [1].

Washingtonia (Arecaceae) is an American genus of palms composed of two species, *W. filifera* and *W. robusta*. These palms have been an important element for the survival of native people even before the arrival of Jesuit missionaries to Baja California in the seventeenth century and continue to be today. Both species have been widely cultivated in California since 1874 and W. robusta is currently one of the most widely cultivated palms of the world. During the early years of cultivation, seeds of both *W. filifera* and *W. robusta* were being grown without knowledge neither of their taxonomic identity nor their geographic origin, due in part, to great morphological variation in both species. Poor understanding of its morphology led either to the description of numerous new species (now mostly reduced to synonyms) or to an oversimplification of the genus resulting in the traditional 2-species circumscription. Accurate knowledge on the distribution of the genus is missing because of lack of fieldwork in its natural range, which is reflected in fragmentary herbaria collections. *Washingtonia*, in a way, has been the elephant of a safari: extensively photographed, but rarely collected. Variable taxonomic circumscription and imprecise species distribution has done little to clarify the identity of the palms brought into cultivation in the nineteenth century. This research is the first comprehensive review of the earliest horticultural records, letters, and nursery catalogs concerning Washingtonia in an attempt to clarify the taxonomic identity and distribution range of both species, since none of them have useful type specimens. The results show *W. filifera* was introduced into cultivation in Europe from seeds collected in Arizona, California, and Baja California around 1872 and two years later in San Francisco. Definitive evidence shows *W. robusta* was introduced in San Francisco as an ornamental palm from the Mexican states of Sonora, Sinaloa, and Baja California Sur between 1888 and 1900.

Keywords: Washingtonia, Taxonomy, Seeds, Cultivation, Baja California, California.

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Traditional Medicinal Knowledge in Ireland in the 1930s – Exploring botanical treatments.

Authors: Shannon, Fiona [1], Heinrich, Michael [2], Sheridan, Helen [1], Sasse, Astrid [3].

A rich archive of oral and ethnological literature is held in the National Folklore Collection (NFC) at University College Dublin, Ireland. The Schools' Manuscript Collection (SMC) is a unique collection stored in the NFC that contains a wealth of information that provides an insight into medicinal beliefs of Irish people in the 1930s. The SMC is the result of a nationwide survey that collected ethnographic information, including traditional medicinal knowledge (TMK) via agency of school children (11-14 years) from 1937-1939.

This research involves analysing the TMK documented from one county in Ireland and examining the most highly cited botanical treatments. The study also involves interviewing original participants of the scheme (today 86-93 years of age), to document their recollections of TMK and compare this with the information in the SMC. This is the first stage of a study where data from different regions will be compared and contrasted to explore cultural, social and geographic impact on the areas' TMK in the 1930s.

All TMK documented in the SMC from County Wexford was transcribed, categorised and analysed using the qualitative analysis software NVivo. The original participants were contacted through a snowball sampling method and their recollections were compared with the corresponding SMC material and the findings were categorised and analysed using NVivo.

Over 2500 TMK entries were analysed. The results highlight that medicinal practices included a mixture of symbolism, religion, botanical, animal and food contributions. The data examined indicates that botanical treatments were only a portion of overall TMK. Plants were mostly used for dermatological and respiratory ailments, and include a combination of native and introduced species. The most highly cited botanical entries will be presented, highlighting their traditional use and current phyto-therapeutic research.

The SMC is an early example of ethnobotanical research (within the context of 'folklore') studies, and while the gathering of such data is not unique to Ireland, the method of collecting ethnographic information by children was unique and extremely successful. This project explores only a small portion of the TMK contained in the SMC, therefore further analysis of different counties is planned to enable comparison on findings.

Keywords: Ethnobotany, Medicinal plants, Traditional medicine, Historical texts, Ireland.

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Using ethnography to understand ancient food pathways: elusive wild foods in Archaeobotany.

Authors: Weisskopf, Alison [1].

Ethnobotanical survey can provide insights on how people utilize their local resources and feed back into interpretation of archaeological evidence. Here I employ ethnobotanic data from contrasting regions of Thailand to better understand the exploitation of gathered economic plants in the context of traditional village systems. The division between wild and domestic often blurs with no clear separation between the garden and forest. A common predicament in archaeobotany is the low proportion of the plant material exploited by humans that survives into the archaeobotanical record, as there is a bias towards hard seeds. So how do we identify ancient food pathways? This is where micro fossils such as phytoliths and starches come into play. I use phytoliths in combination with ethnobotany to evaluate plant remains from archaeological sites in Thailand and Vietnam and identify past arable systems and potential wild plant foods. This information is used to understand archaeobotanical results from Rach Nui, an early Neolithic settled but nonagricultural site in Vietnam and Non Ban Jak an Iron Age rice farming site in Thailand.

Keywords: Wild, Food, Phytoliths, Ethnography.

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Conservation of Medicinal and Aromatic Plants through cultivation for economic improvement: an empirical study from Chure region of Nepal.

Authors: Acharya, Ram P. [1], Dahal , Sunita [2], Mahat , Laxmi [3], Kunwar, Ripu [4].

Chure, one of the geologically fragile regions lying at the lap of Himalayas is ecologically and culturally important with the evidence of settlement of seminomadic hunter-gatherers Raute, prime habitat of *Ramapithecus* and as a route from where ancient *vedic* Aryans entered and transcended in whole Nepal. Present study was carried out in February-July, 2014 to assess the distribution, conservation and potential local level economic contribution of medicinal and aromatic plants in Chure Siwalik region of Nepal (500-1500 m asl). Literature review, field observations, informal interviews, group discussions and ecological samplings were conducted. Along with inventory, promotion of cultivation and in-situ conservation of medicinal plants were incentivized and local and indigenous strategies for conservation of those plants and adaptation with the changes of climate, land use and socio-culture were catalogued. More than 180 species were documented out of which 30 are frequent in use and potential in conservation.

Keywords: Medicinal plants, Livelihood.

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Symposium 2

Economic botany: approaches from Archaeobotany, Ethnography and History – Session 3

Chair: Valentina Savo, Simon Fraser University, Canada
Monday, June 5, 17h00 – Room G3-S5/01

Grünkern: From famine food to delicatessen.

Authors: Berihuete-Azorín, Marian [1], Stika, Hans-Peter [1], Valamoti, Soultana Maria [2].

Spelt wheat (*Triticum spelta* L.) was still profusely cultivated across Europe till the 19th century, but its production decreased over time. The recent upswing of healthy nutrition and slow food movement, however, has been a boost for the revival of some products that were almost lost in oblivion. That is the case of spelt wheat whose production and consumption have increased over the last decades. Its cultivation had been kept almost anecdotal in some areas of France, Switzerland, Austria and Germany, to be used in specific foods. In Germany for instance, it has been employed for centuries for the production of Grünkern, apparently born from necessity but that has become much appreciated. Grünkern, also called "the rice of Baden", is made with winter spelt, which is harvested unripe and roasted and smoked over a beech wood fire. The first written reference to Grünkern dates to the 17th century, but we suspect that its use has a longer tradition, that we try to document archaeologically. As part of the project PLANTCULT (ERC Consolidator Grant, GA number 682529), our research concentrates on the Bauland region, a gently hilly and open landscape that lies in the northwestern part of the state of Baden-Württemberg and where its preparation has a long tradition. The aim is to document ethnobotanically Grünkern preparation, not systematically recorded to present, and to obtain reference samples from each production stage. These will allow us to produce reference material, that will be used for comparisons with archaeological remains and allow the identification of Grünkern production in the archaeological record.

Keywords: Grünkern, Spelt (*Triticum spelta* L.), Ethnobotany, Experimental archaeology, Archaeobotany.

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Food plants, exchange and constitution of a common food heritage in the cultural area of the Rio Negro (Northwest Amazon).

Authors: Katz, Esther [1].

The multi-ethnic Rio Negro region (Amazonas, Brazil) is well known for the exchanges between the different languages and cultures and is often considered as a whole cultural area, especially between Eastern Tukano and Arawak ethnic groups. Our study in the Middle Rio Negro shows that the food plants and the food system fit into this pattern. Use of natural resources, agricultural systems, plant and animal ingredients, food processing techniques are roughly the same for the whole population – with slight differences according to ethnicity, local resources, economic level, life history, time spent in religious schools, in town, outside of the region, ... We will examine closely the characteristics of the common features in the food plants and food system, focusing on bitter cassava and chilli pepper. Agricultural and cooking knowledge is usually passed on from mother to daughter. In the traditional context of exogamy, patrilocality and exchanges with allies, in-laws also play a part in the constitution of that knowledge. We will examine available archeological and linguistic data and compare myths, in particular myths of origin of the plants and of agriculture. A first hint suggests that the Arawak are at the origin of the mastering of the main food plants.

Keywords: Amazon, Brazil, Food plants, Agriculture, Cultural exchanges.

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Ethnobotany at the beginning – data on useful plants from Southwestern Angola collected at the Missão da Huíla (1889-1903).

Authors: Catarino, Luís [1], Colaço, Sara [2], Duarte, Maria Cristina [3], Romeiras, Maria M. [4].

The Missão da Huíla was founded in Southwestern Angola in 1881 by the Missionários do Espírito Santo (Congregation of the Holy Ghost). Between 1889 and 1903 the first missionaries, the Catholic priests José Maria Antunes (Portuguese) and Eugéne Dekindt (Belgian), went to Angola and collected a large number of botanical specimens, which were subsequently sent to several European herbaria (e.g. COI, B, P). These missionaries maintained correspondence with notable European botanists, such as Júlio Henriques (COI) and Adolf Engler (B), and a large number of new species were described, from specimens received from Antunes and Dekindt. The LISC herbarium, from University of Lisbon, holds probably the largest collection of specimens collected by Antunes and Dekindt, in a total of more than 1850 herbarium sheets. Another collection of specimens from Missão da Huíla still exists in Angola (LUA herbarium, Huambo), but presently is unavailable, preventing its study. The specimens held at LISC herbarium are particularly rich in ethnobotanical information and, in the case of medicinal plants were probably used as a local prescription guide, registering the medicinal uses of flora, as well as often the methods of preparation and administration, and doses of traditional recipes. From the LISC collection, about 320 specimens, belonging to 60 families and 222 species, have information about the utilities of plants. The missionaries registered also information on the vernacular names of plants for a large number of specimens in the local language (i.e. *lunyaneka*) and most of the medicinal species have also a second name given by the *vimbanda*, the local healers (singular *quibanda*), probably for exclusive use by this local practitioners traditional medicine. Among the uses reported, the traditional medicine is the largest one, with information reported in a total of 258 herbarium specimens, followed by edible, phytochemical, veterinary and species used for timber, respectively with 26, 16, 12, and 9 records. In conclusion, Angola is endowed with rich and varied flora, and the herbarium specimens collected by Antunes and Dekindt, in the framework of the Missão da Huíla, provides early documentation of the properties of the local plants.

Keywords: Southern Africa, Medicinal plants, Edible plants, Traditional knowledge.

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Quantification of medicinal plant trade from Darchula District, Nepal.

Authors: Pyakurel, Dipesh [1], Srivastava, Sumanbala [2], Smith-Hall, Carsten [1].

Quantitative environmental product trade studies provide inputs to understanding rural development and biodiversity conservation issues. Yet such studies are rare, including for the Himalayan medicinal plants that have been large-scale traded for centuries from far-western Nepal. The study aims to identify commercial medicinal plant species and quantify the traded volume and value at the district level and in the production network in Nepal and India. Data was collected from March to August 2016 in Darchula District in far-western Nepal: 121 quantitative (25 local traders, 38 sub local traders and 58 harvesters), 34 qualitative (19 local traders and 15 sub local traders) and 4 focus group interviews were conducted. The quantitative data was used to estimate the value and volume of trade whereas qualitative information provided input to identify production network governance issues. The annual volume of medicinal plants traded from Darchula district is 401 tons with a value of US$4.66 million at local trader's level in fiscal year 2014/015. The trade comprised 23 species, in volume terms dominated by tejpat (*Cinnamomum tamala*, 127 tons), kaulo (*Persea odoratissima*, 82 tons), and pakhanved (*Bergenia ciliata*, 51.5 tons). Three out of five most traded products in terms of volume i.e. tejpat, dalchini and rittha (*Sapindus mukorossi*) are domesticated. Regarding value, this was dominated by yarsagumba (*Ophiocordyceps sinensis*) with an annual value of US$ 3.81 million, equivalent to 81% of total traded value. The trade contributed an average of 54% of the total household cash income at harvesters' level. Thus, income from medicinal plants is of major economic importance to harvesters who have limited income opportunities. With their embeddedness, good marketing margins and access to harvesters and to financial capital, local traders are identified as the dominant actor in the medicinal plant production network.

Keywords: Medicinal plants, Trade, Income, Livelihoods, Governance.

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Reflection of transhumance on agriculture: comparison of agriculture of Chalcolithic and modern transhumant communities from the territory of Armenia.

Authors: Hovsepyan, Roman [1].

Recent ethnobotanical investigations in Armenia show that transhumant lifestyle reflects on agriculture by shrinking its volumes and diversity, thus making it more specialized. The agriculture of transhumant pastoralists in Armenia (e.g. Yezidis), if there is any, is usually limited with the cultivation of cereals (wheat and barley) and sometimes also in yard cultivation of vegetables and fruit trees. Until last century, the need of vegetal food was compensated by gathering of wild edible plants, mostly from the mountains, and by bartering with agriculturalists using mostly milk products and meat. Possibly situation with agriculture and transhumance was similar since the Chalcolithic period (5th millennium B.C.), when new lifestyle – the transhumance appeared in the territory of Armenia. Two Chalcolithic archaeological sites situated in the territory of Armenia, one on the north - Getahovit-2, the other on the south - Godedzor, both revealing signs of transhumance (although part of the population of Godedzor could have been permanent), are being investigated for archaeobotany. As for modern time transhumant pastoralists, the bread wheat and the barley were the principal crops cultivated in both Chalcolithic sites. In addition, for Godedzor settlement some other crops were also recorded in low quantities (~1%): emmer, pea, lentil and possibly flax. For the Getahovit-2, a cave that was only seasonally inhabited by pastoralists, mostly remains of edible seeds of arboreal plants are recorded (species of *Celtis*, *Crataegus*, *Rubus*, *Cotoneaster*, *Rosa*, *Prunus*, *Fagus*, *Sambucus* and *Vitis sylvestris*). Remains of cultivated plants are extremely few in Getahovit-2 cave. Although some pulses and naked barley were still present in the archaeobotanical assemblage of Chalcolithic sites from the territory of Armenia, their agriculture already differed from that of the Neolithic population situated in the Ararat Valley when agriculture was more diverse (bread wheat, macaroni wheat, emmer, lentil, bitter vetch, pea, false flax, alyssum, etc) and less stressed on cultivation of cereals. The possible reasons for that transformation might have been the climate change, shift to transhumant lifestyle and agriculture “movement” upwards mountains.

Keywords: Transhumance, Chalcolithic, Agriculture, Cereals, Archaeobotany.

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The plants mentioned in the Hippocratic treaties - gynecologic theme.

Authors: Póvoa, Orlanda de Lurdes Viamonte [1], Sousa, Ana Alexandra Alves [2].

Modern herbal medicine can benefit from the knowledge conveyed by historical texts, namely from ancient Greece. The present work is based on a part of the Hippocratic treatises considered of the gynecological theme: The Fetus of Eight Months; Infertile Women, The Diseases of The Young; Superfetation and Fetotomia, dating back to the V-IV centuries BC. The texts were translated from the original texts by Ana Alexandra Alves de Sousa. The doubts of identification of the plants were resolved considering the description of the plants in the original texts and the characteristics of the botanical species. For each citation was done a record of the plant used, the part of the plant used, the purpose of its use and the type of preparation of the plant or the mixture of plants. In the analyzed texts, 272 plant citations were registered, comprising 86 different species. The vines (*Vitis vinifera* L.), the olive tree (*Olea europaea* L.) and myrrh (*Commiphora myrrha* (Nees) Engl.) were among the most cited species. The main types of use were poultice and fumigation (for external use) and infusions (internal use). For the majority of the mentioned species, current bibliographic references were found, confirming their pharmacological activity.

Keywords: Ethnobotany, Ancient Greece, Historical texts.

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Symposium 3

Ethnobotany, ethnopharmacology and natural products: challenges and trends – Session 1

Chair: Michael Heinrich, University College London, School of Pharmacy, United Kingdom
Tuesday, June 6, 11h00 – Auditório Dionísio Gonçalves

Caribbean Medicinal Plants as potential sources of anti-aging cosmetic applications - an application of HPLC ESI MS MS.

Authors: Peter, Sonia [1], Headley, John [2], Peru, Kerry [2].

Caribbean medicinal plants have a well established history of usage by indigenous and naturalised populations. Two families of plants, Asteraceae and Lamiaceae, feature prominently in Caribbean Pharmacopoeia and are rich sources of bioactive agents. These plant families have been widely investigated and shown to biosynthesise a variety of natural product classes of compounds including flavonoids, polyphenols, terpenoids and alkaloids. Flavonoids and polyphenolic acids are known to possess antioxidant properties which contribute to their protective properties. Three members of the plant families, *Chromolaena odorata* and *Pluchea carolinensis*, both of Asteraceae, and *Plectranthus amboinicus*, belonging to the Lamiaceae, were investigated using HPLC ESI MS MS for the presence of flavonoids and polyphenolic acids. A number of flavonoids, and flavonoid glycosides, were discovered in the methanolic and aqueous extracts from the leaves of *P. amboinicus*. *P carolinensis* extracts yielded chlorogenic acids and *C. odorata* yielded flavonoids and flavonoid glycosides including rutin. Studies have shown the benefit of chlorogenic acids and flavonoids in wound healing and general modulation of inflammatory events that can lead to instability of the skin matrix. The structural elucidation of free radical scavengers in the extracts of these species supports the inclusion of the plant material in skin care protective products such as sun screens.

Keywords: Tropical Plants, Mass Spectrometry, Free radical scavengers, Cosmeceuticals.

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Novel Ethnopharmacology of antibiotic plants from Medieval Celtic Herbal.

Authors: Wagner, Charles Stephen [1], De Gezelle, Jillian [1], Robertson, Maureen [2], Robertson, Keith [2], Wilson, Mickey [3], Komarnytsky, Slavko [3].

Antimicrobial drug resistance is a growing threat to global public health. Since the Roman era, historical records and herbal texts relating to traditional Celtic medicine indicate an extensive pharmacopeia of plants for treating infections caused by microbes. However, a major barrier for successful integration of these remedies into mainstream practice is the current lack of accurate interpretation and scientific validation. One of the most thorough historical texts concerning traditional Celtic plant medicines was recorded by the Physicians of Myddfai sometime before 1233 AD, which featured roughly 300 species fixed in 800 recipes. A thorough literature review was conducted partially in the original Welsh, using secondary sources to pin down plant and illness identities. 165 plants were selected for microbial indications. Using a new bioassay developed by the Komarnytsky lab, 107 species from the table were located in the field and tested for simple antibacterial inhibition in situ. About 80% of the plants showed antibacterial activity in the assay, along with the discovery of two plants with novel activity. The purpose of this new bioassay is to establish novel leads for further ethnopharmacological studies and gives hope to the possibility that more of the approximately 300,000 untested plant species could be prescreened outside of a lab. To validate the new assay and the generalized Celtic knowledge of antibacterial plants, garlic (*Allium sativum*) and juniper (*Juniperus communis*), two high scoring hits recorded in the assay were subjected to bioassay guided fractionation. Fractions and respective pure bioactive compounds were then tested in the laboratory settings for their ability to inhibit Gram-positive (*Staphylococcus aureus*), Gram-negative (*Escherichia coli*), and resistant strain bacteria (MRSA) growth. Garlic and juniper were chosen because of their low cost, availability, and known activity so that the correlation between historical source, assay, and laboratory study could be well demonstrated and further applied to novel species on a broader scale. Results from antibacterial assays showed that the indicated plants were being well utilized by the medieval Celts and that the assay picked up on their activity. This study demonstrates a new integrative approach to plant based antibiotic drug discovery.

Keywords: Antimicrobial resistance, Physicians of Myddvai, Traditional use, Drug discovery, Medical anthropology.

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Medicinal plant safety: an overview of the drug interaction screening program for popular Jamaican medicinal plants at the University of the West Indies.

Authors: Picking, David [1], Delgoda, Rupika [1].

Medicinal plant use continues to be high in Jamaica, with a TRAMIL survey identifying 73% prevalence. The same survey identified 27% of medicinal plant users taking pharmaceutical drugs concomitantly, and 19% physician awareness of such practices. An earlier survey, of prescription drug users, identified 80% concomitant use with medicinal plants, with 18% physician awareness. A key aspect of medicinal plant safety is understanding the potential risks from adverse drug reactions (ADRs) resulting from concomitant use of plants with pharmaceutical drugs. ADRs, caused by the altered metabolism of one drug by a second drug, are well researched and documented. However, those resulting from medicinal plant-drug interactions are less researched, particularly in developing countries, where medicinal plant use is high and few of the most commonly used plants have been studied. Survey findings have resulted in our laboratory screening over 20 medicinal plant crude extracts, to date, utilizing *in vitro* fluorometric assays, against the activity of human cytochrome P450 (CYP) drug metabolizing enzymes. Results include those for *Petiveria alliacea*, in which crude extracts moderately or weakly inhibited the activity of all enzymes screened, indicating an unlikely clinical manifestation for these traditionally prepared remedies. Crude aqueous extracts of *Hyptis verticillata* potently inhibited the activity of two drug metabolizing enzymes, CYPs 1A2 and 3A4. Further screening of seven key phytochemicals, present in the crude extract, and tested against the activity of CYP1A2, were shown not to contribute to the potency of the extract, indicating likely synergistic effects. Such *in-vitro* evaluations are key to identifying extracts, as in this case, warranting further clinical evaluation. Our studies indicate the need for greater awareness amongst healthcare professionals of concomitant medicinal plant usage, for increased dialogue with patients, knowledge of medicinal plants and heightened pharmacovigilance, to avoid adversities that might arise from potential medicinal plant-drug interactions. To this end, the results from our laboratory, amongst others, have recently been published in the book, “Potential drug interactions for commonly used medicinal plants and foods in Jamaica.” The contents of the book, and ongoing research findings, are also being developed as a website and mobile phone app.

Keywords: Cytochrome P450, Enzyme inhibition, Medicinal plant-drug interactions, Drug-herb interaction, adverse drug reactions, ADRs, Medicinal plants, Jamaica, TRAMIL.

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Beating around the bush: how plant availability shapes Medicinal Plant Knowledge.

Authors: Matthew, Bond [1], Orou, Gaoue [1].

Medicinal plants play a critical role in ecosystems, economies, and societies around the world. However, there is currently limited understanding of how people select medicinal plants; one hypothesis is that plant accessibility and abundance increases likelihood of medicinal use. The handful of studies that directly test this hypothesis show mixed results, which may be due to limitations in human/environment sample size and selection. Our research rigorously evaluates the availability hypothesis by surveying four subsistence villages in Solomon Islands using interviews with every adult (315 participants), and assessing plant availability in $50m^2$ survey plots 0-2km from the center of each village (160 plots total) in a systematic random sampling scheme. Results show that species distance, abundance, and maturity have different effects on medicinal plant knowledge. By testing how plant availability affects medicinal plant knowledge, this project clarifies the processes of cognition and learning, and informs new approaches for biocultural conservation.

Keywords: Biocultural diversity, Conservation, Ethnobotany, Ecological knowledge, Indigenous, Knowledge dynamics, Medicinal plants, Solomon Islands.

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Globe amaranth as an alternative source of natural red-violet colorants: an optimization study addressing current needs of the industrialized world.

Authors: Roriz, Custódio Lobo [1], Pinela, José [1], Pereira, Carla [1], Fernandes, Ângela [1], Prieto, Miguel Angel [1], Barros, Lillian [1], Oliveira, M. Beatriz P.P. [2], Carvalho, Ana Maria [1], Barreiro, Maria Filomena [3], Ferreira, Isabel C.F.R. [1].

Plant-derived colorants have an extensive history of use around the world for enhancing food and clothing. However, artificial colorants are nowadays massively used in the food industry due to their abundance, cheaper prices, and bright colors. These additives are recognized for their potentially toxic and allergic effects to humans, and contribution to environmental pollution. This leads the current, more conscientious consumer to opt for foods containing natural coloring agents, which may also have health-promoting effects. A current challenge is to find natural matrices rich in molecules with coloring capacity and optimize their recovery and stabilization. A chemical prospecting study allowed us to select globe amaranth (*Gomphrena globosa* L.) as a rich source of betalains, a group of chromoalkaloids that can be divided in betacyanins (red-violet pigments) and betaxanthins (yellow pigments). Given the powerful colorant capacity of these molecules and the great interest to use natural colorants in the food industry to replace the artificial counterparts, this study aimed to optimize the production of a natural colorant from globe amaranth using efficient and more sustainable processes. The non-conventional methods of microwave-assisted extraction (MAE) and ultrasound-assisted extraction (UAE) were used for samples processing. For production of the coloring ingredients, a full factorial design was implemented combining the independent variables of processing time (*t*), temperature (*T*) or power (*P*), ethanol concentration (*Et*) and solid/liquid ratio (*S*/*L*) and response surface methodology was used for optimization. The extraction yield and coloring capacity of the extracts was maximized based on different responses: extracted residue, determined by gravimetric analysis; betacyanins levels, monitored by high-performance liquid chromatography coupled with mass spectrometry; and color intensity, measured by UV-Visible spectroscopy and colorimetry. The optimum processing conditions for MAE (*t*= 8 min, *T*= 60 ºC, *Et*= 0%, and *S*/*L*= 5 g/L) originated 39.6±1.8 mg/g, while for UAE (*t*= 22 min, *P*= 500%; *Et*= 0%, and *S*/*L*= 5 g/L) led to 46.9±4.8 mg/g, which supports the use of UAE for recovery of betacyanins from the studied plant. This study highlighted globe amaranth as an alternative source of red-violet colorants with high potential to be used as natural food additives.

Keywords: *Gomphrena globosa* L., Globe amaranth, Natural colorants, Optimization study, Natural food colorant.

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Incense plants: interdisciplinary approaches to species diversity and ethnobotanical uses.

Authors: Selliah, Sugir [1], Heinrich, Michael [2], Weckerle, Caroline [1].

Since incense plants are often related to religious rituals, little attention has been paid to investigate their species diversity and ethnomedical uses. However, investigations on traditional medicinal use of smoke and its chemical composition suggest that incense plants may also have pharmacological activity. Our aim is to provide an integrated understanding of ritual and medicinal uses of incense plants across Eurasia and to assess the factors that drove their selection (i.e.: whether it is cultural or/and pharmacological). In order to explore and disentangle these neglected resources, we have integrated perspectives and knowledge from different disciplines such as ethnobotany, phylogenetic research and phytochemistry. As first step, a review of the ethnobotanical literature provided an overview of the diversity of local incense plant use in medicinal and ritual settings across Eurasia. We have constructed an incense plants database by compiling data related to uses and botanical information from the existing scientific literature such as books and articles. Then, data exploration was performed using a basic descriptive statistical approach. In total, 556 species (374 genera, 114 families) with 1033 use-reports have been recorded. The most commonly reported families are: Asteraceae, Solanaceae, Lamiaceae, Fabaceae, Burseraceae, Cupressaceae, Apiaceae, and Poaceae. Beside Cupressaceae and Poaceae, this distribution is similar to what we generally find for medicinal plants. Solanaceae revealed to be commonly used for medicinal purposes while Cupressaceae is typically used for ritual purposes. Our data suggest that incense plant species are mainly used as mono-ingredients and their most used parts are the leaves, the stem and exudates, respectively. Furthermore, for medicinal purposes the smoke tends to be actively inhaled while in ritual use it is passively inhaled. This study supports the relevance of exploring the chemical composition of incense plants smoke for bioactive compounds that potentially be useful for treating specific disorders.

Keywords: Incense plant, Ethnobotany, Medicinal use, Ritual use.

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From famine wild plants in mountain regions of Northeastern Portugal to gourmet foods in contemporary diets: a nutritional-based revalorization study.

Authors: Pinela, José [1], Roriz, Custódio Lobo [1], Pereira, Carla [1], Fernandes, Ângela [1], Barros, Lillian [1], Oliveira, M. Beatriz P.P. [2], Carvalho, Ana Maria [1], Ferreira, Isabel C.F.R. [1].

Wild plants have received high importance at different locations and times of the human history given their ability to provide nutrients and protection in scarcity periods. In the Northeastern region of Portugal, a mountainous land with vast biodiversity and cultural heritage, a large number of edible wild plants have become underutilized over time. This abandonment was mainly due to altered lifestyles of modern society and massive utilization of a restrict number of crops. However, some wild species are now emerging in gardens and kitchens around Europe and increasingly found in farmers' markets, gourmet food shops and restaurants. Following this trend, this study aimed to characterize five species traditionally consumed as vegetable (*Montia fontana* L., *Nasturtium officinale* R. Br. and *Rumex induratus* Boiss. & Reut.) or as condiment (*Pterospartum tridentatum* (L.) Willk and *Thymus pulegioides* L.) in terms of nutrients and bioactive compounds. Wild specimens of the selected plants were gathered in the Northeast region of Portugal and analyzed for their nutritional value following standard procedures; free sugars, fatty acids, tocopherols and ascorbic acid were analyzed by chromatographic techniques; and total phenolics and flavonoids were quantified by colorimetric assays. All plants revealed low protein contents. The highest levels of carbohydrates and free sugars were found in the flowering parts of the two species used as condiments. Fructose and glucose predominated in all plants except in *T. pulegioides* in which sucrose prevailed. These low-fat foods revealed healthy fatty acids profiles mainly composed by α-linolenic acid, a precursor of long-chain n-3 polyunsaturated fatty acids. *M. fontana* and *R. induratus* were sources of ascorbic acid; a 100-g portion of *R. induratus* contain more than 50% of the recommended dietary allowances (RDA) for adults. *R. induratus*, *T. pulegioides* and *P. tridentatum* presented the high α-tocopherol content, whose 100-g portions contribute in more than 30% of the RDA. Regarding bioactive non-nutrients, while *P. tridentatum* was found particularly rich in total phenolics, *T. pulegioides* showed the highest total flavonoid content. This extensive work demonstrates that the selected famine foods have a healthy fatty acids composition, vitamins and bioactive compounds, and can be considered as interesting contemporary foods.

Keywords: Wild food plants, Valorization, Nutricional value, Northeast of Portugal.

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An ethnobotanical review on uses of the Turkish *Salvia* species.

Authors: Bulut, Gizem [1], Dogan, Ahmet [2], Senkardes, Ismail [1], Tuzlacı, Ertan [1].

Salvia L. is one of the most useful genera especially traditional therapy in Turkey. The aim of this study is to revise various ethnobotanical uses of *Salvia* species according to our investigations and scientific literature records. Our investigations are based on local ethnobotanical studies. The ethnobotanical information was obtained through open ended and semi-structured interviews from the local people. The specimens were collected during the field works and then identified. In addition, the scientific literature records on the subject were revised. According to the results, 36 *Salvia* taxa are ethnobotanically used in Turkey. The usages of the plants are respectively as follows: traditional folk medicine (34 taxa), food (19 taxa), herbal tea (5 taxa), spice (2 taxa) and dye (1 taxa). Among them, *Salvia fruticosa*, *S. tomentosa* and *S.virgata* are the most popular plants and they are used in many localities of Turkey.

Keywords: Ethnobotany, *Salvia*, Medicinal plants, Edible plants, Turkey.

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Symposium 3

Ethnobotany, ethnopharmacology and natural products: challenges and trends – Session 2

Chair: Patrick Van Damme, Ghent University, Plant Production, Belgium
Tuesday, June 6, 14h30 – Auditório Dionísio Gonçalves

DNA barcoding associated with chemical analysis for the quality control assessment of wild and propagated individuals of the copalchi medicinal plant complex of Mexico.

Authors: Cristians, Sol [1], Bye, Robert [2], Nieto-Sotelo, Jorge [3], Mata, Rachel [4].

The copalchi complex, *Hintonia latiflora*, *H. standleyana* and *Exostema caribaeum*, is widely used in Mexico for treating diabetes. The latest pharmacological and phytochemical studies revealed that the infusion of the leaves have hypoglycemic and antihyperglycemic activities. For those reasons the monograph of the main copalchi species, *H. latiflora*, was recently added to the Mexican Herbal Pharmacopoeia. Nevertheless, quality control parameters are focused to the bark, but not to the leaves; moreover, information about other Rubiaceae species is needed. Additionally, the overexploitation of *H. latiflora* threatens their wild populations. In this work, the DNA barcodes and chemical profiles of the leaf infusions were generated considering different wild populations for *H. latiflora* and seedlings propagated in a greenhouse, as well as separate individuals of the three species. The concatenated sequence of the molecular markers *trnH-psbA*, *rpl32-trnL* and *ITS2* clearly distinguishes the three taxa, clarifying the taxonomical ambiguity of *Hintonia* genus. Additionally, the chemical profiles allow us the unequivocal identification of each species supporting the molecular results; the geographical origin of the samples did not modify the chemical profile of *H. latiflora*, suggesting that it is a robust identity test. The chemical profiles of the wild and propagated individuals demonstrate the presence of the bioactive compounds, providing plant material for the gatherers, reducing the exploitation of the wild populations; achieve enrichment reforestations programs; and guarantee a standardized source of bioactive compounds The complementary use of molecular and chemical markers will assure the quality of plant material used in traditional medicine for therapeutic purpose, and should be valuable new information for the National Health authorities as a part of the Mexican Herbal Pharmacopoeia.

Keywords: *Hintonia latiflora*, *Hintonia standleyana*, *Exostema caribaeum*, *ITS2*, *rpl32-trnL*, *trnH-psbA*, 4-phenylcoumarins, Chlorogenic acid.

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Ethnobotany of Medicinal Plants in Clusiaceae of China.

Authors: Long, Chunlin [1], Ji, Yuanyuan [1], Liu, Bo [1], Li, Ping [1], Shu, Hang [1].

Pharmacological studies revealed the significant biological activities of compounds isolated from Clusiaceae (*sensu lato*) plants, including xanthones, benzophenones, acylphloroglucinols, naphthodianthrone, polyphenols, and flavonoids. In China there are 8 genera and 95 species of Clusiaceae. Two genera, *Garcinia* and *Hypericum*, are widely distributed in the country, particularly in the tropical and subtropical areas. The ethnic people have rich traditional knowledge about Clusiaceae plants for their values of edible fruits, drinks, herbal medicines, dyes, oil-bearing seeds, timber and ornamentals. During our ethnobotanical investigations from 2012 to 2016, we found the local people frequently used Clusiaceae plants as herbal medicines for various purposes. Informants from Han and different ethnic groups including Dai, Miao, Li, Yi, Hani, Bai, Jinuo, Zhuang, Bulang, Yao, Buyi, Dong, and Shui had been interviewed in rural villages and local markets. They collected barks, branches, leaves or fruits of *Garcinia* for treatments of tumors, skin ulcers, hemorrhoids, dense tinea, bruises, bleeding and burns, mashed for external uses or took orally after decoction. The *Hypericum* plants have widely been used to treat hepatitis, dysentery, jaundice, irregular menstruation, and traumatic injury, mainly by taking orally after decoction of roots or aerial parts. The decoction of young *Cratoxylum* leaves has been drunk as an herbal tea for treating throat problems, hepatitis, fever, diarrhea, and digestive ailments. Both women and men could recognize the commonly-used species of Clusiaceae. But healers are mostly male, and know more about their medicinal values. Almost 50% (48 of 95) of Clusiaceae species are endemic to China, and many of them have not been studied phytochemically or pharmacologically although they have been used as ethnomedicines for a long history. Further researches to extract chemicals from Chinese Clusiaceae species will be necessary in support of local people's ethnomedicinal uses.

Keywords: Clusiaceae*, Garcinia, Hypericum, Cratoxylum,* Ethnobotany, Ethnomedicine.

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Baobab (*Adansonia digitata* L.) and tamarind (*Tamarindicus indica* L.) value chains for greater income stability in (West) African rural communities: a SWOT analysis.

Authors: Van Damme, Patrick [1].

Baobab and tamarind are two emblematic, under-utilised fruit tree species that are widely used in (West) Africa. Based on previous (and earlier documented) ethnobotanical work in Senegal, Mali and Benin, we analysed existing production/collection, processing and (by-) product chains in the above countries characterising the respective value chains for their respective markets and for their strengths, weaknesses, opportunities and threats. At the end, recommendations are made for improving chains, and training stakeholders in the process.

Keywords: Economic botany, Value chains, SWOT analysis.

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Medicinal plants and sustainability : approaches to developing sustainable extraction and management of *Prunus africana* in Cameroon.

Authors: Robert, Nkuinkeu [1], Jean Pierre, Tcheutchoa [2], Philippe, Wanty [3].

Prunus africana is a high value indigenous multipurpose tree species found in mountainous areas of Cameroon and other african countries. Many rural household as well as small and medium-scale enterprises depend on this resource for their medicine, construction needs and income. It is also a significant source of revenue for the state. Its bark has been traded internationally for over 40 years. The over exploitation and illegal harvesting of this species have lead to the species being considered as vulnerable and included in the “red list” of the International Union for the Conservation of Nature and Natural Resource (IUCN) on the one hand, and Annex II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on the other hand. The route is all clear and it needs to be followed to ensure the survival of this species upon whom the livelihoods of many people and the health of prostrate patients scattered around the world depend. It has been reported that more than 1,6 million *Prunus africana* trees have been planted on farm, since 1976 in Cameroon: This highlights the importance of domestication and regeneration activities that have taken place and are ongoing (Foaham 2009, Awono, 2008, Nkuinkeu 1999). *Prunus africana* management has always been governed by customary and statutory laws. The regulatory framework in place for this species was inappropriate, therefore it was not realistic to envisage successful conservation and development measures in an inadequate regulatory framework. This work is not only designed to review the existing framework for *Prunus africana* exploitation, and trade as well as cultivation in Cameroon, But also makes recommendations for national and international actions in terms of bridging the gaps between research and practical conservation and sustainable use.

Keywords: *Prunus africana*, Cameroon, Unsustainable exploitation, Management.

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The chemical divergence of two geographically isolated genera of Cupressaceae: Australian *Callitris* and South African *Widdringtonia*.

Authors: Sadgrove, Nicholas [1], Van Wyk, Ben-Erik [2].

The Australian genus *Callitris* and the related South African genus *Widdringtonia* share similar timber qualities, being exceptionally resilient to termite feeding. Foliage from these genera was also included in a *materia medica* of the respective indigenous peoples. Till now only the chemistry of volatiles has been investigated, which has demonstrated no obvious chemical similarity between the genera. In our laboratory, we have investigated both timber and foliage from two species of *Callitris* and three species of *Widdringtonia* for essential oils and larger compounds, mainly diterpenes. The aim was to conduct a comprehensive study of potentially acaricidal/antifungal compounds and to give a more detailed account of chemical similarities and dissimilarities. Both genera are a good source of novel and known diterpenes that are similar or familiar respectively, to others previously described more broadly in Cupressaceae. Examples include pisiferic acid, sandaracopimaric acid and communic acid. Our conclusions are that while the biogenesis of such diterpenes is related, the chemical assignments show little in the way of overlap, which is remarkable considering the persistence of termite resistance in these useful timbers.

Keywords: Phytochemistry, Diterpene, Essential oil, Ethnopharmacology.

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Traditional knowledge protects the indigenous Pacific Banyan *Ficus prolixa* on the Society Islands (French Polynesia, Pacific Ocean).

Authors: Larrue, Sébastien [1].

Ficus prolixa [Moraceae], called Pacific Banyan, is a native species in the South Pacific islands and an important tree in the traditional Polynesian society. The Pacific Banyan is widely dispersed in the South Pacific islands but locally endangered on some of them due to habitat loss, seed dispersal failure and global urbanization. By using a field survey on people (crowd) of the island of Tahiti, we have attempted to estimate (1) the persistence of traditional knowledge about *F. prolixa* and (2) if this knowledge may support the conservation of the Pacific Banyan on the Society Islands. The results reflect the conservation of traditional knowledge about different uses of *F. prolixa* and this knowledge can be viewed as an efficient tool for the conservation of the Pacific Banyan in landscape.

Keywords: Pacific Banyan, Society Islands, Traditional knowledge, Protected tree, Native species.

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How do value chains of cherimoya (*Annona cherimola* Mill.) work in the plant species' centre of origin ?

Authors: Van Damme, Patrick [1], Vanhove, Wouter [2].

We present value chain analysis as a novel method to examine the conservation status of and sustainable use strategies for cherimoya (*Annona cherimola* Mill.), an underutilized, perennial fruit species native to the Andean valleys of Ecuador, Peru and Bolivia. It was found that value chain features such as market channels, chain governance, quality performance and distribution of added value over chain actors differ significantly between cherimoya fruits that are registered by a collective trademark such as the Cumbe variety and another group of more traditionally produced and commercialized cherimoya fruits. The former is exported from its production area (Lima province in Peru) to neighbouring Andean countries, is graded and selected intensively, has a higher quality perception and creates significantly more added value for both producers and traders than the other, locally produced cherimoyas whose value chain is governed less intensively. Previous studies on the genetic diversity of cherimoya in the countries of origin have stressed the necessity of conserving cherimoya germplasm in areas characterized by highly diverse (southern Ecuador and northern Peru) or rare (Bolivia) cherimoya germplasm. Although value chain development is generally considered crucial in on-farm conservation of underutilized species, the example of the Cumbe cherimoya shows that intraspecific diversity can be threatened by commercial success. Farmers who believe that quality is exclusively linked to a certain genotype have purchased Cumbe cherimoya grafts from each other, leading to genetic erosion of the local cherimoya genetic base.

Keywords: Underutilised plant species, Value chains, Economic botany, SWOT analysis.

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Ethnobotanic study on plant knowledge of Mapuche communities from Budi Lake (Araucania region, Chile): historic comparison and recent dynamics.

Authors: Pennec, Flora [1], Rojas Villegas, Gloria Isabel [2], Bahuchet, Serge [1].

Collaboration between ethnobiologists from National Museum of Natural History of Paris, France and artists from art collective Ritual Inhabitual, which aim was to explore the diversity of Mapuche culture, allowed a field ethnobotanical study during one month in Mapuche communities from Budi Lake in Araucania region, Chile. Interviewing several persons and collecting plants and knowledge associated, we realized a herbaria composed by some 40 plants, representing the vegetal diversity of life forms and uses present in this region. These plants were determined thanks to collaboration with the department of Botany of National Museum of Natural History of Santiago, Chile. We propose to analyze and compare some results about species presence, vernacular names and typology of uses with information collected in early 20th century and compiled in references works (*e.g.* Gusinde M. 1916, Medicina e Hygiene de los Araucanos. Museo de Etnologia y Antropologia de Chile. 1 pp 177-294 ; Mosbach E. 1992, Botánica Indígena de Chile. Museo Chileno de Arte Precolombino. Fundación Andes. Ed. Andres Bello, Santiago, Chile). Firstly, these comparisons reveal relevant aspects about the local knowledge importance in historic botanical descriptions. Then, our results highlight the decline of the native vegetation and the dynamics of knowledge and practices associated with plants. Indeed, some initiatives, from Chilean government or from Mapuche communities themselves, like ecotourism or traditional medicine service in public hospital, emphasize the importance of local knowledge on plants in environmental, social and economic development.

Keywords: Ethnobotany, Local Knowledge, Knowledge dynamics, Mapuche.

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Foraging and pollinating behaviour of *Apis mellifera adansonii* Latreille (Hymenoptera: Apidae) on *Lophira lanceolata* Van Tiegh. ex Keay (Ochnaceae) flowers in Meiganga (Adamawa, Cameroon).

Authors: Van Damme, Patrick [1], Soukontoua, Yves [2].

In the Meiganga savannah within Cameroon's Adamawa region, we observed wild *Lophira lanceolata* flowers in order to know their pollination mode. We also evaluated the apicultural value and the impact of *Apis mellifera* (and other foragers) on pollination and fructification of the aforementioned species. From December-January 2014/15 to December-January 2015/16, we followed 784 inflorescences. We applied different treatments including open-pollinated flowers with unlimited insect access; bagged flowers to prevent any insect visit; bagged flowers with limited access to *A. mellifera*; and hand-pollinated flowers. For each treatment, we assessed the fruiting index (number of fruit per number of initial flowers). On freely blossoming flowers, we carried out 22,231 observations according to different daily time frames (from 6.00 am to 5.00 pm). We evaluated the frequency of visits of *A. mellifera* and other foragers. We recorded data on: foraging ethology; harvested floral products (pollen and honey); abundance of foragers; duration of a foraging trip; and foraging speed. We also carried out melissopalynology (pollen analyses of honey) and measured sugar content of nectar. Results show that *L. lanceolata* has a mixed pollination mode with predominance of allogamy (cross-pollination) which is essential for fructification. In addition, it's a highly nectariferous bee plant. Furthermore, *A. mellifera* is among the predominant foragers. The latter carry pollen from flower to flower making it an effective pollinator with a significant impact on fructification. This study highlights the contribution of *L. lanceolata* and *A. mellifera* interaction in improving fruit yields and honey production within the region.

Keywords: Honey production, Economic botany, Pollinator success, Underutilised plant species.

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Symposium 3

Ethnobotany, ethnopharmacology and natural products: challenges and trends – Session 3

Chair: Joan Vallés, Universitat de Barcelona, Laboratori de Botànica Facultat de Farmàcia i Ciències de l'Alimentació, Spain
Thursday, June 8, 11h00 – Auditório Dionísio Gonçalves

Sustainability of traditional ecological knowledge: importance, distribution, endemicity and conservation of Spanish medicinal plants.

Authors: Pardo-de-Santayana, Manuel [1], Benítez, Guillermo [2], García, Celia [1], Molina, María [1], Inventario Español de los Conocimientos Tradicionales, IECTB [1].

More than 17,000 of the plant species of the world have been used as medicines. The Mediterranean basin, and specifically Spain, has a great floristic and ethnobotanical richness, comprising its useful flora around 3,000 plant species. This paper studies medicinal plants traditionally used in Spain in order to analyze the sustainability of their exploitation. Given that sustainability is related to the amount of the resource and its gathering pressure, its availability and cultural importance were analysed based on: the number of papers cited from a selection of over 180 papers, the number of 10x10 km UTM grid cells in which the plants were represented, the number of phytosociological inventories in which the presence of the plant has been registered, and searched on their current conservation status in European, national and regional legislations. The total number of wild or naturalized medicinal species in Spain reaches 1,393, 15% of them being endemic. A positive correlation was found among cultural importance and abundance (ρ=0.48) and among cultural importance and distribution (ρ=0.502), showing that abundant widely distributed species are those more commonly used. Most of the medicinal plants (72%) do not appear on the consulted regulations and do not have any legal protection or known threat and only 11 species are registered in any of the annexes of the European Habitats directive. While this study confirms that people tend to select as medicinal abundant and widely distributed species, many other criteria are used for selecting them.

IECTB authors: L Aceituno, R Acosta, A Alvarez, E Barroso, J Blanco, MA Bonet, L Calvet, E Carrio, R Cavero, U DAmbrosio , L Delgado, J Fajardo, I Fernandez-Ordonez, J Garcia, T Garnatje, JA Gonzalez, R Gonzalez-Tejero, A Gras, E Hernandez-Bermejo, E Laguna, JA Latorre, C. Lopez, MJ Macia, E Marcos, V Martinez, G Menendez, M Molina, R Morales, LM Munoz, C Obon, R Ontillera, M Parada, A Perdomo, I Perez, MP Puchades, V Reyes-Garcia, M Rigat, S Rios, D Rivera, R Rodriguez, O Rodriguez, R Roldan, L San Joaquin, FJ Tardio, JR Vallejo, J Valles, H Velasco and A Verde

Keywords: Ethnobotany, Spain.

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Multi-functionality and domination: salience of the use of wild plants in Belarus.

Authors: Sõukand, Renata [1], Hrynevich , Yanina [2], Prakofjewa, Julia [2], Kalle, Raivo [3].

In modern ethnobotany Belarus has been literary terra incognita, as only one study featuring data from Belarus has been published recently; yet this region has a lot of interested insights to offer thanks to different recent cultural and social influences, having diverse nature and relatively archaic rural areas. The presentation sums up some of the results of the fieldwork that was carried out as a practical part of a development cooperation project financed by Estonian Foreign Ministry in May 2016 in 11 villages of the Lubań district, Belarus. One hundred thirty-four randomly selected persons were interviewed regarding the use of wild food plants and means for treating various human diseases or health-related conditions. Two different research lines will be followed in this presentation: 1) the use of wild plants for food and human medicine and 2) comparison of the patterns of use of three different etic remedy groups (wild plants, cultivated plants and other remedies). There appears to be clear a tendency to use wild plants in several different areas once they are brought into the home, which may be due to the need to maximize the versatility of limited resources. While the number of wild taxa used was relatively high, the mean number of taxa used per person was quite low, indicating relatively minor importance of wild plants, which along with the low importance of snacks signals that unintended contact with nature has been lost. Comparison with earlier research on wild food plants shows the considerable difference among seldom-mentioned taxa or uses, showing possible regional differences despite the homogenization of the population during the Soviet era; while the comparison of the recorded non-plant remedies with available historical data show remarkable erosion of the use. In the context of modern medicinal use, wild plants still constitute the largest proportion of the remedies used in human ethnomedicine compared to cultivated plants and non-plant remedies. This signals that wild plants stand out from the general erosion of local ethnomedicinal knowledge, among many possible reasons for that may be their relative acceptance by academic medicine and wide promotion in popular literature.

Keywords: Belarus, Wild, Edible plants, Medicinal plants, Non-plant remedies, Local knowledge.

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Unlearning debt in the context of the use of wild food plants.

Authors: Kalle, Raivo [1], Sõukand, Renata [1].

It is widely agreed that in industrialized Europe knowledge on the use of wild food plants shows a decreasing trend with few instances of valorization. We argue, that on the society level the reach of erosion is even greater than it seems, as many uses that are no longer practiced, are still remembered and can make society feel assured that this very practical knowledge is still there. Our field research in Saaremaa showed that only 36% of recorded uses have been practiced throughout life. Another third (34%) of uses existed as a childhood memory, which also encompassed taxa useful during times of food shortage and 20% of the uses recorded were recently abandoned. The uses of wild food plants acquired later in life, at some point during adulthood (4%) or recently (6%), were rather temporal in nature and affected by fashion trends. While it is not reasonable to fully carry over the ecological phenomenon into human society, the idea of “extinction debt” (according to which some species in a plant community are doomed to extinction due to changing environmental conditions, but the actual extinction event has not yet occurred due to the slow intrinsic dynamics of populations) can still be used as a model. As it is the practical use that ceases to continue, we proposed the term “unlearning debt” to emphasize the hidden erosion of the learned knowledge. While still in the active memory of older generations, the practical knowledge is deemed to be forgotten because it is no longer practiced (as not explicitly needed or due to lack of wild or other supportive resources) and therefore the chances for being learned by younger generations are much lower. While in modern human society there is always a possibility to re-learn from the books, there are still many aspects and skills that can be learned mainly through practice. Therefore, to ensure the survival of food-security related knowledge, it is important to ensure the continuity of the use of wild food plants on the family level, by educating children through their participation in making food from wild plants.

Keywords: Ethnobotany, Food sovereignty, Wild food plants, Saaremaa, Unlearning debt, Folk history.

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The value of ethnobotany for multi-species landscape conservation.

Authors: Parathian, Hannah Elizabeth [1], Hockings, Kimberly Jane [2], Frazão-Moreira, Amelia [3], Bessa, Joana [1], Sousa, Cláudia [1].

We used quantitative and qualitative methods to examine wild plant utilisation by people living in three communities in Cantanhez National Park, Guinea-Bissau. A total of 490 people and 49 households (Cadique, n=311 people, n=29 households; Caiquene, n=145, n=15; Cabdaia, n=34, n=5) were approached. Men, women and children between the ages of 5 and 68 years took part (n=474). We carried out weekly semi-structured interviews visiting all households for 36 weeks to record plant-use (n = 8380, with a family mean of 171 data points and a median value of 61). We asked people to recall which plants they had used, collected and consumed over no more than seven days. We recorded plant-use under five categories: medicine, firewood, construction, artefacts and food. We took samples of 193 wild plant species. 143 of 193 plants were identified by their scientific and local names, 16 were identified by their local name only, and 34 remained unidentified. We collected empirical data through participant observation of wild plant harvesting by different user groups. We also engaged in opportunistic discussions with people about the extraction and use of wild resources, and conducted all-occurrence sampling when resource extraction was either directly observed or traces identified. We calculated Use Value (UV) integers for each plant to examine the species and parts that are important to local people, and ranked the total UV scores for each plant species. These data could then be compared with quantitative data on chimpanzee overlap in botanical resources by running a Spearman’s rank correlation. We suggest collecting systematic quantitative data on human plant use is crucial for conservation when exploring the coexistence of sympatric species in multi-species landscapes, as quantitative data sets on human plant use can be compared with data sets on plant use by nonhuman species which are typically collected through direct obsevation or feeding traces. Such data comparisons are a useful way of identifying important resources to key species and thus provides a good indication of the sustainability of forest ecosystems.

Keywords: Guinea-Bissau, Conservation, Botanical resource use, Sympatric species.

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Ethnomedicinal plant diversity in Thailand.

Authors: Phumthum, Methee [1], Balslev, Henrik [1].

Plants have provided medicines to humans for thousands of years, and in most parts of the world people still use traditional plant derived medicines. Knowledge related to traditional use provides an important alternative to unavailable or expensive western medicine in many rural communities. At the same time, it is valuable for the development of modern medicine. Unfortunately, globalization and urbanization causes the disappearance of much traditional medicinal plant knowledge. The study aims to review available ethnobotanical knowledge on medicinal plants and to estimate its diversity in Thailand. Information about ethnomedicinal uses of plants in Thailand was extracted from 64 scientific reports, books, and theses produced between 1990–2014. Plant identifications in the primary sources were updated to currently accepted names following The Plant List website and the species were assigned to family following the *Angiosperm Phylogeny Website*. Use Values (UV) were calculated to estimate the importance of medicinal plant species (SUV) and families (FUV). Medicinal use categories, plant parts used, preparations of the medicines, and their applications were noted for each use report. We found 16,789 use reports for 2187 plant species in 206 families. These data came from 21 ethnic groups living in 121 villages throughout Thailand. The health conditions most commonly treated with medicinal plants were in the categories *digestive system disorders*, *infections/infestations*, *nutritional disorders*, *muscular-skeletal system disorders*, and *genitourinary system disorders*. Plant families with very high family use values were Fabaceae, Asteraceae, Acanthaceae, Lamiaceae, and Zingiberaceae and species with very high species use values were *Chromolaena odorata* (L.) R.M.King & H.Rob., *Blumea balsamifera* (L.) DC., and *Cheilocostus speciosus* (J.Koenig) C.D.Specht. Stems and leaves were the most used plant parts, but also other parts of the plants were used in medicinal recipes. The most common way of using the medicinal plants was as a decoction in water.

Keywords: Medicinal plants, Thailand, Ethnomedicine.

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Edible wild flora of Guinea-Bissau (West Africa) – plants used and species with valuation possibilities.

Authors: Catarino, Luís [1], Indjai, Bucar [2], Frazão-Moreira, Amélia [3].

Guinea-Bissau in West Africa, is a small country with a total population of over 1,500.000 people living largely in rural areas with a strong dependence on natural resources to satisfy basis needs, such as remedies, firewood, building material, and food. The country's vascular flora is estimated to encompass more than 1,500 species, and the main vegetation types in the country are dry forest, woodland, palm groves, savanna woodland, grass savanna and mangrove. A countrywide census was carried out to identify the edible wild plants known and to characterize their use and potential for NTFF exploitation. Data were obtained from herbarium vouchers, in the available bibliography, and through fieldwork campaigns carried out by the authors. A total of 81 edible plant species were recorded, from 32 families. Malvaceae, Apocynaceae, and Anacardiaceae were the plant families containing the largest number of species with 10, 8, and 6 species respectively. From the 81 species used, 74 are eaten, eight are used in drinks, four as spices, two as cooking oil and one as sweetener. The plant parts most consumed are fruits and seeds, followed by leaves and roots or tubercles. Thirty-five of the edible plants recorded are marketed, 27 fruits, five dried and grinded leaves and flowers (locally named lalo´s), two seeds and one as oil. From these, only a few species are extensively sold in national markets, having economic importance, such as *Adansonia digitata*, *Dialium guineense*, *Elaeis guineensis*, and *Parkia biglobosa*, available all over the year and *Landolphia heudelotii*, *Saba senegalensis*, *Spondias mombin*, *Uvaria chamae*, and *Vitex doniana*, sold only seasonaly. Some species, such as *Adansonia digitata*, *Dialium guineense*, *Elaeis guineensis*, *Landolphia heudelotii*, *Parkia biglobosa*, and *Saba senegalensis*, are also exported for the neighbour contries, namely Senegal, and to the contries where are communities of Guinean emigrants, like Portugal.

Keywords: Non timber forest products, Edible plants, Useful plants, Ethnobotany, Traditional knowledge.

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The research of Josip Bakić on nonconventional sources of food at the coast of ex-Yugoslavia (1962-1986 and after).

Authors: Jug-Dujaković, Marija [1], Łuczaj, Łukasz [2].

Josip Bakić, biologist from Split, Croatia, took the main professional role in the military macro-project "Survival in the Nature" that lasted for 26 years. The project is a unique example of combining a scientific study with a practical military experiment: inventarisation of edible plants and animals was done, the possibility of soldiers' and citizens' survival on the Adriatic coast and islands based on wild plants and marine and terrestrial animals was explored; wild food plants and animals from the nature that had been used by the population from the east Adriatic coast during World War I and II were surveyed; phytochemical properties of wild edible plants and animals were assessed, and their preservation was studied. The results of the macro-project were disseminated to the public through scientific papers and presentations, workshops, film documentaries, and survival book and handbook. The macro-project "Survival in Nature" is the only example in history in which military experiments on foraging were documented to such an extent and over such a long period of time, with the results made available to the public.

Keywords: Foraging, Famine, World War II, Josip Bakić, Wild edible plants, Wild foods, Sea food, Adriatic Coast, Survival.

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Biomass production and nutrient concentration on potted *Stevia* in response to N, P, K or B fertilization.

Authors: Afonso, Sandra Cristina Pereira [1], Arrobas, Margarida [1], Rodrigues, Manuel Ângelo [1].

Stevia rebaudiana (Bertoni) is a perennial plant belonging to Asteraceae family, native from Amambay region, between Brazil and Paraguay. It has been used for centuries by Guarani Indians as a sweetener and to treat diabetes. Stevia composition includes glycosides from steviol, the steviosides, natural sweeteners that reduce blood glucose, noncaloric, with a sweetening power much higher than sucrose. Studies also showed a high content of proteins, K, P, Mg, Ca and trace of copper, iron, manganese and zinc. Japan was one of the first countries to commercialize stevia based products and to establish it as a crop, and since then interest has expanded overall. European Union only authorized stevia as a food additive since 2011. Natural and healthy alternatives to sugar are being more preferred by consumers, explaining the great increased of stevia based products, and the perspectives are for stevia consumption to increase even more in the coming years. Also there is a growing scientific interest on stevia. However, agronomic knowledge is still scarce. This investigation aimed to assess the effect of increasing rates of N, P, K or B application on stevia biomass production and nutrient concentration in plant tissues. The effect of fertilizer treatments on stevia was also assessed through the use of the portable chlorophyll meter SPAD-502 plus which estimate leaf chlorophyll content. A pot experiment was installed as a randomized design with four replications. Five rates of each nutrient were applied, namely N (0, 0.75, 1.5, 2.25, 2 g/pot), K (0, 0.25, 0.5, 1, 1.25 g/pot), P (0, 1.25, 2.5, 3.75, 5 g/pot), or B (0, 0.025, 0.05, 0.075, 0.1 g/pot). The data is important to adjust fertilizer rates to crop demands, enabling to maximize production and improve the nutritional value of stevia products. Results showed a significant increase of dry biomass in response to N fertilization, attaining the higher values with a rate of 1.5 g N/pot. There were not found significant differences in dry matter yield with P, K or B fertilizer rates. SPAD readings showed a slight variation with N fertilization and maximum values were recorded in the 1.5 g N/pot treatment.

Keywords: *Stevia rebaudiana*, Fertilization, Biomass production, Tissue elemental composition.

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Symposium 3

Ethnobotany, ethnopharmacology and natural products: challenges and trends – Session 4

Chair: Sonia Peter, Barbados Comunity Colleage, Bardados
Thursday, June 8, 14h30 – Auditório Dionísio Gonçalves

Invasive weed to WMD: episodes in the remarkable culture history of the Castor Bean.

Authors: Mathewson, Kent [1].

This paper traces the geographical and cultural historical twists and turns in the diffusion and utilization paths that have taken the castor bean (*Ricinus communis* L.) from its African domestication hearth, to a multi-purposed Old World cultivar, to a cosmopolitan weedy invasive, to recent appearances on the world stage as a putative WMD and agent of bio-terrorism. Perhaps no other invasive plant has had such multifaceted history of use and dispersal. It may be the earliest known use of poison by humans, and a common household item in ancient Old World civilizations. Later, castor bean served as a multipurpose African diasporic actor/agent aiding both planters and slaves: lamp oil, medicine, emollient. Ricin, castor's poison extract, also may have been was used in Afro-New World sorcery. At various times and places during the centuries of Euro-colonial tropical expansion, the castor plant was promoted as a promising commodity. Italian and Iberian fascists dosed political opponents with castor oil (a strong purgative/laxative). Today, it continues to have a multifaceted presence in folk medicine and spiritual practices. Most recently, castor bean has achieved notoriety as a potential weapon of mass destruction. In 2003 Colin Powell appeared before the U.N., alleging that ricin (along with anthrax) was being weaponized by al-Qaeda in league with Saddam Hussein, to attack western targets. Powell contented this proved Iraq's possession of WMDs. Thus, one might argue, this common invasive species helped authorize the invasion of Iraq. Most recently, ricin has been implicated in a number of mailings to powerful political figures. At the same time, castor oil has been promoted as a source of biofuel, particularly in Brazil, as a constituent of Afro-centric health care products, and an effective deterrent to lawn-burrowing pests. Despite its disparate and often surprising historical appearances from the Paleolithic to the present, scant attention has been paid to *Ricinus communis* in its interconnected geographical, cultural historical, and economic botanical manifestations. This paper seeks to address these and other castor bean lacunae.

Keywords: Castor bean, Ricin, Poison, Oil.

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Quilombo ethnomedicine: how 'Africanized' are Brazilian Maroon Pharmacopoeias?

Authors: Voeks, Robert [1], Santana, Bruna [2], Funch, Ligia [2].

Studies of diaspora groups are crucial for discerning the dynamics of plant knowledge acquisition and retention. African maroon communities in Latin America are particularly revealing, as enslaved peoples faced seemingly insurmountable barriers to the introduction of their healing plant pharmacopoeias. This study examines the results of recent ethnomedical surveys of maroon (quilombo) and non-maroon Afro-Brazilian communities in the Atlantic Forests of eastern Brazil. Our results reveal that the ethnofloristic composition of maroon and non-maroon communities is quantitatively similar. Their pharmacopoeias are dominated by species associated with anthropogenic habitats, especially home gardens and ruderal communities. The principal divergence involves plants that are of African origin or are otherwise associated with religious traditions of African origin, especially Candomblé. Maroon communities employ significantly larger numbers of species that trace their origin to sub-Saharan Africa and that are employed to address culturally-specific disorders of African origin. Although these species represent important cultural markers of the Afro-Brazilian experience, their continued use is threatened by the growing influence and spiritual intolerance of evangelical Christian beliefs.

Keywords: Maroon, Medicinal plants, Brazil.

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Should LEK be shared in a changing world? Evidences from an ethnobotanical survey in Morocco.

Authors: Blanco, Julien [1], Carrière, Stéphanie M [2].

In drylands, local ecological knowledge (LEK) enables a heavy sustained use of plant resources that contributes to local livelihoods. In this sense, LEK is a key component of people's resilience to environmental and socio-economic changes. LEK is often considered to be unevenly distributed within a given community, its distribution varying according to a range of socio-economic and individual attributes. This intra-cultural heterogeneity may result in high variability in people's resilience, both at the individual and collective level. One may then hypothesize that LEK sharing can contribute to increasing both individual and collective resilience. LEK sharing may therefore represent a particularly valuable strategy in drylands where communities need to cope with high environmental stochasticity. In complement, people may also be more knowledgeable for more apparent plants, according to the ecological apparency hypothesis. We conducted an ethnobotanical survey in a Moroccan community from the Saharan fringe to assess LEK variability and test these hypotheses. We used free-listing and semi-structured interviews focusing on plant-related LEK and uses with a representative range of socio-economic people. We also performed vegetation surveys in the village surroundings, recording an abundance-dominance index for all species. Finally, LEK variability between people and between plant species was analyzed. Results suggest that a social risk management strategy (SRMS) is adopted by people for LEK sharing. This strategy, consisting in a large diffusion of LEK, may enhance individual and collective knowledge and, thus, resilience. Our results confirm the validity of the ecological apparency hypothesis, despite some limitations due to the specificity of dryland vegetation. They also suggest some level of LEK erosion, likely due to the people's disconnection from the learning environment, which could threaten people's resilience. Finally, we discuss how the strategy highlighted in this study could represent an asset for dryland communities to face global changes.

Keywords: Local Knowledge, Ecological apparency hypothesis, Intra-cultural variability, Risk management, Resilience, Quantitative ethnobotany, Morocco.

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Quantitative ethnobotany of Namaqualand, South Africa.

Authors: Nortje, Janneke [1]

Namaqualand is the traditional home of the Namaqua, the largest group of Khoi (pastoral-nomadic) people, and one of the most ancient of human cultures. The oral-traditional plant knowledge of this area was in urgent need of systematic and rigorous documentation because of the rapidly eroding indigenous knowledge base. An advanced Matrix Method, consisting of seven phases, was used for quantification. The phases include the Planning Phase, Recognisance Phase, Semi-Structured Interview Phase, Quantification Phase, Confirmation Phase, Feedback Phase and Publication Phase. Three towns in each of the five bioregions of Namaqualand were selected for the Quantification Phase based on results from the previous phase. For the Quantification Matrix, a photo album ("flip-file") of all recorded useful plants (430 plant species) was shown to 62 participants from the Knersvlakte, Sandveld, Hardeveld and Gariep. Traditional and contemporary knowledge about the names and uses of these plants was carefully recorded for each participant. The quantification that was done not only allows for comparisons between the bioregions but also identifies the most important medicinal, edible and craft plant species that are used in Namaqualand. Another level of comparison includes the ethnobotanical knowledge of the different bioregions, towns, participants and age groups. New vernacular plant names both in Afrikaans and Nama were recorded and will contribute to preserving and enriching the local indigenous knowledge. The quantification of the ethnobotany of Namaqualand and the numerous new records give a new perspective on Khoi-San traditional plant use.

Keywords:

Affiliation: 1 - University of Johannesburg

Patterns in medicinal plant knowledge and use in a Maroon village in Suriname.

Authors: Klooster, Charlotte van 't [1], Andel, Tinde van [2], Reis, Ria [3].

Traditional medicine plays an important role in the primary health care practices of Maroons living in the interior of Suriname. Large numbers of medicinal plants are employed to maintain general health and cure illnesses. Little is known, however, on how knowledge of herbal medicine varies within the community and whether plant use remains important when modern health care becomes available. This papers addresses the diversity in medicinal plant knowledge and use in a remote Saramaccan Maroon community and the importance of medicinal plants vis a vis locally available modern healthcare. Ethnobotanical data were collected in a remote Maroon village in Suriname by means of participant observations, semi-structured interviews and plants voucher collections. The paper shows that their plant use reflects actual health concerns, but as modern medicines are available for most of these concerns, the use of herbal medicines seems to be a deep rooted cultural preference, especially when concerned with cultural illnesses and health promotion.

Keywords: Suriname, Maroons, Saramaccan, Traditional knowledge, Medicinal plants, Traditional medicines

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An ethnobotanical review on uses of the Turkish *Gundelia* genus.

Authors: Dogan, Ahmet [1], Bulut, Gizem [2], Senkardes, Ismail [3].

Gundelia L. (Asteraceae) genus is widely distributed in countries which Egypt, Iran, Israel, Jordan, Turkey, Azerbaijan, Turkmenistan and Syria. It grows well in east parts of Anatolia. Gundelia is one of the most useful genus used especially for both food source and a well-known medicinal plant in Turkey. The aim of this study is to revise various ethnobotanical uses of *Gundelia* species based on the our investigations and related scientific literature. In these studies, the ethnobotanical information was obtained through open ended and semi-structured interviews from the local people. The specimens were collected during the field works and identified. The collected plant specimens are kept in the Herbarium of the Faculty of Pharmacy, Marmara University (MARE). In addition scientific literature on the ethnobotanical uses of Gundelia species were revised. Results of the review revealed that all five *Gundelia* taxa in Turkey are used for ethnobotanical purpose. The plants were used mainly for food, folk medicine, as gum and coffee substitute.

Keywords: Gundelia, Ethnobotany, Medicinal plants, Turkey.

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Assessing the abundance of non-timber forest products in relation to forest succession on the Wild Coast, South Africa.

Authors: Njwaxu, Afika [1], Shackleton, Charlie [1].

The number of people in the Eastern Cape (South Africa) engaging in arable cropping has declined markedly over the last few decades due to a number of reasons. In many areas, this has resulted in the abandoned croplands being invaded by trees and shrubs as the start of forest succession. The changing species composition and abundances during forest succession on old fields offers different suites of benefits to local households than was provided by arable fields. This is especially so for non-timber forests products (NTFPs). This study reports on the diversity and abundance of NTFPs as forest succession progresses. A series of aerial photographs were used to identify when delineated arable lands stopped being cultivated. Focus groups were conducted to ascertain what NTFPs species are important to local people and their uses. Species composition of old fields undergoing succession were then assessed using the Braun-Blanquet cover abundance scale. Out of the 65 useful species identified by the local people, 60% were woody species and 40% non-woody. This suggests that the later stages of succession provide more useful NTFPs than the earlier stages. Preliminary results show that early successional species are used mainly for medicinal purposes while late successional species are used mainly for medicinal and cultural purposes. A matrix was used to group the useful species identified by people into six categories namely: medicinal, cultural, fencing, roofing, food and firewood. Results revealed that people use NTFPs mainly for medicinal purposes and cultural significance.

Keywords: Non-timber forest product, Forest succession, Medicinal plants.

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Onopordum species of Turkey and their ethnobotanical uses.

Authors: Senkardes, İsmail [1], Bulut, Gizem [2], Dogan, Ahmet [3], Tuzlacı, Ertan [4].

Information about *Onopordum* L. (Asteraceae) species of Turkey and their ethnobotanical usages is represented in this study. While the genus *Onopordum* L. has 49 taxa in the World, approximately half of them (20 taxa) are located in Turkey. Most of these taxa are Irano-Turanian elements which are found in the inner Turkey. Among them, 6 taxa (*O. anatolicum*, *O. boissierianum*, *O. bracteatum* var. *arachnoideum*, *O. caricum*, *O. davisii*, *O. polycephalum*) are endemic (% 30) to Turkey. *Onopordum* species have a wide distribution area in Turkey. According to the records, this plant grows extensively from s.l. to 2600 m and spreads in various habitats over Turkey. Thus, variously ethnobotanical usages of *Onopordum* L. species are available among local people. It is stated in our observations and in the literature records that 14 of 20 *Onopordum* taxa have ethnobotanical usages in Turkey. Especially medicinal usage of *Onopordum* species is the most common way of their utilization. It is indicated that the most frequent medicinal usages of *Onopordum* species are for the digestive system, circulatory system and urinary system diseases. They are also used as food, coffee, rennet and fodder.

Keywords: *Onopordum*, Ethnobotany, Medicinal plants, Wild food plants, Turkey.

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The "Plants and People of Vanuatu" Project [*Plants mo Pipol blong Vanuatu*]: a long term multidisciplinary study.

Authors: Balick, Michael J. [1], Plunkett, Gregory M. [2], Ranker, Tom A. [3], Thackurdeen, R. Sean [4], Tuiwawa, Marika [5], Harrison, K. David [6], Sam, Chanel [7], Dovo, Presley [8], Ala, Philemon [8], Alo, Frazer [7], Doro, Thomas [7], Wahe, Jean-Pascal [9], Ramon, Laurence [7], Ticktin, Tamara [10], McGuigan, Ashley [11], Naikatini, Alivereti [10], Munzinger, Jérôme [12], Perry A., Brian [13], Amend, Anthony S. [10].

Vanuatu is a South-Pacific archipelago of more than 80 islands, situated between New Caledonia, Fiji, and the Solomon Islands, all of which are globally recognized biodiversity hotspots. The "Plants and People of Vanuatu" project began in 2014, focusing on Tafea Province, the southernmost of the six provinces in the archipelago. Tafea Province is thought to be home to 50% of the nation's plant biodiversity, although there are no reliable data such as a checklist of the flora, making it a "biodiversity black hole." Much of the population of Tafea is involved in subsistence agriculture, and cultural practices ("kastom") are still strong and determine the trajectory of everyday life. Nationwide, Vanuatu is also considered the most language dense country in the world, with 113 recorded languages spoken by 230,000 people, an average of one distinct language for every 2000 people. Many languages, including several in Tafea, are spoken by far fewer individuals, and, along with the biodiversity-dependent culture, are considered endangered. Local plant knowledge is uniquely encoded in languages, through naming, taxonomies, plant-processing technologies, legends, and oral tradition. A large team of local and international researchers is carrying out a botanical survey of Tafea, including ethnobotanical and linguistic studies, and helping communities with their biocultural conservation efforts. One novel approach used in this project is the creation of on-line "talking dictionaries," recording names of plants and plant products in a number of the local languages in Tafea, pairing these with photographs and spelling. Following the catastrophic Category 5 Cyclone Pam in March 2015, when nearly all buildings on Tanna Island were destroyed, in addition to rebuilding their dwellings, villagers are constructing traditional cyclone houses made entirely of local plants in which to take refuge during future storms. During construction of these special houses, we have observed elders carefully supervising the activity of their children and grandchildren, providing exacting details on how these were built in the past. This is only one example that reveals the value of traditional knowledge and its importance in advancing resilience and sustainability goals in the face of global change.

Keywords: Ethnobotany, Vanuatu, Linguistics.

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Symposium 4

Agrobiodiversity and traditional knowledge: conservation strategies and sustainable development – Session 1

Chair: Laura Aceituno-Mata, Instituto Madrilleno de Investigación y Desarrollo Rural y Alimentário (IMIDRA), Spain
Tuesday, June 6, 11h00 – Auditório Pequeno

Plant use, globalization and tradition in Palau: The Ngasech (First Born) ceremony and food.

Authors: Fadiman, Maria [1], Thomas, Michael [2].

Although globalization affects cultures throughout the world, researchers are particularly interested in the current and historical influence of the United States on the Pacific Islands. Palau serves as an important case study, as they have had colonial influence of Spain in 1710, then Germany in 1898 then Japan in 1944 and then ultimately the United States as a Trust Territory until 1978 when it gained its independence and still has a Compact of Free Association with the United States. Furthermore, the unofficial connections are still strong. This paper addresses results of outside influences in Micronesia, specifically the plant use in Palau. Colonization in Palau The concept of globalization is addressed through the lens of the theory of "Globalization as hybridization" as opposed to a clash of cultures. The research methodology for the project included structured, semi-structured and informal interviews, along with outside and participant observation. Much of the research already written on this region focusses on the high rate of diabetes among islanders. This health issue relates to their food dependency on the United States, and to shifting away from local plant life as integral to the local diet. To survive the long trip, processed items are popular, such as canned meat like SPAM. This paper looks at the role of globalization beyond just food tradition, addressing cultural retention and what this means for the social and ecological environment of the Islands. One of the customary ceremonies that the people of Palau still celebrate is the Ngasech (First Born) ceremony, held after a woman has her first child. This paper look at the globalization of this ritual in relation to: plant use, attire, gender roles, economic transactions, ceremonial hut construction and the role of diaspora. The findings show that the myriad changes coupled with a deep rooted continuation of historical tradition, form a syncretic event demonstrating the fluidity of culture in today's changing world, and the importance of these far reaching effects.

Keywords: Palau, Globalization, Ngasech, Ethnobotany, Food.

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Traditional plant-based remedies used to treat wolf bite injuries in Portugal and Spain: phytotherapeutic sources and cultural values for the conservation of an emblematic animal species.

Authors: González, José Antonio González [1], Carvalho, Ana Maria [2], Vallejo, José Ramón [3], Amich, Francisco [4].

The Iberian wolf (*Canis lupus signatus* Cabrera, 1907), an endemic subspecies, is an important element of the rich natural and cultural heritage of the Iberian Peninsula (Portugal and Spain). Despite the decline of this large carnivore species over the last few decades, wolves are still in the imaginary of Iberian rural communities that perceive this canid as both a diabolic creature and a mythic and benign animal. At the present time, livestock attacks attributed to the wolf are more and more frequent in the Iberian Peninsula, resulting in serious social problems. Most problems are due to economic damage caused to domestic animals in isolated rural areas. According to several researchers, some interesting strategies for Iberian wolf conservation might be related to traditional livestock practices. Medical and veterinary popular remedies in the past, many of them largely forgotten and already abandoned, might contribute to wolf conservation strategies, as well as minimise the causes of livestock damage. Based on several documentary sources and literature review of ethnobotanical studies conducted in Portugal and Spain, from the beginning of the twentieth century to the present, a total of 37 remedies for healing wolf bites in humans and livestock were reported, highlighting the medicinal use of 30 species of vascular plants, belonging to 16 botanical families. Leaves were the predominant plant part mentioned. Boiling plant materials in water for topical uses was the most frequent method of preparation found. Some traditional remedies combined two or more plant species in order to potentiate their effects. This communication emphasises the great interest of local knowledge in terms of biodiversity conservation strategies and provides useful information about several potential sources of phytochemicals.

Keywords: Iberian wolf, Wolf bites, Herbal remedies, Ethnomedicine, Iberian Peninsula.

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Denominations of origin and other related formal tools: relations with local knowledge, genetic resource conservation, product development and public awareness in Italy. A preliminary approach.

Authors: D'Antuono, Filippo [1], Giambanelli, Elisa [1].

A regulatory approach to the conservation and protection of traditional / local food products, and related plant and animal resources is in force in Europe. Italy ranks first for the number of officially certified origin denomination products. Besides EU certified IGP and DOP products, many other origin denomination or identification labels are in force, for the initiative of local administrations and private entities Among others: De.Co. (denominazione di origine comunale), PAT (Produzioni agricole tradizionali) and private Slow Food "Presidi" and "Arca del Gusto" products. The items registered into the "Repertori volontari regionali delle risorse genetiche agrarie" must also be added. At the same time, some EU funded projects tried to implement a formal definition of "Traditional food", aimed at: a) establishing the criteria for minimum requirement for registration; b) finding the clues of "traditionality" that are better valued by consumers and, by consequence, potentially exploitable by manufacturers. On the other side, other lines indicate that the concept of "traditionality" is a modern construct, that does not exist in local societies in which value perception is still mainly based on direct experience and knowledge of local resources. This latter approach seemed to be supported by extensive investigations carried out during the BaSeFood research project With this background, a project towards a systematic analysis of Italian origin certified or identified products is being entreprised. The lines to be followed are: a) the complete revision of plant species and varieties included in the different registers; b) the individuation of duplicates and gaps; c) the developments of representative case studies on the basis of specific / varietal or geographical characters. The subsequent analyses are aimed at defining the impacts of origin indication and certification on; a) the in situ conservation of local types, and relations with the present status of ex-situ conservation; b) the development and sustainability of local products based on native resources; c) the relations of the present systems with local knowledge systems. A preliminary scheme and framework is presented, also in view of a possible cross-country cooperation.

Keywords: Traditional foods, Local knowledge, Genetic resources, Landraces, Origin certification and identification.

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Agrobiodiversity and Sustainability in the 21st Century: necessary as the analytic nexus or the next anthem of future agroecology and food systems?

Authors: Zimmerer, Karl [1], de Haan, Stef [2].

Policy-relevant research on the importance of agrobiodiversity to the resilience and sustainability of food systems and environments has received less attention to-date than related fields such as agroecology and food systems. Yet advances in agrobiodiversity research can offer a uniquely integrated perspective on the ecology, sociocultural, and economic dynamics of agriculture and food systems in the context of resilience and sustainability challenges. This presentation draws on the findings of the forum on “Agrobiodiversity in the 21st Century” that was held during one week in October 2016 in Frankfurt. It briefly traces the evolution of agrobiodiversity research through three-plus decades from the initial phase of predominant genetic resource frameworks to current global change and sustainability perspectives involving climate, food systems and human health, and cultural, socioeconomic, and governance factors. It then uses these perspectives to consider evidence for the importance of agrobiodiversity as a “next anthem” of sustainability research. This function refers to the broad-level integration of the understanding of domesticated nature amid global changes affecting agriculture and food systems. The final section of the presentation examines the mounting evidence for the usefulness of agrobiodiversity as an “analytic nexus.” This function is well-suited to evidence of the increased interactions of food and the environment with cultural as well as socioeconomic dynamics. The conclusion synthesizes these new findings and the argument for a new perspective based on agrobiodiversity that is needed for the resilience and sustainability of agri-food systems.

Keywords: Agrobiodiversity, Agroecology, Sustainability, Conservation, Sustainable development, Global change, Nutrition, Health.

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Seeds of transition and local knowledge in Cuban organic agriculture.

Authors: Fernández-Prieto, Leida [1], Carney, Judith [2].

In the early 1990s Cold War geopolitical realignments forced Cuba into a radical restructuring of its agricultural sector with implications that today resonate far beyond its borders. The Soviet Union's oil subsidy, which had supported sugar exports from state farms for decades, came to a halt in 1989. Without subsidized oil, Cuba's highly mechanized farm system collapsed. The US responded to the country's agricultural crisis by tightening its economic embargo in 1992, making imported foodstuffs even more difficult to procure from neighboring countries. Faced with food shortages and the real prospect of hunger, Cuba prioritized food sovereignty and feeding its people. This required decentralizing agricultural production from large to small units, expanding vegetable farming to unused urban lots, and raising food without imported chemical fertilizers and pesticides. As a result of such challenges, Cuba emerged the first country in the twentieth century to produce its food organically. Twenty-five years later, the thaw in US-Cuba relations may herald new market opportunities for Cuban agriculture, given the escalating US import demand for organic vegetables. This paper focuses on the seeds and local knowledge that facilitated the Cuban agrarian transition during the post-Soviet crisis, which became known as *Special Period*. Despite the momentous political-economic and agricultural changes that have shaped Cuba since 1959, farmers did not wholly abandon heirloom seed varieties that had long been planted in family garden plots. In fact, these seeds led the transition to organic farming. Saved for generations because of their taste and cooking properties, these heirloom seeds now hold unrealized economic potential in emerging organic produce markets. The research for this paper is based on visits to organic farms and farmers' markets in the greater Havana region; interviews with agricultural extension agents and growers at former state farms, cooperatives, and in peri-urban gardens; and one co-author's personal experience living though the country's agricultural transition to organic farming from the 1990s to the present.

Keywords: Cuba, Food sovereignty, Organic farming, Local Knowledge, Heirloom seeds.

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Drivers of biological and biocultural diversity in Pacific Island agroecosystems.

Authors: Ticktin, Tamara [1], Quazi, Shimona [1], Dacks, Rachel [2], Tora, Mesulame [1], McGuigan, Ashley [1], Hastings, Zoe [1].

The need to design and promote agricultural systems that are compatible with the conservation of biological and biocultural diversity is widely recognized. Traditional agroforestry systems are widespread globally, have been practiced for millennia and have the capacity to maintain high levels of biodiversity and ecosystem function. However, the social drivers of biodiversity conservation in these systems are poorly understood. This is especially relevant in the Pacific Islands, where traditional agroforests play a major role in food security and in conservation of native and endemic species, but are in steep decline. We used structural equation models to test the direct and indirect drivers of biological and biocultural diversity conservation in Fijian agroforests. We carried out plant ecological surveys in 100 agroforests across five islands as well as semi-structured interviews and social network surveys with farmers. We documented 149 tree species in the agroforests, including 94 indigenous species, a quarter of which were endemic to Fiji. Traditional Ecological Knowledge (TEK) was the strongest driver of native tree species richness, followed by social network connectivity of the farmer. Livelihood diversity was an important positive driver of TEK, indirectly increasing native species conservation. Market integration had a weak but positive effect on TEK and on livelihood diversity, also indirectly increasing native species conservation. TEK was negatively correlated with invasive species cover. Ninety percent of the tree species recorded were useful, and native tree richness was significantly positively correlated with both nutritional functional diversity and cultural use diversity. Our results demonstrate the critical role, both direct and indirect, that TEK can play in maintaining biologically and bioculturally diverse agroforests. They also highlight the value of the novel application of the systems-level statistical approaches we used to identify and disentangle the effects. Our results suggest that initiatives to conserve native biodiversity are not likely to be successful without accompanied efforts to support the continued transmission and innovation of TEK.

Keywords: Traditional knowledge, Traditional agriculture, Biodiversity conservation, Social-ecological systems, Pacific Islands, Social networks, Agroforest.

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Narragansett Food Sovereignty Initiative and climate change (NE Coast USA).

Authors: Salick, Jan [1].

Climate change on the northeast coast of the US is prominent with rising seas, breaking high temperature records, droughts and floods, all resulting in a rapidly changing environment. The Narragansett, an Algonquin native people of the northeast coast, are struggling to revitalize their historically decimated culture while the environment upon which their culture is based is changing rapidly. Their Indigenous Knowledge (IK) of culture and environment is available through spiritual and traditional practices and is being applied within the Narragansett Food Sovereignty Initiative – including strategies for adaptation to and mitigation of climate change. Food Sovereignty, as opposed to sustainability or security, is a bottom up (local) process that defines goals and power relations before methods and outcomes are identified. Components of this process are analyzed with detailed examples from the Narragansett Food Sovereignty Initiative. Within this process, the Narragansett struggle for identity and power is much exacerbated by climate change.

Keywords: Food sovereignty, Narragansett, Climate change, Indigenous knowledge.

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The politics of food research: plant genes, patents, and political sense-making.

Authors: Rose, Janna [1].

This study examines a case where two property right systems collide on a daily basis. The case is comprised of a team of plant geneticists from American, Australian, Indian, and Turkish institutes who work with local farmers in Turkey, Ethiopia, and India. The researchers from the team are attempting to discover useful plant genes—not for profitable chemicals or drugs but for future food crops. As quickly as possible, they publish their findings in order to make them open-source, to prevent others from patenting them. Additionally, the American researchers must contend with the desire of their universities to hold patents and licenses to accrue fees and earnings. Plant genetics are at the very heart of global politics, and balancing access, use, sovereignty and social power or authority is a key issue for researchers, local farmers, and all other stakeholders. Thus, the research questions: *How does political sense-making configure in the decisions that plant geneticists make about their research? How do politics and policies influence the boundary-work of plant geneticists? And vice-versa, how do plant geneticists make decisions that include local practice (that go beyond normal field boundaries) to best inform local and global politics?* While science is often thought of as objective and apolitical, this research team and local farmers enact political sense-making in everything they do (Latour 1999), from their ecosystem-based research design to which colleagues they choose to work with, from their choice of potential funding agencies to which journals they attempt to publish in. This case codes the choices they make as boundary work and the sense-making they undergo as a form of political weaponry (of the semi-weak) (Scott 1985). The team viewed many of their actions as defiant to the currently powerful patent system. Through their team and other like-minded teams at international conferences, they sought to play a political role in the global debate over food issues. Political and scientific endeavors articulate in many ways, but future research requires more detailed research on how these spheres interact, create boundaries, and make sense of each other in order to solve global problems of food and inequalities.

Keywords: Intellectual property rights, Khoi-San, Sensemaking, Boundary work, Food sovereignty.

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A pot full of memories: merging biocultural diversity and organic farming in Sierra Norte de Madrid, Spain.

Authors: Aceituno-Mata, Laura [1], Pardo-de-Santayana, Manuel [2], Tardío, Javier [3].

Mountain rural areas are a refuge for agrobiodiversity. In these regions landraces represent a valuable resource for rural development and organic farming. In 'Sierra Norte', a mountain area located in the north of the province of Madrid, an ethnobotanical study was carried out to collect landraces and the traditional knowledge related to their use and management. At the same time, the researcher collaborated in the establishment of a local initiative with the aim of conserving agrobiodiversity by using it, named La Troje. The steps followed to achieve this aim were: 1) to study local biocultural diversity, 2) to conserve landraces promoting the collaboration of organic farmers, homegardeners, seed banks and researchers, 3) organic production of landraces' seeds, seedlings and fruit trees for being distributed among local homegardeners and organic farmers 4) to disseminate traditional knowledge about landraces and encourage consumers to taste them. We interviewed 160 informants about the characteristics, use, management and local evaluation of landraces. As a result of the research, there were found 129 landraces (48 vegetables, 73 fruit trees and 8 cereals), that are conserved in institutional germplasm banks and local seedbanks. Analysing the local evaluation and selection criteria for landraces, we found that the most important were: flavour, texture, productivity and aptitude for conservation. The landraces selected following these criteria match with the present needs of local homegardeners and organic farmers, but a new ingredient was added to the pot: memories. Growing, cooking and eating these varieties make them and their consumers recall ancient recipes, flavours and scents. But modern diet in this region is more complex and varied than was in the past. When complexity arises the answer is always diversity: the organic farming initiative decided to complement their array of local varieties with landraces from other regions all over the world.

Keywords: Biocultural diversity, Organic farming, Landraces, Sierra Norte de Madrid, Traditional knowledge.

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Symposium 4

Agrobiodiversity and traditional knowledge: conservation strategies and sustainable development – Session 2

Chair: Zbynek Polesny, Czech University of Life Sciences, Czech Republic
Tuesday, June 6, 14h30 – Auditório Pequeno

Local ecological indicators for the conservation of wild populations of *Sideritis raeseri* Boiss. & Heldr. in Prespa National Park, Albania.

Authors: Tomasini, Sabrina [1].

Mountain tea (*Sideritis raeseri*) is one of the more than 80 medicinal plants collected and traded in Prespa National Park, Albania. It is of great cultural and economic importance to local communities, but harvest is suspected to be unsustainable threatening the survival of wild populations. To optimise species management at the Park level, we explored local ecological knowledge (LEK) indicators of conservation status, i.e. the indicators applied by local resource users to guide the management and harvesting of mountain tea. LEK indicators were identified through a combination of semi-structured interviews, participatory mapping and harvest trips with resource users. For comparison, a plot-based resource inventory along transects was carried out and joint plot surveys were organised with key informants. A household survey showed how commonly the indicators are applied among the population. Results showed that local harvesters adopt a variety of socio-economic, market-based and ecological indicators to assess wild populations of mountain tea and inform their harvest practices. Based on these indicators, resource users perceive mountain tea populations overall as rapidly decreasing. There was general agreement between conservation assessment based on LEK-indicators and the plot-based method, indicating that official conservation monitoring in the National Park could be based on existing informal LEK indicators. However, it has to be taken into account that local resource users' indicators focus on the harvestable resource and not the plant population as such.

Keywords: Medicinal plants, Local Knowledge, Conservation, Sustainable harvest.

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Consumption of wild edibles by Vasava tribals: implications for sustenance and conservation of indigenous nutritional knowledge.

Authors: Chauhan, Sonali H [1], Yadav, Santosh [2], Takahashi, Taro [3], D'Cruz, Lancy [4], Okada, Kensuke [5].

Background: The Vasavas are a tribe from Gujarat state in India who have a rich tradition of indigenous medicine and have traditionally practiced sustainable traditional subsistence farming. However, in today's highly dynamic social scenario they face new challenges with their limited agricultural land holding and the urgent need for generating higher economic returns from their limited and highly fragmented agricultural land holding and decreasing forests. With these limitations they need to migrate for searching a means of economic livelihood or their children migrating to nearby villages for modern education. This changed access to the forest and introduction to new nutritional and healthcare perceptions threatens their indigenous knowledge which is passed on from elders to the new generation by word of mouth and close association to the forest.

Objective: Following an ethno-medicinal survey with the tribals in the 1990s, there was seen a need to study their diet and agricultural practices in greater detail to understand the nutritional and medicinal consumption patterns. This would aid in understanding the diet and healthcare perceptions in the tribal community. The current study reports the data from the field studies conducted over time with the interaction with the community from the year 2014 to 2017.

Methodology: The data reported is drawn from the semi-structured questionnaire survey conducted in the field trip from Dec 2015 to Jan 2016. The list reported is a product of the field trips and identification in the forests and agricultural fields with the members accompanied by a botanist. The perception and concepts about their nutritional and medicinal concepts were gathered from key informant interviews (August 2016) and observations and informal conversations over the time of study since 2014.

Results and discussions: In this conference, we report the wild edible consumption patterns of the tribal community and elucidate the reasons behind the decreasing consumption and draw implications for conserving the indigenous nutritional and medicinal knowledge for the future in a sustainable way.

Keywords: Wild edible plants, India, Indigenous knowledge, Medicinal plants.

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Diversity of wild edible plants in Hani terraced paddy rice agroecosystem in Honghe prefecture, Yunnan, China.

Authors: Luo, Binsheng [1], Liu, Bo [1], Zhang, Hongzhen [2], Zhang, Hongkang [3], Li, Xuan [3], Li, Jianqin [1], Yang, Jun [4], Wang, Yizhou [1], Bai, Yujia [5], Ma, Lijuan [1], Long, Chunlin [6].

The Hani people in Honghe Prefecture, Southeastern Yunnan, China, have practiced terraced paddy rice farming for more than 1300 years. The terraced paddy rice fields combined with forests and water system form a special and charming agroecosystem, which have attracted great interests from tourists and scientists as well. The local people have traditionally collected wild edible plants from the ecosystem for centuries. By conducting field works via ethnobotanical methods, 45 local knowledgeable people from 3 different ethnic groups were interviewed and 225 local wild edible plant (WEP) species, belonging to 93 families and 164 genera, have been recorded. The results showed the diversity of edible parts and preparation methods of WEPs, and most of them are eaten directly or cooked as wild vegetables. A large majority of these WEPs possess great economic potential for future development. The reasons of diversity of WEPs and challenges they are facing have been discussed in this paper. This study can not only help indigenous people recognizing the values of local WEPs and associated traditional knowledge, but also provide ethnobotanical information for future development in this attractive tourism region.

Keywords: Hani terraced paddy rice fields, Edible plants, Ethnobotany, Diversity.

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Trends in agrobiodiversity for quinoa and some wild relatives: underutilized crops and wild species for sustainable agricultural production in Peru.

Authors: Fagandini Ruiz, Francesca [1], Bazile, Didier [2].

Andean crops have formed the basis for much of the world's current staple diet. Peru is a center of origin for many species of grains such as *Chenopodium quinoa* Willd., *Chenopodium palliducaule* Aellen, and *Amaranthus caudatus* L. . Almost all the important native species of Peru are cultivated on the highlands in traditional agro-ecosystems by small scale farmers. We investigated the geographical distribution (presence or absence) and the diversity of conservation management practices for seven crop wild relatives of *Chenopodium quinoa* Willd. in six local communities of the Puno's Region in Peru. Qualitative research methods were applied to identify and describe farmers' practices related to species and agroecosystem management. Crop genetic diversification is a result of small farmer strategies and actions aimed at developing landraces adaptable to a broad range of climatic, ecological, agronomic and social conditions. The maintenance of this permanent process of farmer-driven genetic diversification and adaptation to face with global changes is directly linked to specific strategies applied to on farm management of quinoa's landraces and *In situ* conservation of an external pool of genes originated from crop wild relatives. The traditional cultural practices that are compatible with in situ conservation or sustainable use requirements have been declining over the last 50 years for our 6 study sites. The chorèmes are used for a graphic synthesis of the main drivers of changes. It is therefore important to identify the potential impact of the recent agricultural export market on on farm management of quinoa cultivars and on in situ conservation of the quinoa's wild relatives. We emphasize the importance of continuous co-learning with local actors for designing new rules for the sustainable management of complex agroecosystems and securing agricultural production for the future considering more the various dimensions of agrobiodiversity.

Keywords: *Chenopodium quinoa* Willd., Crop wild relatives, *In situ* conservation, Farm management, Agrobiodiversity, Peru.

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Diversity of edible plants in food systems of Bugis, Mandar, Minang and Acehnese cocoa farmers in Indonesia.

Authors: Pawera, Lukas [1], Barbora, Tumova [2], Céline , Termote [3], Zbynek, Polesny [4], Danny, Hunter [5].

In this nutritional-ethnobotanical survey, we studied the consumption, importance and perception of plant diversity in the food systems of cocoa farming communities in Sulawesi (Bugis and Mandar) and Sumatra (Acehnese and Minang). Data were collected during the 2016 rainy season from February to May in four provinces. Altogether 123 farmers were interviewed individually, and information was complemented with qualitative data from 13 focus group discussions comprising 166 participants. In addition to interviews, seasonal calendars, freelisting exercises, qualitative 24-hour food intake recalls and homegarden inventories were carried out. According to the food recalls, the highest average individual dietary diversity scores (theoretical maximum=9) were determined for Bugis (IDDS=4.65), while the lowest for Mandar (IDDS=4.0). In all areas together, 59 food plant taxa were consumed the previous day. The highest number of taxa was consumed by Minang, whilst the lowest by Bugis. Freelisting of fruits and vegetables captured 80 taxa (28 not reported by food recalls) in the food systems. Respondents listed 52 vegetable taxa of which the most culturally salient were leafy amaranth, water spinach, long bean, cassava and moringa, respectively. In case of fruits, banana, papaya, citrus spp., rambutan and durian obtained the highest composite salience out of 31 fruit taxa. Through the group discussions, 27 other less-commonly consumed folk taxa were documented. All the methods together resulted in a total of 117 folk taxa, of which 104 have been identified down to species/genus level. Majority of plant taxa are cultivated, a few are being purchased, numerous are either cultivated or wild, and 45 are exclusively gathered in the wild. Results are suggesting that dietary diversity scores might not correlate with the richness of food plant diversity consumed in the sample. Communities' foodscapes showed both divergences as well as similarities in the use of plant diversity, yet, in the face of an increasing pressure of conventional food system, promoting traditional food diversity is urgently needed for empowering local communities in their understanding and valuing of this food heritage. Accordingly, the study results will help developing a culturally-sensitive nutrition project aiming to sustainably improve the diet of smallholder cocoa farmers.

Keywords: Dietary diversity, Food and nutrition, Indigenous crops, Wild food plants, Traditional food system.

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Local ecological knowledge as a tool for a sustainable territorial management in Gorbeialdea (Biscay, Basque Country).

Authors: Menendez-Baceta, Gorka [1].

During decades, natural protected areas have developed their conservation policies on the basis of an antagonist split between nature and humans. However, in Europe most of those areas are the result of the activity of peasant communities, that have shape the territory through last centuries. In such a way, we ought consider, and protect, those areas not as "natural" ecosystems, but as social-ecological systems.

Fieldwork was conducted in Gorbeialdea (Biscay) between September 2008 and October 2011, through consented semi-structured interviews with 122 informants that had a sound local ecological knowledge in the area.

By the 1950s the local landscape was shaped by three basic agroecological units. First of all, near the family house, there was a little homegarden, ortua; then there were the extensive crops fields, soloa; and finally the mount, basoa. Inside of one of each unit, a great variety of agroecological niches could be found: fruit trees, meadows, hedges, mountain pastures, pollards, shrublands, extensive crops... As a whole, it was a complex social-ecological system in which a multifunctional use of the resources was possible (energy, human and animal food, building material, textile fibers), integrating the local inhabitants in the ecological processes, and without setting a dichotomy among nature and humans. Nevertheless, with the disappearance of peasant communities and the establishment of market economy in the second half of twentieth century, all this social-ecological system was modified: modern and intensive agricultural activities (intensive livestock farming and forestry plantations) were deployed and, as a consequence, many ecological niches disappeared.

The present research offers detailed information about the management of many ecosystems that are trying to be preserved in the natural protected areas of the region. It also offers a perspective to understand the local thought pattern, which is fundamental for a more democratic and participative policy making. Finally, this social-ecological approach can help us to develop new territorial models in which the human presence and the conservation of the biodiversity can match.

Keywords: Local ecological knowledge, Social-ecological systems, Peasants, Basque Country, Ethnoecology.

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Assessing the contribution of wild plants to organic food systems in Austria.

Authors: Schunko, Christoph [1], Vogl, Christian R. [2].

The commercialization of gathered wild plants plays a role in local food systems but also along complex global supply chains as e.g. in the case of berries from Scandinavia or herbs from SE-European countries. Wild plants can be commercialised as organically certified products if gathered according to the EC Organic Farming Regulation. This research adds to understanding the commercialization of organically certified wild plants in Europe and explores the commercialization of wild plants gathered throughout Austria. The research question addressed in this presentation is: What qualitative and quantitative contributions do gathered wild plants make to organic food systems? All seven certification bodies responsible for inspecting and certifying organic producers (mostly farmers, but also other enterprises such as forest and restaurant owners) in Austria were contacted to i) yield information on producers certified for wild collection, location of the production site, kinds of gathered wild plant species, amounts gathered, products made; and ii) to conduct semi-structured interviews with in-house experts on the conditions and practice of organically certified wild plant collection. About 1-2% of 21,000 organic producers are certified for collecting wild plants and fungi in all regions of Austria. The median value is at about four wild plants per producer. Organically certified wild plants are most frequently processed on-site and sold directly to consumers. Products are made in small quantities and the median value is about one kilogram of fresh gathered plant material per certified plant per year. Some organic producers are specialised in harvesting large amounts of single plant species. The wild plant most frequently certified organic is *Sambucus* sp. and the flowers and berries are processed and sold as liqueur, jam, jelly, syrup, vinegar, wine and dried. This research shows that commercial wild plant gathering in organic farming contributes to organic food systems mostly on local levels in Austria. Whereas the diversity of species and quantities gathered and processed are often small, wild plants contribute to a diversification of farm activities throughout Austria. This again may support the maintenance and innovation of folk biological knowledge about the use of agrobiodiversity on organic farms.

Keywords: Non timber forest products, Wild plant gathering, Biocultural diversity, Local ecological knowledge, Organic Agriculture.

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Strategies for traditional knowledge retention and adaptation in a migrating world: a case study of Bosnian refugees in St. Louis, Missouri, USA.

Authors: Glenn, Ashley [1].

According to the Office of the United Nations High Commissioner for Refugees (UNHCR), the number of refugees, asylum-seekers, and internally displaced persons worldwide has surpassed 60 million in 2015, the highest level in 20 years. Cut off from their homes and networks, displaced people often cannot bring many belongings with them, but they all carry knowledge suited to their homeland, now exercised in new locations. Studying the effects of migration on plant use, and the resultant effects on health and well being, is increasingly important in an increasingly displaced populace. A new research program at the William L. Brown Center aims to study the ethnobotanical knowledge and strategies of refugees, focusing on Bosnians in St. Louis, Missouri, USA. The current estimate of the Bosnian-American population in St. Louis is around 65,000-70,000, making it the largest population outside of Sarajevo. In local press, Bosnians express pride that the community they've created benefits Bosnians, other immigrants, and the St. Louis city as a whole, and have set up many businesses, including restaurants and markets. In this talk I will explore strategies for applying, retaining, and adapting Bosnian traditional knowledge to thrive in St. Louis.

Keywords: Ethnobotany, Refugees, Immigration, Bosnia, Urban.

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Varietal crop research as a tool to engage with agrobiodiversity: an open door to interdisciplinary learning for STEM and farmer training programs.

Authors: Dutra Elliott, Daniela [1], Bost, Jay [2], Fermahin, Amanda [1]; Rivera Vega, Myrna Berlitz [1], de la Pena, Gustavo [1], Diaz, Francesca [1].

Around the world as populations shift from land-based economies to urban environments there is typically a loss of knowledge about biodiversity including inter and intra specific variation of food crops. While the fields of ethnobotany and economic botany have done well in recording biocultural knowledge before and as it is being eroded (and in some instances working to slow and/or prevent this erosion), there are societies that are already disconnected from their traditional biocultural knowledge and their food sources. This creates the lack of faculty to recognize, appreciate, and utilize crop biodiversity. The island of O'ahu in Hawai'i provides an excellent setting to address such a question, as it is populated by a highly diverse population of agriculturally derived peoples, the vast majority of whom are now urbanized and thus have relatively low exposure to crop diversity. Meanwhile, a growing interest in food self-sufficiency from grassroots to the highest levels of the State government, is opening opportunities for a new generation of farmers, who need crops and crop varieties adapted to the considerable pest and disease pressures present in Hawai'i, as well as to the diverse cuisines found on the island. New farmers also need consumers educated and appreciative of crop diversity. In an attempt to address these needs, crop variety trials were integrated into the curricula of a new farmer training program and into community college science courses. We contend that teaching students and beginning farmers to engage in accessing, trialing, and selecting from a wide variety of available crop germplasm can change their perspectives greatly, turning them from passive consumers into at least knowledgeable consumers and in some cases into custodians and generators of crop biodiversity. Exposing students and new farmers to variety trials and related subjects of agrobiodiversity early in their trajectory rather than this being the domain of "expert" students and farmers has the potential to influence their educational paths and to increase the numbers of people involved in such important work.

Keywords: Agrodiversity.

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Symposium 4

Agrobiodiversity and traditional knowledge: conservation strategies and sustainable development – Session 3

Chair: Tinde van Andel, Naturalis Biodiversity Center, Netherlands
Thursday, June 8, 11h00 – Auditório Pequeno

Socio-economic importance of the 'Queen of African plants': *Raphia* (Palmae/Arecaceae) species in Cameroon.

Authors: Suzanne, Mogue Kamga [1], Henri, Owona [2], Abdon, Awono [3], Bonaventure, Sonké [4], Thomas , Couvreur L.P [5].

Raphia (Palmeae/Arecaceae) represents a third of palms across tropical Africa. However, its socio-economic contribution to the livelihoods of the Cameroonian society is still poorly known. For the government most *Raphia* products are not yet recognized as a non-timber forest products leading to the absence of a sustainable management plan of the resource. This study aimed at filling the knowledge gap on the socio-economic contribution of *Raphia* products to rural and urban livelihoods across Cameroon. Four hundred individuals were interviewed in five regions. The questionnaires focused on the type and use of products derived from *Raphia*, income, availability of the resource and area of activity. Our results confirm that *Raphia* species provide a wide variety of products for food, construction, art, medicine and clothing. Roles and implication in different activities vary depending on gender with generally more men being involved in harvesting and women in retailing. *Raphia* products contribute between 11-32% to the income of individuals involved depending on the region. Many products are of cultural importance in traditional ceremonies, instruments and gifts. *Raphia* products are deeply anchored at many levels of the Cameroonian society, playing multiple central roles for community subsistence, trade and culture. For the first time in Cameroon a national wide socio-economic picture on the knowledge and importance of this resource is provided which can lead to improved exploitation of its species.

Keywords: Raphia, Economy, Importance, Cameroon.

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Pathways from the wild to cultivation: drivers of management schemes and prospects for spider plant (*Gynandropsis gynandra* L.) utilisation in Benin and Togo.

Authors: Sogbohossou, Eurydice Olga Deedi [1], Andel, Tinde van [2], Achigan-Dako, Enoch [3], Schranz, Eric [4].

The sustainable exploitation of underutilized crops is a function of the intensity and diversity of management practices. For spider plant (*Gynandropsis gynandra* L.), a neglected leafy vegetable in Benin and Togo, we investigated the determinants of the diversity in uses and management and how these practices could evolve in the future. We hypothesized that the management regimes of the species varied among communities and reflected cultural importance of the species. Semi-structured interviews were conducted with 428 respondents selected using snowball sampling from six socio-linguistic groups in Benin and one in Togo. A cultural significance index (CSI) was used to quantify the cultural importance of the species. A regression tree analysis was performed to identify the socio-demographic factors influencing the CSI. A generalized linear model with Poisson distribution allowed to investigate the drivers of management intensity. We found that the species was used as a vegetable and a medicinal plant in all communities. The cultural importance of the species was strongly associated with ethnicity, age, land tenure, income, and education. Adoption of the four levels of management practices identified was related to ethnicity and land tenure of the respondents. While the urban Ewe considered spider plant as a commercial food crop, they had less knowledge about its medicinal uses than the Adja, who cultivated the species in home gardens. The other socio-linguistic groups were more used to wild harvest and had limited knowledge about its medicinal properties. They were willing to start spider plant cultivation, provided technical support and demand from end-users were available. Development of strategies for sustainable utilization and promotion of spider plant or other underutilized vegetables in West Africa should therefore build on local communities' perceptions, cultural preferences, and needs.

Keywords: Indigenous crops, Traditional knowledge, Management, Ethnicity, Benin.

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Cultivated plants in the Kaxinawá Indigenous Land of Nova Olinda, Acre, Brazil.

Authors: Lanza, Tomaz Ribeiro [1], Ming, Lin Chau [2], Haverroth, Moacir [3], Ferreira, Almecina Balbino [2].

The great diversity of plants currently known and used by man is a result of the coevolution that occurred during millennia between the native populations and the different ways in which they used it. In this long period the vegetable species supplied the alimentary, industrial, artistic, medical or even ritualistic needs of different peoples. In the midst of this dynamic interrelation, man learned to cure his illnesses and to make his food richer and more diversified. Research suggests that the traditional native orchards materialize a highly complex productive system, which requires a wide input of local agricultural knowledge and practices for its maintenance. In addition, many plant resources depend directly on human management in these agroecosystems to persist. In this sense, this study has as main objective to provide the valorization and the preservation of this knowledge on the forms of use and management of the plants that have been, over time, accumulated, selected and used by countless generations. The research is being carried out in the IT Kaxinawa of Nova Olinda (TIKNO), located in the Amazon Biome, municipality of Feijo, Acre, Brazil. Kaxinawa agriculture is an important mechanism for ensuring the supply of food to the community, and is based mainly on the management of capoeiras and fallow. These practices are closely associated with the wordview and local belief system, which aid decision-making and agricultural management practices. The survey of cultivated plants was carried out in 2016 through semi-structured interviews and on the spot visits in the productive areas. Four types of productive areas were identified, such as: scrubland, agroforestry yards, banana and temporary beach crops. A total of 30 agricultural crops were identified in 21 botanical families, with 111 varieties, with emphasis on cassava (*Manihot esculenta* Crantz) with 21 varieties, banana (*Musa paradisiaca* L.) with 18 varieties, maize (*Zea mays* L.) with 12 varieties and (*Arachis hypogeae* L.) with 8 varieties. The high agrobiodiversity observed in TIKNO shows the genetic and cultural richness of these traditional populations, and it is necessary to continue the studies that value the knowledge associated with this wealth.

Keywords: Agrobiodiversity, Amazon, Indigenous.

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Remembering Mauka: biocultural diversity conservation and the case of the 'lost' Andean crop *Mirabilis expansa* (Ruíz & Pav.) Standl.

Authors: Gendall, Harriet [1], Sørensen, Marten [1], Theilade, Ida [2], Seminario Cunya, Juan [3], Chalampuente Flores, Doris [4].

The so-called 'lost crop' "mauka" (*Mirabilis expansa* [Ruíz & Pav.] Standl.) is a highly endangered and chronically understudied species of root vegetable native to the Andes. This in-depth ethnobotanical case study, carried out in collaboration with the International Potato Center (CIP) and the National Institute for Agricultural Innovation (INIA) in Peru, is the first to assess both reasons for the decline of the crop and approaches to effective conservation efforts. Emphasis is placed on farmers' perspectives, which were distilled from 40 interviews conducted with Andean farmers (26 actively cultivating mauka and 14 who were familiar with or had given up cultivating the crop). Mauka was found in Ancash, Huánuco and Puno—three regions of Peru that had previously been under-explored in terms of mapping the crop's distribution—and a total of 21 germplasm accessions were collected for ex-situ conservation; several of which constitute morphotypes new to scientific research. The 'lost crop' case study was framed by a broader discussion addressing processes inherent in biocultural diversity generation and loss, particularly with relation to agriculture; which found 'cultural memory' and 'situatedness' to be important considerations for the design of effective conservation projects. It is argued that despite suffering from severe genetic erosion and loss of associated ethnobotanical knowledge, mauka is worth conserving, and has greater potential than originally thought; specifically in a gastronomic context. As part of the study, mauka was introduced to chefs at Central Restaurant (Lima, Peru)—No. 4 of the World's 50 Best Restaurants in 2016—who carried out gastronomic experiments with it and have now begun working with local farmers to 'revalue' this ancient crop and incorporate it into their Peruvian ecosystem-inspired menu.

Keywords: *Mirabilis expansa*, Mauka, Biocultural diversity, Lost crop, Crop conservation, Ethnobotanical knowledge, Cultural memory, Gastronomy, Novoandina.

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Biocultural impacts of climatically shifting plant distributions.

Authors: Matthew, Bond [1], Barbara, Anderson [2], Priscilla, Wehi [2].

The recent 2016 IUCN Congress in Honolulu, Hawaii, highlighted the inextricable linkages between culture and nature, and the threats that indigenous peoples face in a changing world. Climate change is a major threat to us all, and is already affecting species extinctions and social systems. However, there is a lack of research that analyzes how indigenous biocultural systems will be affected by continued climate change; this gap is particularly concerning since indigenous peoples manage 80% of the world's biodiversity. Here, we have integrated cultural context and harvesting practices with projected future species ranges, and developed collaborative management strategies to strengthen biocultural resilience to climate change. For this case study, we selected two New Zealand native species that have high cultural value to the indigenous Maori people: kuta (*Eleocharis sphacelata* R.Br.) and kūmarahou (*Pomaderris kumeraho* A.Cunn. ex Fenzl) are used for weaving and medicinal purposes, respectively. Future suitability maps for each species were generated by running species distribution models for 50 and 70 years in the future under conditions of low and high greenhouse gas emissions. Suitability maps were then interpreted by adding demographic layers and cultural use information. Our results show a contrasting pattern: the range of kuta shifts away from where it is most culturally important, and the range of kūmarahou expands to include regions where the plant has high cultural use but cannot currently grow. This project serves as a model to improve future biocultural assessments that predict and mitigate the effects of climate change on resources and cultures across the planet.

Keywords: Biocultural diversity, Climate change, Conservation, Ecosystem services, Indigenous, Ethnobotany, Ecological knowledge, Natural resources, Species distribution modeling, New Zealand.

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The case for folk valuation of Plant Genetic Resources.

Authors: Wall, Jeffrey [1], Kose, Coskun [2], Okan, Taner [3], Kose, Nesibe [4], Aksoy, Elif [5].

We present an ethical argument for a more pluralist valuation of plant genetic resources (PGR) by drawing on contemporary environmental ethics, ontology and value anthropology. We find that PGR valuation would be enhanced by a more pluralist approach to value. We arrive at this conclusion by way of establishing a set of three nested assertions. First, PGR conservation has come to be understood as an important feature of larger biodiversity conservation and environmentalism. Yet while ethical justification for environmentalism and, later, biodiversity conservation has enjoyed significant development in areas outside of utilitarian instrumentalism, such as virtue ethics and aesthetics, we maintain that PGR conservation has escaped and is thus overdue for such revisions. Second, in light of the ontological turn in the social sciences and humanities we review ontologies of PGR in order to broaden the possible justifications for their conservation. We demonstrate that the accepted ontology of PGR impinges on the logic for and approaches to conservation. Third, we maintain that this impingement occurs through the characterization of value of and among plant resources. Leveraging our broadened ontological consideration of PGR, we introduce the insights of value anthropology to further justify a pluralist reckoning of plant value. To trial our argument, we go on to review the history of value for European chestnut (*Castanea sativa*) in Turkey in light of evidence from our extensive ethnobotanical field research. This case will illustrate the breadth and richness of values which have driven vigorous human-tree engagement over several millennia and rendered the Chestnut populations which we are in the position to conserve today. We thus call for a renovation of the concepts and practices of germplasm valuation at work in contemporary PGR conservation practice from accession to curation and management so that they are in a position to give rise to a conservation which conserves, not just resources, but the informal, persistent and diverse cultures of plant conservation around the world as well.

Keywords: Genetic resources, Pluralism, Ontology, Value anthropology, *Castanea sativa*.

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Wild Food Plants in the Kaxinawá Indigenous Land of Nova Olinda, Acre, Brazil.

Authors: Lanza, Tomaz Ribeiro [1], Ming, Lin Chau [2], Haverroth, Moacir [3], Ferreira, Almecina Balbino [2].

Of the 350 thousand species of plants in the world, about 30 thousand are edible, and we consume only about 200 species, with most carbohydrates of plant origin obtained from three main species: corn, rice and wheat. In Brazil there is the greatest biodiversity in the world, about 15% in number of species of plants, animals and microorganisms, mainly in the northern region of the country, specifically the Amazon Biome. Currently Brazilian Indigenous Lands (TIs), which have been sighted with high potential for conservation and environmental protection, are distributed in about 12% of the Brazilian territory. In the state of Acre, little research was done on ethnobotany, with a great part of the emphasis on medicinal plants, demonstrating the importance of carrying out more in-depth ethnobotanical studies on food plants. The most populous indigenous ethnic group in Acre is Kaxinawá or Huni Kuin, belonging to the Pano linguistic family, great traditional knowledge about the use of natural resources. The objective of the present study was the study of wild food plants used in the five villages of TI Kaxinawá of Nova Olinda (TIKNO), located in the municipality of Feijó, Acre, Brazil. TIKNO covers an area of approximately 28,000 hectares, on the banks of the Envira River, with a total population of 492 inhabitants. The methodology used was free listing and walking in the woods with different indigenous representatives. The free listing was conducted with young and adult, and the walks in the woods with indigenous adults. To date, 44 species have been identified, distributed in 36 genera belonging to 20 botanical families, with emphasis on the families Arecaceae (12 species), Malvaceae (5 species) and Moraceae (4 species), representing 47% of the species. Of the total number of species, the most important are the fruit trees that represent approximately 95% of the plants consumed in the forest. These species are important food sources, whether in the occasional feeding route and hunting incursions, as well as for daily food and processing, because together with the cultivated plants they contribute to the food security and guarantee the cultural preservation of the associated knowledge.

Keywords: Wild food plants, Amazon, Indigenous.

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Morphological and genetic diversity of Hawaii's ‘uala (*Ipomoea batatas*) cultivars in an effort to engage with cultural knowledge.

Authors: Hanohano, Adam [1], Wiehl, Tristyn [1], Fermahin, Amanda [1], Diaz, Francesca [1], Bost, Jay [2], Dutra Elliott, Daniela [3].

He `uala ka `ai ho`ola koke i ka wi, the sweet potato is the food which ends famine quickly. This Hawaiian proverb puts into context the immense significance of sweet potato (‘uala) to the survival of Hawai’i’s indigenous people. ‘Uala is a canoe plant brought by Polynesians from South America. In Hawaii it became a staple crop for it grew well in poor soils and required few inputs. Ancient Hawaiians selected nearly 200 cultivars which served their own specific uses as a food staple, medicine, fish bait, or tied to religious practices. Currently the Hawaiian archipelago is facing a sustainability crisis; a problem Native Hawaiians had already solved. The knowledge pertaining to specific Hawaiian cultivars has been lost over time due to socio political changes across the island chain. Botanical gardens around the state have collected and conserved some of this diversity, including many varieties with Hawaiian names, some of which, it is believed, may be at least partly of older pre-European introduction origin. However, little is known about the agronomic potential of the varieties and their state of health, nor has their morphological or genetic diversity been well documented. To realize the potential of these collections the material needs to be characterized and evaluated with genotypes identified and the nomenclature clarified. In order to expand the knowledge of ‘uala varieties we characterized the morphological and genetic diversity of Hawaiian heirloom sweet potatoes from ex situ botanical garden collections. A photographic guide to these clones with cultural and agronomic information is being produced.

Keywords: Agrobiodiversity.

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The varietal diversity of the fig (*Ficus carica* L.): biocultural interactions and social behaviors in traditional agroecosystems of the Rif in Morocco (case of Bni Ahmed).

Authors: Younes, Hmimsa [1], Yildiz, Aumeeruddy-Thomas [2], Ater, Mohammed [3].

A study of the agrodiversity of traditional agroecosystems of the Rif in northern Morocco has shown an important agrodiversity, made of marginal agricultural products (engrain, rye, sorghum, erse), local landraces of major agricultural products (barley, wheat, beans, chickpea) and a diversified arboricultural system which main emblematic species are olive, grape, almond and fig trees. The richness in local varietal diversity of fig trees represents a salient characteristic of traditional rifian agroecosystems. Indeed, the fig is the fruit species that has the highest level of diversity with some 133 varieties recorded as compared to 21 for the grape, for example. The coexistence of cultivated and spontaneous forms and the genetic characteristics that link local varieties to locally based wild and spontaneous forms raise the question of the origin and the preservation over time of this diversity of fig varieties. From a social perspective, the fig is highly appreciated by local rifian societies. Indeed, beyond its importance as a food item and for the household economy through trade, fig trees have an important patrimonial value. An ethnobiological approach has been undertaken to analyze these dimensions with a particular interest on popular nomenclature, practices, uses and diversity of the classification systems. The analysis of the data obtained enable to respond to questions raised as the social processes that have led to the selection and protection of this varietal diversity. Our work relate to explanations of these key elements through ethnobiological analysis of fig varieties replaced in a social, cultural and biological context.

Keywords: Rif, Agrodiversity, Fig, Ethnobiology.

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Symposium 4

Agrobiodiversity and traditional knowledge: conservation strategies and sustainable development – Session 4

Chair: Maria Fadiman, Florida Atlantic University, USA
Thursday, June 8, 14h30 – Auditório Pequeno

Tracing ancestor rice of Suriname Maroons back to its African origin.

Authors: Andel, Tinde van [1].

African rice (*Oryza glaberrima*) and African cultivation practices are said to have influenced emerging colonial plantation economies in the Americas. However, the level of impact of African rice practices is difficult to establish due to limited written or botanical records. Recent findings of *O. glaberrima* in rice fields of Suriname Maroons bear evidence of the high level of knowledge about rice among African slaves and their descendants, who consecrate it in ancestor rituals. Here we establish the strong similarity, and hence likely origin, of the first extant New World landrace of *O. glaberrima* to landraces from the Upper Guinean forests in West Africa. We collected African rice from a Maroon market in Paramaribo, Suriname, propagated it, sequenced its genome, and compared it to genomes of 109 accessions representing *O. glaberrima* diversity across West Africa. By analyzing 1,649,769 SNPs in clustering analyses, the Suriname sample appears sister to an Ivory Coast landrace, and shows no evidence of introgression from Asian rice. Whereas the Dutch took most slaves from Ghana, Benin and Central Africa, slave ship captain diaries record the purchase of food for provisions when sailing along the West African Coast, offering one possible explanation for the patterns of genetic similarity. This study demonstrates the utility of genomics in understanding the largely unwritten histories of crop cultures of diaspora communities. Our next step is to determine the full variety of rice landraces grown by Maroons in Suriname and French Guiana.

Keywords: Rice, Suriname, Landraces, Maroons, Traditional agriculture, Trans-Atlantic slave trade, Ritual crops, French Guiana.

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Miombo woodlands: biodiversity and bioprospection.

Authors: Ribeiro-Barros, Ana I [1], Maquia, Ivete [1], Duvane, Jossias [2], Moura, Isabel R [1], Silva, Maria J [1], Bronze, M. Rosário [3], Ribeiro, Natasha S. [4].

Miombo woodlands are the most important provider of ecosystems services in Southern Africa (SA), representing an important plant diversity center, with ca. 8500 plant species. Besides their contribution to energy, water and carbon balances, the woodlands represent an untapped source of natural bioactive molecules, such as pharmaceuticals, food additives, food supplements, cosmetics or agro-chemicals. We are currently addressing conservation and bioprospection issues in key species from the Niassa National Reserve (NNR), one of the most pristine areas of Miombo in SA. Ecological studies identified fire, resulting from a combination of climate, human and animal pressures, as the major threat to this ecosystem. As a result, areas exposed to frequent fires present considerable changes in vegetation composition, structure and genetic diversity. In this context community-based in situ and ex situ strategies are being implemented. Among others, these include the integration of traditional-knowledge systems and scientific knowledge towards bio-based socio-economic development. A database containing ethnotanical, biochemical, biological and pharmacological data has been set up for 16 tree species, all of which used to treat, prevent or alleviate complaints caused by the four main groups of diseases in Africa, i.e. diarrhea, malaria, sexual diseases and respiratory illnesses. The case study of *Brachystegia bohemii*, the most typical Miombo species in NNR, will be presented.

Keywords: Miombo, Biodiversity, Bioprospection.

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Assessment of unexplored sugar beet wild relatives as new genetic sources for abiotic stress tolerance: how species' ecology can assist crop improvement.

Authors: Monteiro, Filipa [1], Duarte, Maria Cristina [2], Romeiras, Maria M. [1].

Sugar beet (*Beta vulgaris* subsp. *vulgaris*) is one of the most important cash crops worldwide, being of high value to European agriculture and is within the 2013 top ten world commodities, with Europe contributing with 68% production. Besides the world-wide importance for 20% of sugar production, *B. vulgaris* subsp. *vulgaris* also includes root and leafy vegetables for food and fodder, being all derived from the wild sea beet (*B. vulgaris* subsp. *maritima*). Sugar beet is frequently irrigated in drought prone growing areas, as such the current challenge on breeding cultivars to enhance sustainable production under climate change scenarios raises urgency for drought and salt tolerance traits. Thus, broadening crops genetic basis through recurring to wild relatives (CWRs) for coping towards abiotic tolerance is a viable means. Sugar beet CWRs comprise species from *Beta* (gene pool 1 and 2) and *Patellifolia* (gene pool 3), commonly found in coastal areas of Europe and Mediterranean Region, where a rich genetic heritage still exists. In this work, we have conducted a broader research project aiming to delimit taxa and identify priority locations to establish agrobiodiversity reserves of the wild sugar beet relatives occurring in Portugal (Western Iberian Peninsula). Data helpful to the future conservation and utilization of key sugar beet wild relatives occurring in ecological habitats supported by clinal gradients will be presented, along the identification of in situ populations for future molecular genetic assessments. Also, it is presented how new molecular tools can assist to uncover genetic diversity underlying the huge ecological range of sugar beet naturally occurring CWRs in Portugal. Since Portuguese sugar beet wild relatives have adapted to specific habitats, they represent unexplored agrobiodiversity resources on novel traits to assist sugar beet breeding programs on abiotic stress.

Keywords: Sugar beet, Wild relatives, Agrobiodiversity, *In situ* conservation.

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Improving Indonesian cinnamon (*C. burmannii*) value chains for greater farmer income.

Authors: Van Damme, Patrick [1], Menggala, Sidi Rana [2].

Genus *Cinnamomum* (Lauraceae) regroups a number of species whose stem barks are harvested, conditioned and traded as cinnamon on the international market. Formal market is complemented by traditional uses that prevail locally. Over the centuries, the species have been domesticated so that now at least six different ones are grown, esp. in South East Asia. In this respect, it generates income mostly to small-scale farmers. Our research addresses some of the issues faced by cinnamon (*C. burmannii*; trade name: Korintje, Padang cassia, or Indonesian cinnamon) growers in Korintji (Jambi province, Sumatra, Indonesia) who would like to strengthen the product's value chain. Research questions are: do Korintji farmers lack institutional and/or technical capacity to engage into sustainable trade ? Would they need international certification ? And: what kind of investment would be needed to improve sustainability? The presentation will focus on these aspects, and formulate recommendations for value chain improvement.

Keywords: Value chains, Economic botany.

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Can legume cover crops be used for sustainable agricultural intensification and diversification in West African cashew orchards?

Authors: Vidigal, Patricia [1], Romeiras, Maria M. [2], Catarino, Luís [3], Monteiro, Filipa [4].

During the last decades, agricultural land-uses in West-Africa has, followed a strong trend on expanding cash crops in pursue of global market needs. Cashew (*Anacardium occidentale* L.) represented in 2015, 45% of the World cashew production, thus making this crop of enormous economic importance, especially in Guinea-Bissau. The extensive regime adopted for cashew production in Guinea-Bissau is assembled under a monoculture orchard, by replacing traditional food crops and occupying fallows and woodland patches. Thus, this cropping system, although slight productive, involves potential risks to Guinea-Bissau and its farmers, due to biodiversity decrease and of family's income sources, as well as the reduction of ecosystem services availability. Therefore, it is essential for peasant farmers to adopt agricultural practices conducive to increase farm resilience to climate and market uncertainties, by crop diversification and sustainably intensifying land use. Considering the wild plant diversity and agrobiodiversity in conjunction with local knowledge, a sustainable solution for peasant farmers, while respecting their livelihood needs and traditions, should be envisaged towards the sustainability of such an important agrosystem. In this work, we discuss the viability of using multi-purpose legume cover crops as a solution for a sustainable agricultural intensification and diversification in the production of cashew in Guinea-Bissau. It is discussed the intercropping of cashew trees with legumes, which offer additional revenues for local farmers while contributing to a sustainable production. To be acceptable for farmers, a cover crop must provide useful products, preferably that can be either locally consumed or sold, be easy to sow and harvest, and the products obtained must be easily stored and transported and don't require preservation care, beyond the soil improvement by N-fixation and organic matter enrichment. From the pool of native species already known by local farmers, Bambara bean [*Vigna subterranea* (L.) Verdc.] and Velvet bean [*Mucuna pruriens* (L.) DC. var. *utilis* (Wall. ex Wight) L.H. Bailey] are presented as sustainable solutions for intercropping as cover crops in cashew orchards, both being multi-purpose legumes and often used for other uses, namely for medicinal purposes. Finally, the importance to conserve native legumes diversity in tropical regions, such as Guinea-Bissau, is discussed.

Keywords: Cashew, Sustainability, West-Africa, Native legumes.

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Horse sense: ethnoveterinary knowledge of Mongolian herders.

Authors: Seele, Barbara C [1], Cunningham, A.B (Tony) [2], Esler, Karen J [3], Dreyer, Leanne L [4].

Globally, pastoralist livelihoods are centred on the health of livestock herds. In Mongolia, where herders rely on the well-being of their livestock and the vast rangelands they inhabit, pastoralism holds important economic and cultural significance. Through centuries of herding, Mongolian pastoralists have developed a rich heritage of traditional ecological knowledge, which includes local knowledge, beliefs and practices relating to animal health. Ethnoveterinary knowledge of Mongolian herders was recorded in north-central Mongolia using a mixed-method approach. Fifty semi-structured interviews were conducted with pastoralist families and included free-listing opportunities, the use of photographs of plants in a reference book and a questionnaire with open- and closed-ended questions. To better understand the nomadic pastoralist context that surrounds this ethnoveterinary knowledge, we used participant observation schedules, journal entries and travelling on horseback. Our study demonstrates that Mongolian herders possess a wealth of ethnoveterinary knowledge that includes the use of 39 botanical species from 20 families, representing 29 ethnospecies. Medicinal plant use and importance was analysed by means of use-values, a free-listing salience index and fidelity levels. Results highlight that *Urtica cannabina*, *Sanguisorba officinalis*, *Plantago* spp., *Rhodiola* spp., *Pulsatilla* spp. and *Cacalia hastata* are particularly important ethnospecies, used in the treatment of various livestock ailments. In addition to medicinal plants, we recorded the ethnoveterinary use of twenty non-plant remedies (including fungi, mineral substances and remedies of animal origin) and three ethnoveterinary techniques. In Mongolia, ethnoveterinary practices still play an important role in the lives of pastoralists. Ethnoveterinary knowledge is held by both men and women, and is transmitted between generations as lived knowledge, experiential learning and by active teaching. Maintaining this traditional ecological knowledge requires the conservation of Mongolian rangelands and the continuation of herding practices and herding culture, as well as a family structure that allows for intergenerational connection across space and time.

Keywords: Ethnoveterinary, Traditional knowledge, Mongolia, Medicinal plants, Conservation, Pastoralism, Ethnobotany.

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The Spanish inventory of traditional knowledge related to agricultural biodiversity.

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The importance of traditional knowledge for the conservation and sustainable use of biodiversity was internationally highlighted firstly by the Convention on Biological Diversity (CBD, UN 1992) and, in the case of agricultural biodiversity, some years later by the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA, FAO 2001). The Article 9.2 points out that each Contracting Party should take measures to protect and promote Farmers' Rights, including the protection of traditional knowledge relevant to plant genetic resources for food and agriculture. In Spain, according to this strategy embodied in Law 30/2006, the Ministry of Agriculture has commissioned our team to create and develop the Spanish Inventory of Traditional Knowledge on Agricultural Biodiversity (SITKAB). The aim of this work is to present the goals, methods and expected results of this first stage of the SITKAB. The SITKAB will compile the previously published information on traditional knowledge regarding Agricultural Biodiversity at two levels: plant species and crop landraces. A team of more than 80 researchers, including Agronomists, Botanists, Anthropologists and Linguists from more than 20 research centers, universities and non-governmental organizations related with the Agricultural Biodiversity will develop it. The methodology regarding databases management, use-categories and publications will be similar to the Spanish Inventory of Traditional Knowledge related to Biodiversity (1). The expected results of the SITKAB comprise a global database that will be available on-line for the general public and individual dossiers that summarize the traditional knowledge about a selection of cultivated plant species and landraces. In this first stage we will publish a free access book with about 50 of these dossiers referred to 30 species and about 20 landraces. This inventory will aid to protect, preserve and promote the traditional knowledge relevant to plant genetic resources cultivated in the different regions of Spain. References (1) Pardo de Santayana, M., Morales, R., Aceituno, L., Molina M. (ed) (2014). Inventario Español de los Conocimientos Tradicionales relativos a la Biodiversidad. Primera fase: introducción, metodología y fichas. Ministerio de Agricultura Alimentación y Medio Ambiente, Madrid.

Keywords: Agrobiodiversity, Ethnobotany, Traditional knowledge, Spain.

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Traditional foods in modern society - leafy vegetables (quelites) in a Nahua community, Mexico.

Authors: Sánchez-Ramos, Claudia [1], Vibrans, Heike [1], Rivas-Guevara, María [2], Linares-Mazari, Edelmira [3], García-Moya, Edmundo [1], Saynes-Vásquez, Alfredo [1].

In the Mesoamerican food system, quelites (edible leaves, stems and flowers) play a major role. However, they are widely associated with poverty. Various aspects of the quelites have been studied, but the sociodemographic factors that influence the consumption of these plants in a rural environment have been neglected. This work reports on the species of quelites used in a rural, indigenous area in Mexico, their sources, ways of preparation, consumption quantities, and sociodemographic factors that influence knowledge of them, and consumption. Also, we documented consumption of newly introduced, commercial vegetables to see if they were preferred to the traditional quelites. The field work was carried out between 2014 and 2015 in Tetlatzinga, Soledad Atzompa, a highland region in the Sierra de Zongolica, Veracruz, Mexico. The population belonged to the Nahua ethnic group. A random sample of 20 families, and students of the last grade of an elementary, secondary and high school, were surveyed with semi-structured interviews; other methods included free lists and food diaries. The number of quelite species consumed, 35, was similar to other areas in the region. The maize fields (milpa) were the main source, followed by home gardens, with relatives and neighbors, in natural vegetation and purchase in the market. Quelites were eaten boiled, fried, bleached, raw and roasted. On average, families consumed about 10 kg of fresh quelites in two meals per week, with considerable variation. During the quelite season, average per capita consumption was much higher than the USDA recommendations for leafy green vegetables and approached the recommendation for all vegetables. Gender, age and occupation influenced consumption, but not the socioeconomic level, bilingualism or years of schooling, with some nuances among students. People were conscious of the health benefits of quelites through extension efforts by the local clinic. Cooks innovated with new dishes and recipes. Contrary to expectations, the consumption of quelites was common and well-regarded in the study area; only a few children and adolescents preferred other foods. Simple interventions, such as health talks, may have had a positive effect. At present, introduced vegetables play a less important role.

Keywords: Ethnobotany, Food system, Mexico, Sociodemographic factors.

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Understanding local/traditional knowledge for developing conservation strategies in line with sustainable development: a framework approach.

Authors: Scherrer, Yvonne M. [1], Heinrich, Michael [2].

Introduction: When it comes to identifying conservation strategies compatible with sustainable development (incl. SDGs), the knowledge of the local communities inhabiting an area is incremental for later success: Not only have they a profound knowledge on the natural resources, regional ecological processes and related changes over time, their perspectives are also incremental for selecting adequate local development strategies. Understanding what matters locally is therefore pivotal. However, capturing local livelihoods in a way that allows for collaboration and respects frameworks such as CBD or the Nagoya Protocol often proves challenging. Typically, the obstacles hampering an – ideally – mutual exchange are related to either issues of power/domination or a lack of insight/overview from the side of (mostly) Western actors due to their usually highly specialized professional backgrounds.

Objectives: While research can do little against power issues, this project focuses on the second issue by providing a structured approach to the phenomena of local knowledge. I suggest and elaborate a social science-based approach to understanding local ecological and cultural knowledge that is theoretically suitable for gaining an understanding of a broad variety of local knowledge forms, including knowledge from communities in both developing and industrialized countries.

Methods: The research project covers questions related to theory of science. Methodologically, an extended literature analysis determines the central contributions from sociology, anthropology and philosophy on understanding local knowledge. Subsequently, suitable generic dimensions are distilled and aggregated in a conceptual-analytical framework according to Jabareen[1], Dowdig[2] and Stanley[3] while considering the normative principles of sustainable development.

Result: The result consists in a generic framework on local knowledge that intends to facilitate access to principally any given traditional knowledge form by providing a set of key dimensions and questions. Next to covering knowledge content and processes/skills, the framework also includes complementing dimensions such as the knowledge's social organization, its socially legitimized sources or the general life-world context.

Conclusions: A structured approach to local knowledge supports researchers and professionals from all disciplinary backgrounds in gaining a comprehensive understanding of a given local livelihood with the aim of making the insights viable for mutually benefiting research and development endeavors.

Keywords: Traditional (local) knowledge, Local livelihoods, Sustainable development, Ethnopharmacology, Research methodologies.

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Pandanus use in Micronesia: past, present and future.

Authors: Merlin, Mark D [1], Gallaher, Timothy [2].

Pandanus tectorius Parkinson (*senso lato*), is a widespread small tree found in the tropics, in coastal strand habitats and sometimes inland on low elevation slopes of moderately wet to wet valleys up to about 600 meters. Its native range extends from Australia through parts of mainland and insular Southeast Asia into both Near and Remote Oceania. This species is one of the most useful trees to most Pacific Islanders with widespread ethnobotanical relationships involving its roots, trunk, limbs, leaves and fruit. As a keystone species in the cultures of many Pacific Islanders, this multipurpose plant played a crucial role in the early voyages and dispersal of humans in the tropical Pacific and continues to be a significant source of woven products, building material, medicine, and food. Its importance, particularly on atolls is demonstrated by the hundreds of named cultivars that have been developed from this species, many of which are now being forgotten due to the loss of traditional knowledge. Today the continued existence of the species is impacted by rising sea level, urbanization, changing diets, and introduced pests. This review compares the relative cross-culture importance of this versatile species in the past, present and future in a variety of Micronesian societies. Issues of cultural biodiversity, cultivar conservation, food security, and traditional ethnobotanical knowledge are discussed.

Keywords: *Pandanus*, Multipurpose use, Keystone species, Biodiversity, Conservation, Food security.

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SEB Free Topics – Session 1

Chair: Anna Waldstein, University of Kent, School of Anthropology and Conservation, United Kingdom
Monday, June 5, 12h00 – Auditório Dionísio Gonçalves

The production and commercialization of palm wine from *Hyphaene coriacea* and *Phoenix reclinata* in Zitundo area, Southern Mozambique.

Authors: Martins, Angelina Rosa de Oliveira [1], Shackleton, Charlie M. [1].

In Southern Mozambique a traditional palm wine called “sura” or “ntchemane” is produced using the sap from the palm species *Hyphaene coriacea* and *Phoenix reclinata*. Production of palm wine is one of the main livelihood activities in the area, contributing significantly to household subsistence income. The aim of this study was to examine the local commercial trade of palm wine in Zitundo. Specifically we described the tapping activity, the local management practices and the palm wine markets as well as assessed the incomes derived from palm wine sales and the perceptions on productivity, abundance and sales fluctuation. Thirty-seven palm tappers were interviewed. Tapping palms was practiced year round in five of out of the sixteen villages that compose the Zitundo administrative region, and was the main source of household income for 78% of tappers interviewed. The tappers mean annual profit from palm wine sales was 33 442 ± 15 088 ZAR. The mean number of palms tapped per day was 102 ± 52 palms, each yielding approximately 600 ml per day. Tappers spent an average of 25 ± 18 hours per week on tapping activities. *Hyphaene coriacea* was the preferred species for palm wine production. Ninety-seven percent of the tappers said that *Hyphaene coriacea* produces more sap; however the majority of tappers considered that *Phoenix reclinata* sap produces a better wine.

Keywords: Palm wine, Local trade, Income, Perceptions.

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Uses, local knowledge and management of the Pepper-bark tree (*Warburgia salutaris*), a threatened medicinal plant species in southern Mozambique.

Authors: Senkoro, Annae Maria [1], Shackleton, Charlie M. [1], Voeks, Robert A. [2], Ribeiro, Ana Isabel [3].

Warburgia salutaris (G.Bertol.) Chiov. (Cannelaceae), pepper-bark tree, is one of the most highly-valued medicinal plants in southern Africa that has long been employed against ailments of bacterial and fungal origins. Due to unsustainable harvesting, the species is threatened throughout its range. We explore factors at the household level that influence exploitation and management of the species by comparing knowledge distribution, existing management practices and local ecological knowledge among the people of the Lebombo mountains, Tembe River and Futi corridor regions, in southern Mozambique. Random, semi-structured interviews were conducted (182), complemented by 15 group interviews. The numbers of uses differed significantly between the three regions. Similally, knowledge sharing and homogeneity varied substantially among the three regions, contradicting our hypothesis of no variation of knowledge among the regions. Local management practices were centred on harvesting procedures that were normally done through horizontal stripping (71.4% informants) but more than half could identify less/more damaging harvesting approaches. Even though the species was important to almost all the households, the highest percentage reported the absence of specific actions to help maintain the species. Notwithstanding, the Tembe River region informants generally demonstrated more interaction with the species compared to other regions revealed by higher local ecological knowledge. However, local ecological knowledge differed significantly between the three regions on information related to habitat for the species, phenology, reasons for changes in post-civil war abundance, and the growth rate. The good practises found in different regions should promoted and integrated in the management plan to avoid further loss of the species.

Keywords: Threatened species, Management, Local ecological knowledge.

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Redomestication of feral turnips in Mexico: phenotypic and genetic evidence.

Authors: McAlvay, Alex [1], Emshwiller, Eve [2].

Understanding the process of reciprocal genetic and cultural change involved in the domestication process has long been a focus of archaeology, genetics, and other fields. Unfortunately, it is difficult to make inferences about the complex ecological, cultural, and evolutionary factors involved in domestication processes that happened thousands of years ago. Spontaneous populations of field mustard (*Brassica rapa* L.) in Mexico provide a unique opportunity to study this process in real-time because ongoing interactions between traditional farmers and this species may be similar to those that led to the original domestication of the crop. Field mustard is native to Eurasia, where it was domesticated into morphologically diverse crop forms (e.g. turnips, bok choi, napa cabbage, and oilseeds) making it a model of phenotypic diversification under artificial selection. Now an agricultural weed in temperate areas worldwide, *B. rapa* appears to have been introduced to the Western Hemisphere as early as the 16th century. Following its introduction, weedy forms of *B. rapa* have been adopted as food, medicine, and fodder by dozens of cultures ranging from Canada to Argentina. We collected samples from 102 populations subjected to different traditional management regimes (sparing, sowing, transplanting) from temperate areas of six Mexican states and conducted semi-structured interviews and questionnaires with members of nine ethnic groups. We then compared phenotypes in a common garden and found delayed flowering time and increased aboveground biomass in plants from populations that were sown, compared to those that were harvested from spontaneous populations. We also compared samples genetically using genotyping by sequencing (GBS). Results will be discussed. Our findings suggest that traditional management of field mustard in Mexico may have selective consequences. If humans have selected these populations for certain characteristics, those populations represent cultural heritage that is not currently protected by seedbanking efforts. This genomically-enabled short-generation plant could provide a powerful study system in the future for further understanding the ecological and cultural aspects of domestication. We present the first study of incipient domestication using powerful next-generation sequencing genetic techniques.

Keywords: Domestication, Edible plants, Conservation, Management.

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Dendrochronological analysis of old-growth forest and the pre-European cultural landscape of the Appalachian region, USA.

Authors: Heeter, Karen J. [1], Brosi, Sunshine L. [2], Smith, Laura G. [1].

Old-growth forests in North America, defined as being present prior to European-settlement, are often mistakenly described as natural and untouched by cultural influence. Dendrochronological techniques, commonly referred to as tree-ring analysis, are methods of exploring the history of these forests. In the Appalachian forests (USA) these techniques can provide information going back 500 years. Dendrochronology can give insight into past disturbances within these ecosystems including a rare glimpse of anthropogenic disturbances by Native Americans prior to European settlement. My project on old-growth sites in Maryland, USA focuses on recreating the history of these forests, in particular to 1) determine the years of major forest disturbances indicated by periods of release of older trees in the stand and to 2) determine the mean annual growth of these forests and the change in the rate of growth over time. Understanding past forest disturbances will assist in predicting how the forests will respond to future disturbances. Single-species and genera historic disturbances include the loss of the American chestnut (*Castanea dentata* (Marshall) Borkh.) due to chestnut blight in the 1930s and defoliation of oaks (*Quercus* L.) by gypsy moth. Over the past 100 years the forests have experienced an increase in white-tailed deer abundance and nearly a century of fire suppression in these fire-adapted ecosystems. My aim is analyze older trees to gain insight into pre-European settlement disturbances potentially caused by anthropogenic activity by the Iroquoian-speaking tribes *Massawomeck* and *Tuscarora*, including intentional species selection and anthropogenic fire activity. My project intentionally recognizes the roles of Native Americans in old-growth forests. Determining the rate of growth of trees within these stands will provide insight into sustainability, including determining a sustainable rate of harvests of younger stands and a reference for future studies on the impact of climate change in these ecosystems.

Keywords: Dendrochronology, Tree-rings, Old-growth forest, Appalachia.

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SEB Free Topics – Session 2

Chair: Ben Erik van Wyk, University of Johannesburg, South Africa
Monday, June 5, 14h30 – Auditório Dionísio Gonçalves

Ethnobotany and Global Literacy in the Classroom.

Authors: Orr, Blair [1].

Michigan Technological University requires all undergraduate students to take 12 core credits of general education and 12 focused general education credits. The focused classes must align with a specific university learning goal. Each learning goal has a rubric that describes the objectives of the learning goal and the broad measures used to assess how well the objectives have been achieved. Most focused courses are taught within humanities or social sciences. An ethnobotany course has been developed within the School of Forest Resources and Environmental Science that is designed to address learning goal 3, Global Literacy. This presentation focuses on the details of the Global Literacy rubric and how the ethnobotany class is designed to develop global literacy among third and fourth year undergraduate students. Learning objectives are incorporated in both the lecture syllabus and in the primary writing assignment for the course. The primary assignment is both graded by the instructor and assessed for learning objectives by University General Education Council.

Keywords: General education, Learning rubric.

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Tung-oil trees (*Vernicia cordata*): a component of a cultural landscape in Wakasa region, Japan Sea Coast, Central Japan.

Authors: Kitagawa, Junko [1].

Tung-oil tree (*Vernicia cordata*) was introduced from China to Japan in the 16th century. From this time on, fruits of tung-oil trees became one of the most important products in Wakasa region in Japan Sea Coast, Central Japan. The oil was extracted from fruits and utilized for lightning and waterproof of umbrellas. In the 19th century, production of oil from tung-oil trees in Wakasa was the highest in Japan. Now, no commercial production of oil from it is observed.

Pollen analysis around this area indicates that the hills were spotted with pine trees from the 17th century to the middle of the 20th century. From1950, broad-leaved trees increased. It is said that the economical value of tung-oil trees became less and the stands were deforested and planted more valuable ume plum trees. If this is true, reconstructed cultural landscape is quite different from that based on pollen analysis. To clarify how the landscape was, the statistical data of tung-oil trees and ume-plum trees from the early 20th century to the middle of 20th century was analysed.

The data of the tung-oil tree stand area was available in Wakasa region only from 1905 to 1913 and that of fruit harvest from 1905 to 1941. The area of ume-plum stands are not available in Wakasa region but available in larger administrative region, Fukui prefecture only from 1941. The area of tung-oil tree stands was about 1000 ha in the early 20th century. It was about 3 % of the total forested area in those days. Probably, it became nearly 10 % of secondary forests surmising from the area of secondary forest at present. The area of ume plum stands was maximum in 2002 and was 512 ha. It was much less than the stand area of tung-oil trees. It cannot be said that the stand was replaced by ume plum stands. The harvest of fruits was oscillated from the early 20th century to the middle of 20th century, but it gradually became low from 1930s. Probably tung-oil stands were deforested or abandoned and turned broad-leaved tree forests.

Keywords: *None specified*.

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Legume diversity in Ethiopia: findings from an integrated research and education program.

Authors: Ruelle, Morgan [1], Tewolde-Berhan, Sarah [2], Asfaw, Zemede [3], Edwards, Sue [4], Dejen, Asmare [5], Nebiyu, Amsalu [6], Power, Alison [1], Tana, Tamado [7], Tsegay, Alemtsehay [8], Woldu, Zerihun [3].

A diversity of crop varieties and knowledge are necessary to sustain food systems under an increasing range of economic and climatic conditions. Legumes are particularly important for agroecological intensification of smallholder farming systems, as direct sources of food, fodder, and cash income that also enrich soil fertility. Ethiopia has been recognized as a center of diversity for many legumes, including chickpea (*Cicer arietinum*), cowpea (*Vigna unguiculata*), grass pea (*Lathyrus sativus*), faba bean (*Vicia faba*), fenugreek (*Trigonella foenum-graecum*), field pea (*Pisum sativum*), and lentil (*Lens culinaris*). Despite their significance, the status of farmers' legume varieties within Ethiopia is largely unknown. The lack of baseline data makes it difficult to measure changes in legume diversity as farmers gain access to new markets and adopt higher-input agricultural practices. With support from the McKnight Foundation, a consortium of six universities launched the Legume Diversity Project, an integrated research and education program aimed at building knowledge about Ethiopia's legumes, focusing on farmers' varieties. In 2016, the project sponsored its first cohort of ten MSc students to conduct research in different parts of the country. In addition to coursework at their respective universities, students received training in research ethics, interview methods, Open Data Kit, GIS, statistical analysis in R, and scientific writing. Following a shared protocol, students conducted stratified surveys and key informant interviews to compare farmers' production and use of legume varieties among ethnic and agroecological contexts. Students found that across all study areas, farmers maintain their own varieties as sources of food, fodder, and soil fertility improvement. The highest numbers of varieties were found among common bean (*Phaseolus vulgaris*, 32 varieties), followed by faba bean (14 varieties) and field pea (11 varieties). Farmers' varietal diversity includes differences in optimal planting and harvesting times to cope with increasing variability in the onset and end of rainy seasons. The project team is developing a book to support identification and use of traditional food legumes, particularly by extension personnel, as well as strategies for farmers and policy makers to protect and enhance Ethiopia's legume diversity as a vital biocultural legacy that supports agroecological intensification.

Keywords: Legume crops, Farmer variety, Agroecological intensification, Climate change adaptation, Ethiopia.

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Vision and change: using student plant family presentations to teach Botany.

Authors: Chock, Al Keali'i [1].

Most Introductory Ethnobotany (Botany 105) students at the University of Hawai'i at Mānoa do not have a scientific background, and are enrolled in the class because of its designation as one of the General Education Foundation courses (which give students skills and perspectives that are fundamental to undertaking higher education) required for graduation. Two courses in Global and Multicultural Perspectives (FG) are required, and they must be from different groups: A, prehistory to 1500 (8 courses available); B, 1500 to modern times (17), and C, prehistory to modern times (7 courses, including Bot 105 and Bot 105A). Attempting to have the students memorize the different plant parts is not a pleasant chore. Vision and Change advocates the integration of core concepts and competencies, student research and student-centered learning. The student's assignments is to select a plant family from the Spices List, and to make a short (2-5 minutes) power point presentation to include the family's outstanding characteristics; and one or more plants which are used as spices. Nearly all of the students are computer-savy, and have been cautioned about "fake news" and inaccurate blogs. They usually use a search engine to find the information. The students' research involves not only botanical sources, but other multi-disciplinary ones, as they try to connect uses with the different cultures (from prehistory to contemporary times). Slide citations include all of their resources/references, with both the name of the source and the URL. Subsequent assignments have been for a medicinal, invasive, and endangered species of the student's "family". This year the category of ritual or religion is being added. The presentation includes plant parts characteristics; plant distribution (natural and/or through the agency of people); plant interactions and diversity; the influence of plants on culture; patterns of plant selection; and the effects on the environment. This teaching tool teaches the students the interaction of peoples with their environment, culture, and history; biological diversity; centers of origin of crops, culture, knowledge, and people; development of horticultural varieties; and the organization of an oral visual presentation, and public speaking.

Keywords: Teaching, Vision and Change, Ethnobotany, Botany, Student participation, Culture, Student-centered learning, Botanical terminology.

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Magical plants for weather control in Southern Africa.

Authors: De Wet, Thea [1], De Wet, Helene [2].

Humans in most societies believe that their actions can have a meaningful impact on the weather, for example, creating or preventing rain, wind, storms, thunder and lightning. Controlling the weather is usually done by men and women with special powers and knowledge of nature. They know which plants have the right properties for protecting or harming, which parts of plants should be used (leafs, bark, roots, bulbs), and how these should be applied – in single portions, as parts of mixtures or as living plants, strategically positioned around the homestead. In this paper, we would like to explore basic "principles" of weather manipulation and discuss a number of plants believed to have magical powers that could be used to control the weather. We will explore what these plants have in common and what their main characteristics are, examine their symbolism and talk about what people believe the link between a particular species and controlling a weather event is. For example, the stems of *Adenia gummifera*, a vigorous perennial climber, are believed to "contain water" and are used in the Lovedu rain queen's rainmaking-pot. Branches of *Asparagus plumosis* ("disperser of the clouds") is a widespread creeper in southern Africa that are associated with the wind and believed to be malevolently used to prevent rain. South Africa has a very high lightning ground flash density. Fatal lightning strikes are common and people obviously feel compel to protect themselves against lightning or apportion blame for lightning-related deaths. In KwaZulu-Natal, *Kigelia africana* and *Hawarthia limifolia* are planted near homesteads for basic protection. However, there is also a need for more complex "medicine" that could be used to drive away thunderstorms. This is a skill possessed by a "doctor of the sky"/"doctor of the weather" (*inyanga yezulu*). Key ingredients of their protective medicine include python, rock-rabbit and iguana fat, colourful feathers, some otter skin and tortoise flesh, plus the crushed stems of *Maerua angolensis* and the red Ifafa lily (*Cyrtanthus mackenii*). We will present results from informant interviews, ethnographic literature, published ethnobotanical surveys and from key botanical texts such as Watt & Breyer-Brandwijk.

Keywords: Ethno-botany, Magical plants, Weather control, Southern Africa, Anthropology.

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Older canoes, larger trees: reading the history of the forest through traditional boats.

Authors: Hanazaki, Natalia [1], Fonseca Kruel, Viviane S [2], Tamaio, Neusa [3], de Paula, Lais L [4].

Dugout canoes used in Brazilian coast are carved on a single tree trunk and are traditionally used in artisanal fisheries. In the last decades, several changes are contributing to the decrease in the making and use of these boats, such as the economic changes in fisheries and the reduction on forest areas. We studied the ethnobotany of dugout canoes to understand how the current canoes can reflect the history of the forest. We sampled the Atlantic Forest in Brazilian coast from Cabo Frio (Rio de Janeiro) to Laguna (Santa Catarina), covering four states and more than 1200km. In the main artisanal fisheries areas we searched for the oldest and youngest canoes, and after prior informed consent of the owners we registered ethnobotanical data for each canoe, measuring the width, length, and whenever possible collecting botanical or wood samples for identification through wood anatomy techniques. We sampled 325 canoes (including 138 from secondary data for the north part of São Paulo State). Each canoe is carved from a single tree, but one tree can be used to make more than one canoe. The ages of the canoes varied from 1 to more than 200 years old; lengths were from 11m to 2.28m; widths from 1.48 to 0.4m. We considered the canoes as recent when age was equal or less than 26 years (median age), and old with more than 27 years (e.g. canoes built before the 1990's). The most used trees for both recent and old canoes were *Schizolobium parahyba* (34%), *Inga* spp. (15%), *Cedrela* sp. (12%), *Ocotea/Nectandra* (5%), *Clarisia racemosa* (3%), *Calophyllum brasiliense* (2%) and *Ficus* sp. (2%). All canoes made of *Ficus* sp. and most of *C. racemosa* were old canoes. Age positively correlates with lenght (Pearson r=0.36) and with width of the canoe (Pearson r=0.42). Together with ethnobotanical data, these positive correlations are evidences that in the past the available trees were larger than today, reflecting changes in the forest structure; additionally, the slight changes in the species used in the past and today can also indicate changes in forest composition.

Keywords: Atlantic forest, Traditional knowledge, Local ecological knowledge, Timber, Historical use.

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Folk views of wild mushroom uses and their ecology in the Mazovia region, Poland.

Authors: Kotowski, Marcin [1], Łuczaj, Łukasz [1].

The ongoing research on traditional knowledge of wild mushroom uses in the Mazovia region is the first piece of research that undertakes a complex ethnomycological analysis of an entire region in a European country. The research is carried out in 38 evenly distributed locations (more or less every 30 km) defined by the Polish Ethnographic Atlas. The high sample size, i.e. 760 planned interviews (20 per village) will enable authentication of the acquired information and statistical elimination of borderline and improbable results. The main objectives of the research are to create a list of mushrooms collected by people living in this region, to find rare and protected mushroom species used by local communities and to acquire information about the purpose, methods and extent of their use. The conducted research also enables the assessment of the importance of wild mushrooms for local communities and the creation of a list of the most preferably collected mushrooms with a description of their uses.

The tradition of mushroom picking for culinary purposes results in numerous folk observations regarding the occurrence of wild mushroom species. People searching for mushrooms in order to collect them for their own use usually have knowledge that enables recognition of the elements of habitat that are suitable for certain mushroom species. Therefore the information acquired during interviews also enables us to depict the folk view of mushroom ecology and population changes and to compare it with scientifically accepted knowledge concerning mushroom habitat preferences.

Keywords: Ethnomycology, Mazovia, Poland, Mushroom uses, Traditional knowledge, Mushroom ecology.

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Dayak biological classification system and the use of para-taxonomists in the inventory of tropical forest trees.

Authors: Theilade, Ida [1], Girmansyah, Deden [2], Brofeldt, Søren [1].

One of the functions of the newly-established Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is to bring different knowledge systems, including indigenous knowledge systems, to the science–policy interface. One key challenge lies in how to use information generated by different knowledge systems. It is therefore important to understand how folk biological classification systems connect or otherwise with scientific classification systems. However, in-depth studies on the principles underlying folk biological taxonomy and nomenclature in non-Western societies are still lacking. This lack of understanding of the conceptual foundations of 'ethnoscience' may partly explain the few attempts to bring indigenous knowledge systems into the science-policy interface. The aim of the present study was to explore the Dayak biological classification system of rainforest trees and to compare tree identifications by a trained botanist to those of local indigenous forest users. A network of 32 circular plots (r=15) was established in undisturbed rainforest in Berau, East Kalimantan. Trees (>10 cm DBH) within the plots were identified individually by an Indonesian botanists and by six indigenous Dayak men from the nearby village. The identifications by the Dayaks relied solely on existing local ecological knowledge using vernacular names. After the survey, the six Dayaks received training as para-taxonomists to autonomously collect botanical specimens. Focus group discussions using name cards were conducted to map the Dayak classification system of trees. A total of 752 trees were found inside the plots representing 136 species. An additional 64 tree species were collected by the para-taxonomists outside the plots. The Dayak linguistically recognised groupings of trees (or taxa) of varying degree of inclusiveness, and grouped the taxa into hierarchical categories. Moreover, taxa assigned to each rank were mutually exclusive. Our results suggest that Dayak experts can reliably identify tree species without having access to identification guides and herbaria. Older men applied the classification system more consistently and in greater detail than the younger men. The local para-taxonomists were able to collect large volumes of tree diversity data at relatively low cost suggesting that indigenous knowledge and classification systems may support efforts by botanists to inventory tropical forest trees.

Keywords: Ethnoscience, Folk taxonomy, Biodiversity, Tree diversity, Indigenous knowledge, Botanical collection, Borneo, Indonesia.

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Explaining herder responses to the invasive species *Lantana camera* L. in southern India.

Authors: Puri, Rajindra [1].

Biocultural diversity is threatened by a multiplicity of change drivers including habitat loss, over-exploitation, urbanisation, invasive species, and climate change impacts, the latter exacerbating all others. What is little understood is how people are autonomously responding to changes in biocultural diversity, and what impacts these responses might be having on biodiversity, ecosystem functions, human cultures and livelihoods. Through a mixed methods approach, using ethnobotanical, ecological and anthropological tools and techniques, the research reported here examined the interactions of the invasive shrub *Lantana camara* L., fodder species, cattle and local Soliga and Lingayat herders in a small farming community in southern Karnataka, where surrounding forests have been significantly impacted by *Lantana*. The research examined herders' observations that *Lantana* suppresses forest understory vegetation that provides important fodder species for their animals, that cattle have to graze longer on alternate food sources that weaken them and make them vulnerable to accidental injury or ill health, that grazers avoid dense thickets of *Lantana* and some forest altogether for fear of accidently encountering dangerous wild animals, and that households are giving up cattle because it has become too difficult to feed them, which then has knock on effects on livelihoods, culture and identity. Our evidence suggests that most of these are indeed true, but the explanations for impact and responses are more complex and nuanced than first thought. Herders and their cattle respond in ways that reflect the complexities of a transforming human ecosystem, subject to a synergy of numerous historical and emerging drivers of change. Future research needs and policy implications are discussed.

Keywords: Invasives, Cattle fodder, Biocultural diversity, Ethnobotany.

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SEB Free Topics – Session 3

Chair: Cassandra Quave, Emory University, USA
Monday, June 5, 17h00 – Auditório Dionísio Gonçalves

Global analysis of adaptations to climate change among subsistence-oriented communities.

Authors: Savo, Valentina [1], Morton , Cedar [1], Lepofsky, Dana [2], Lertzman, Ken [1].

Climate change challenges societies and communities living in both developed and under-developed countries. However, around the world, subsistence-oriented communities – indigenous and non-indigenous communities who closely depend on their environments for their food and cultural identity - are among the people most directly affected by climate change. While the international political community debates the relative efficacy of potential mitigation tactics, these communities are already dealing daily with climatic changes and its consequences, and consequently are developing strategies to cope with these changes. We performed a global meta-analysis on how subsistence-oriented communities are coping with and adapting to climate change. This meta-analysis, based on a review of peer-reviewed and grey literature, synthesizes these adaptation strategies and analyzes patterns in people's adaptation responses in relation to different factors (i.e., geographic location cultural group, subsistence activity). In total, we collated more than 5000 adaptation strategies used by agriculturalist, fishers, and other kinds of subsistence-based communities. The most common strategy entails the spreading of risks associated with climate change through the diversification of livelihoods, food sources, and gathering places. We also note that the greatest number and diversity of adaptation strategies collated in our research are those developed by subsistence farmers. Our results could help policy makers and other stakeholders better understand people's choices in dealing with climate change. Moreover, understanding better how people react to changes can help fine-tune climate models and develop future scenarios by considering the potential additional effects of the human responses to the projected impacts of climate change.

Keywords: Climate change, Adaptations, Farmers, Fishers, Indigenous communities.

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Roots, bushes and fruits: a preliminary report on Jamaican complementary and alternative medicine in London.

Authors: Waldstein, Anna [1], Francis, Dennis [2].

As migrant and refugee populations expand around the world, healthcare systems are under pressure to meet growing demands for increasingly multicultural needs, with limited resources. In the midst of National Health Service crisis in the UK, complementary and alternative medicine is growing in popularity, along with the promotion of self-care. Migrants/refugees and their descendants often continue the medicinal plant (and other) healing traditions they have always relied on, which can make substantial contributions to health in diaspora populations.

This paper will present the results of the first phase of a project on the use of transnational completmentary and alternative medicine in the Jamaican diaspora in England. Interviews and market surveys in London have revealed a thriving cottage industry of Jamaican herbal products (including 'roots' drinks, 'bush' teas and fruit juices), as well as a number of healers who offer spiritual guidance and divination. Many of these healing products/strategies have been developed and/or championed by members of the Rastafari movement. These healing resources are important as complementary, and sometimes alternative medicines in the Jamaican diaspora. However, access to herbal products from Jamaica may be hindered by EU legislation on Traditional Herbal Medicines and other regulations related to the transnational trade of plant material.

Our work suggests that the transnational nature of many 'alternative' medical products used in migrant communities means that there are regulatory and environmental, as well as cultural, obstacles to incorporating them into national healthcare strategies.

Keywords: *None specified*.

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Plants as symbols in Christian Art at the National Museum of Ancient Art, Lisbon (Portugal).

Authors: Carvalho, Luis Mendonça de [1], Fernandes, Francisca Maria [2], Nunes, Maria de Fátima [2], Costa, Ana Maria [3], Lopes, Míriam [2], Nozes, Paula [1], Albuquerque, Sara [2].

The National Museum of Ancient Art is the most important museum of art history in Portugal, safeguarding some of the most emblematic art treasures of Portuguese and European art history. In our research we studied the Portuguese and the European religious paintings and sculptures in search of plant used as symbols. We have identified 36 taxa, with the Rosaceae family being the most common family, with 8 taxa (*Cydonia oblonga*, *Fragaria vesca*, *Malus*, *Prunus avium*, *Prunus domestica*, *Prunus dulcis*, *Pyrus*, *Rosa*). With the exception of the Burseraceae family, which includes frankincense (*Boswellia* spp.) and myrrh (*Commiphora myrrha*), all plants are native from or introduced in Europe. Some plants were depicted with botanical inaccuracy although they still have features or written clues that allows the identification. Fruits were the most common (16 taxa), followed by flowers (13 taxa); this data confirms that the cultural uses of plants is usually connected with its availability, economic value and unique characteristics. Most plants were linked to Christian traditions after a creative interpretation of the Bible and the Apocrypha Gospels or were inspired in popular believes from the Middle Age and early Renaissance Europe, such as the carnation and the violets. The collection of NMAA is very rich in botanical elements because most of the paintings, sculptures and tapestries came from extinct convents whose works of art often used plants to allude to religious episodes or as attributes to Saints, Christ and the Virgin Mary. Besides the symbolic use of plants, the works of art displayed in the NMAA have another link with plants in so far as they were created over wood panels (painting) or with wood (sculptures), such as: *Populus*, *Quercus*, *Pinus*, *Juglans*, *Fagus* or *Prunus*. Our research aimed to contribute to a more general accessibility of the coded botanical language used by artists in order to valorize the works of art safeguarded in the National Museum of Ancient Art and the cultural role of plants in human societies.

Keywords: Cultural heritage, Symbology of plants, Plants and art, Cultural history.

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Ethnobotany of the Crow Creek Reservation.

Authors: Patel, Sumera [1], Walker, Karen M. [2], Hart, Robbie [3], Lengkeek, Peter [4], Applequist, Wendy L. [3].

The Crow Creek Reservation, including portions of three counties in central South Dakota, is home to over 2200 primarily Dakota people. The reservation was originally a prison camp for people forcibly transferred from Minnesota, and in the twentieth century the U.S. Army Corps of Engineers dammed the Missouri River, destroying most moist bottomland and leaving primarily dry higher-elevation grasslands. With the aid of local students, elders and knowledgeable older people were interviewed about their knowledge of plants. It was hypothesized that modernization and past disruptions would affect their traditional knowledge. Because much medicinal knowledge was considered private, we emphasize discussion of food plants. Compared to two older published studies of Sioux nations in the region, fewer total useful species and fewer food species were reported by Crow Creek interviewees, and more of the species used were introduced. However, a number of medicinal uses of plants were reported that had not been previously reported by Dakota or Lakota people. There was surprisingly low overlap among all three data sets. Few wetland species were reported to have uses. An effort was made to identify culturally important species; one that seemed surprisingly important was the cottonwood (*Populus deltoides*), which was mentioned in all three datasets and was considered spiritually as well as practically valuable. Because cottonwood mostly grows near water, most habitat was destroyed by the dam and few cottonwoods now grow on the reservation; thus damming had negative cultural as well as economic repercussions.

Keywords: Ethnobotany, Dakota, Food plants, *Populus*.

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Evolutionary Imperialism: agricultural origins and invasive species.

Authors: Blumler, Mark Allan [1].

I link agricultural origins and invasive species, incorporating an evolutionary perspective. Agriculture began in several, tightly circumscribed centers. Consequently (subsequently), the biota of those regions had huge influence on human affairs. Somewhat paradoxically, the centers of agricultural origin are highly diverse in plant species. They have suffered comparatively little invasion of alien species: For instance, consider the spectacular invasion of Mediterranean species into regions of similar climate, with almost no return flow. As agriculture spread, farmers attempted to re-create the ecosystems of their origin regions, a process known as niche construction. For instance, in Europe they plowed to remove perennial vegetation that would otherwise have outcompeted the annual crops from the Fertile Crescent. Near Eastern weeds also benefited from this practice, thus a quasi-Near Eastern biota became established. As of 1492, most farmers grew crops primarily derived from the nearest origin center, sometimes poorly adapted to the local environment despite crop evolution. The Columbian Exchange helped crops to “find” their best environments, thus dramatically boosting food production, but also initiating the invasion problem. In many regions, crops and their associated weeds were the primary introduced plants. Where climate was analogous to the origin center, these often re-adapted to the wild and became highly invasive. Meanwhile, by also pre-empting the agro-weed niche, they blocked native species from evolving weediness, and hence any chance of return invasion.

Keywords: Agricultural diffusion, Invasive species, Contingency.

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Medicinal plants in the City of Brussels, Belgium.

Authors: Povilaityte-Petri, Vitalija [1], Duez, Pierre [1].

Almost 50 % of the City of Brussels territory contain non-built spaces. The forests, public parks, playgrounds and allotment gardens altogether contain 36 % of Brussels green areas which provide various ecosystem services. Private gardens represent an almost equal share – 32 % of Brussels green areas. In addition, Brussels City hosts large number of nationalities and ethnical traditions from all over the world. This illustrates that Brussels City with its unique geographical situation, cultural diversity and large number of urban green zones has a lot of potential for the development of urban ecosystem services, especially cultural ones. The case study on cultivation, foraging and use of medicinal plants in the City of Brussels has been carried out through analyses of available literature, visits to the relevant sites, meetings with professionals working in the field, representatives from the competent authorities, following the activities of nature related organisations, creative artists and ecologists, as well as taking part in events related to medicinal plants presence and use in City of Brussels. The study results showed that wild and cultivated medicinal plants are largely present in public green spaces and specifically designed private, collective, school, university, museum and library gardens as well as city farms. Medicinal plants are often present in multidisciplinary urban greening projects. Besides well-known phyto-therapeutic use, medicinal plants contribute largely to the development of cultural ecosystem services and are often used for creation of spaces for mental relaxation or garden therapy, physical activity and social integration. School gardens rich in medicinal plants are used as outdoor spaces for the pupils to learn and play as well as tools for an integrated child centred education. Gardens of medicinal plants in museums, universities and libraries bring together history, folkloric traditions and state of the art scientific knowledge about medicinal plants. Local nature and culture centres with the involvement of scientists, urban farmers, artists, architects, naturalists and other professionals serve as life-long learning places to explore ethnobotanical knowledge of medicinal plants, to create therapeutic landscapes in the city, and to improve human health and urban well-being.

Keywords: Medicinal plants, Ethnobotanical knowledge, Ecosystem services, Education, Urban ethnobotany.

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Theory in Ethnobotany.

Authors: Stevens, Martin Henry Hoffman [1], Ross, Nanci [2].

Ethnobotany lacks an obvious conceptual theoretical framework all its own. Philosopher Thomas Kuhn described an immature science as one that lacks such a guiding framework, thus making collective progress in our science and education difficult. Ethnobotany is a highly interdisciplinary science deeply entwined with anthropology, ecology, evolution, conservation, biochemistry, history, and economics. It thus benefits directly from the theories that underlie those disciplines. In spite of this, much ethnobotanical research comprises narrowly focused case studies that do not evaluate hypotheses or the theories that could motivate them. In the absence of work that evaluates underlying theories, ethnobotany may not be advancing as much as it could. Further, without a theoretical foundation, the relevance of ethnobotany to other disciplines remains underappreciated. Here we describe what theory is and the benefits of theory. We illustrate the structure and utility of theory using the ecological apparency hypothesis and niche construction theory.

Keywords: Theory, Ecological apparency, Niche construction.

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Folk medicinal plants mixtures: when the whole is greater than the sum of its parts.

Authors: Gras, Airy [1], Parada, Montse [1], Rigat, Montse [1], Vallès, Joan [1], Garnatje, Teresa [2].

In general, the ethnobotanical analyses focus on taxa catalogues and their uses, leaving in the background the mixtures. However, these constitute an important chapter of our researches and they represent a considerable volume of information. The relevance of these data in folk medicine could be explained as a response to the cure of multicausal etiology diseases or by a possible strengthening synergy between the species that constitute a mixture, enhancing its effect in this way.

The main goals of this project are: i) to study the medicinal plant mixtures popularly used in two regions from Catalonia, l'Alt Empordà and el Ripollès from qualitatively and quantitatively points of view and, ii) to perform analyses in ethnobotanical studies such as the associations between botanical families or possible contraindications and negative interactions of the mixtures. The ultimate goal is to test a protocol that can be implemented in other similar cases and to suggest a new index to analyse these data.

In total, a set of 484 mixtures from l'Alt Empordà and el Ripollès (Catalonia, Iberian Peninsula) have been analysed, 462 for human use and 22 for veterinary. *Thymus vulgaris* and *Rosmarinus officinalis* are among the most commonly used species. The aerial part of the plant is the most used, and the anticatarrhal usage the most frequent in both territories. A wide variety of families has been observed in each mixture. This analysis has confirmed that it is possible to study the data of plants in mixtures as thoroughly as when they are considered isolate in an ethnfloristic catalogue.

Keywords: Medicinal plants, Mixtures, Ethnobotany, Catalonia.

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Non-timber forest products as biocultural keystone species.

Authors: Shackleton, Charlie [1], Ticktin, Tamara [2], Cunningham, A.B (Tony) [3].

Non-timber forest products (NTFPs) represent a large suite of species that are valued and used by rural and urban communities the world over. The values of NTFPs to humans are typically classified into five categories, namely direct consumption, cash income generation, cash savings, safety nets and cultural. Here we propose that the value of NTFP should not be viewed solely in terms of their use to humans, but in addition also the broader ecological and social communities in which they are situated. In seeking to illustrate and appraise the importance of NTFPs in the ecological and social communities in which they are found, harvested and managed, we suggest that the concept of keystone species is useful, both ecological and cultural keystones. In this paper we will (i) argue the ecological value of NTFPs over and above just the commonly attributed social values, (ii) bring together the ecological, cultural and social constructs of keystone species and (iii) provide examples that reveal the biocultural keystone dependencies across a range of services provided by keystone NTFP species. In summarising the patterns across several examples, we will conclude with a number of propositions for future study.

Keywords: *None specified*.

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2nd Hispano-Portuguese Meeting on Ethnobiology (II EHPE) – Session 1

Chair: Manuel Pardo de Santayana, Universidad Autónoma de Madrid
Tuesday, June 6, 11h00 – Room G3-S5/01

What factors guide the selection of medicinal plants for a local pharmacopoeia? A case study in a rural community in a historically transformed Atlantic Forest landscape in Brazil.

Authors: Silva, Taline Cristina da [1], Silva, Josilene Marinho da [2], Ramos, Marcelo Alves [2].

Studies investigating the criteria used for the selection of certain medicinal plants into the repertoire of local people have been recurrent in pharmacology and ethnobotany. Two current hypotheses regarding this phenomenon, ecological appearance and diversification, attempt to explain the inclusion of “apparent” and “not apparent”, and native and exotic, taxa respectively, in local pharmacopoeia. From this perspective, this study intends answer the following questions: Do “apparent” and “not apparent” medicinal plants have the same importance? Do “not apparent” plants occupy more therapeutic niches than do apparent plants? Do native and exotic medicinal plants have the same importance? Do exotic and native plants occupy different therapeutic niches? The study was conducted through semi-structured interviews and free listings with 38 householders (18 men, 20 women; aged 19 to 70 years) of the community of Engenho Cuieiras located in the city of Aliança, Pernambuco, Brazil. Of the 66 species cited by informants, herbs were more species rich (39 sp; 59%) than trees and shrubs (27 sp; 41%), supporting the ecological appearance hypothesis. Herbaceous species occupy more therapeutic niches (51) than tree and shrub species (28). Furthermore most of the species cited by the informants were exotics (42 sp; 63.63%). The 94 therapeutic applications cited in this research, 65 of which are treated by exotic species and 29 native, are distributed among 13 body systems. Thus, the results of the present study support the hypotheses of appearance and diversification. It is also strongly-suspected that the studied pharmacopoeia is influenced by landscape changes, since there was a predominance of herbaceous and exotic medicinal plants, indicating that this community can adapt to environmental changes.

Keywords: Ethnomedicine, Traditional medicines, Medicinal plants, Ethnobotany.

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Toward a new classification of use categories: an approach based on Peruvian communities.

Authors: Alban, Joaquina [1], Chilquillo, Eder [2], Cochachin, Elizabeth [2], Castillo, Hellen [3], Melchor, Briggitthe [2], Hurtado-Huarcaya, Jose [2], Castañeda, Roxana [2].

Currently, the use of vegetables resources has implicated to do ethnobotanical research, in which the inminent acultural processes in native peruvian communities have allowed the recovery of traditional knowledge and its sequential revaluation. The application of ethnobotanical indices have enabled to quantify the knowledge of use and the importance of plant resources used by local people in native communities, all of this allow a quantitative and comparative approach. Nevertheless, from the application of these quantitative indices in different studies, it has been observed that the results of these analyzes are related with categories of use, so that individual studies are been applying for different categories that generate different results in a global context with other cultures. For that reason, is necessary standardize a system of categories of use, which considers all associated knowledge and can be replicated in any cultural group. This study establishes a first approach to the classification criteria of categories of use for plant species that are associated with the life and culture of a peruvian local people. It should be noted that these results had to make a widen review of previous studies, in which we modify some categories of use in order to show a certain approach To define “categories of use” using standard descriptors, it was required the debugging of approximately 12,500 reports of use of national flora, resulting in 130 expeditions made by the authors, in native Andean-Amazonian communities. Likewise, we define the scope of each category of use and we give examples for subcategories respectively. It is proposed nine categories, divided into 16 subcategories: medicinal (21), social (8), human food (3), animal food (3), material (13), toxic (3), ethnoveterinary (2), environmental (3) and fuel (5). It is concluded that these new categories of use in its cultural context make future ethnobotanical studies easier due to our efficient compilation, comparison and representation of the data. On the other hand, the analysis show that the use and knowledge of species have the major incident in the social categorie, following medicine, in which reflect the best conservation of traditional knowledge.

Keywords: Traditional use, Ethnobotany index.

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Medicinal plants and practices in the Communitarian Marine Protected Area of Urok Islands, Guinea-Bissau.

Authors: Indjai, Bucar [1], Frazão-Moreira, Amélia [2], Catarino, Luís [3].

The Urok Islands Marine Protected Area is part of the Bijagos Archipelago, encompassing three inhabited islands, Formosa, Nago e Chediã, with a total of 147 km2 and about 3000 inhabitants, mainly from the Bijago ethnic group. The Bijagos are farmers, fishermen and NTFP collectors, living in an insular environment. Their traditional medical system is based upon their African traditional religious beliefs and on a deep knowledge of the properties and uses of local flora. A survey was made in 2016 to document the traditional medicinal knowledge in the Urok islands. In order to understand the acquisition, use and transmission of specialized medicinal knowledge, 13 traditional medicinal practitioners (TMP) were interviewed through semi-structured questionnaires. Moreover, a sample of 110 members of the community was interviewed trough free-listing inquires to assess the spread of medicinal plant knowledge in the community. In this study we present the vascular plants used in traditional medicines of the Urok islands. A total of c. 50 species of vascular plants were collected, mainly obtained in the forest patches near to villages. The main types of diseases treated are provided, as well as the plant parts used and preparation and administration methods. The difference in knowledge on the use of medicinal flora between the community members and the TMP's are discussed, as well as the acquisition and transmission of ethnomedicinal knowledge.

Keywords: Ethnobotany, West-Africa, Traditional medicine, Ethnomedicine.

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Ethnomedicinal practices in the montane rainforests of northern Peru are gendered.

Authors: Corroto, Fernando [1], Macía, Manuel J. [2].

Medicinal plants are both a necessity for the well-being of rural populations living in (remote) tropical regions and an identity for their cultural heritage in relation to their environment. The main objective of this study was to understand the traditional knowledge of the medicinal flora of montane rainforests in the province of Luya of northern Peru. Through semi-structured interviews with 150 informants (49% women and 51% men) in three different districts of the province, we asked whether traditional knowledge is gendered. A total of 257 species of vascular plants distributed in 90 families and 209 genera were reported in the whole region, where women mentioned 84% of the species and 64.4% of use-records, whereas men 80% of the species and 35.6% of use-records. We found 92 medical indications of which 90% were cited by women and 86% by men. These indications were classified in 16 medicinal categories, all of them reported by both genera. In all the categories, women cited more use-records than men. Thus, in the categories of *Ailments and disorders of the nervous system and mental health* and *Ailments and disorders of the sensory system*, women cited more than twice as many records as men. Furthermore, the medicinal category related to ailments and disorders of women, *Pregnancy, childbirth and puerperium* together with *Reproductive system and reproductive health*, were mainly documented by women (84-91% of the use-records from women and 9-14% from men, respectively). All these results were statistically significant ($p<0.0001$). There are also categories in which the knowledge was more equally distributed, such as *Skin and subcutaneous tissue* and *Musculo-skeletal system*, where women reported a similar number of use-records than men. In sum, women of the northern Peru are primarily responsible for carrying out the ethnomedicinal practices, and future strategies to gather ethnomedicinal knowledge in the Andes should focus preferently on them.

Keywords: Quantitative ethnobotany, Traditional knowledge, Montane rainforests, Gender.

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Traditional knowledge preservation assessment: what the data says.

Authors: Semotiuk, Andrew [1], Cuerrier, Alain [2], Beauvrais, Marie-Pierre [2], Ezcurra, Exequiel [1].

The interactions between people and their natural environment over generations have given rise to traditional knowledge systems. This traditional knowledge is often the subject of studies in ethnobiology. Unfortunately, the general consensus is that this traditional knowledge is declining at an alarming rate. Because of this, scientists may call for the preservation, conservation, or documentation of such knowledge. Further, researchers or non-governmental organizations may attempt to stimulate preservation and use. In this study, we ask what preservation strategies are reported in the literature, what follow-up (if any) was done to measure their effectiveness, and what categories of traditional knowledge conservation are currently being attempted by non-governmental organizations. To answer these questions, we systematically reviewed the literature for keywords related to this topic and also searched databases of organizations whose mission it is to preserve such knowledge. We found a range of traditional knowledge preservation strategies that we categorized and provide a state of the current literature. In the literature, follow-up measures were often anecdotal and qualitative with a large portion of the literature focusing on intellectual property rights. Organizations focussed on numerous strategies with policy and community education standing out as predominant objectives in their mission statements. These results show the importance of follow-up measures to initiatives done in the field. While anecdotal, some authors highlight the need at the heart of traditional knowledge preservation, which is experience on the land with elders who can pass on their traditions, ideas, and knowledge. Overall, knowledge of these trends can be used to help organizations form and direct their mission to best conserve traditional knowledge and follow up with their activities to ensure success of their mission statement.

Keywords: Traditional knowledge, Indigenous knowledge, Traditional (local) knowledge, Ethnobiology, Ethnobotany.

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The value of biocultural collections in the Rio Negro, Amazonia (Brazil).

Authors: Nesbitt, Mark [1], Milliken, William [2], Martins, Luciana [3], Azevedo, Dagoberto Lima [4], Coelho-Ferreira, Marlia [5], Garces, Clauia Leonor Lopez [6], Cabalzar, Aloisio [7].

The Northwest Amazon comprises a large region of equatorial forest on the border of Brazil, Colombia and Venezuela, which has been inhabited by indigenous peoples since the pre-colonial period. Today they occupy 80% of its area. Travellers such as Richard Spruce, who visited the region in the 1850s-1860s, described the vitality and dynamics of these populations, demonstrated by the size of their longhouses, their extensive inter-communal ceremonies, and their rich material culture. The biocultural objects and associated information collected by Richard Spruce constitute a unique point of reference for the useful plants, ethnobotany, anthropology and environmental history of the region. Housed at the Royal Botanic Gardens, Kew and the British Museum, both in London, this under-researched collection incorporates indigenous plant-based artefacts, samples of useful plant products, detailed archival notes on the use of plants by inhabitants of the Amazon, and accompanying herbarium voucher collections. This paper focusses on an ongoing research programme aimed at building capacity in Brazil to research, cataloguing and mobilising data from these biocultural collections, and developing these important resources for improved understanding of the useful and cultural properties of plants. It aims to build collaborative relationships, making biocultural collections and associated data freely accessible online, and above all to strengthen capacity of indigenous communities on the Rio Negro for autonomous research into material culture and plant use. We present the activities we have developed in the first two years of the programme. Workshops at Kew, Rio de Janeiro and São Gabriel da Cachoeira have enabled the Spruce collections to be fully digitised and artefacts made available through the Reflora portal (reflora.jbrj.gov.br). Training has been given in collection and study of biocultural objects, both to museum staff and representatives of indigenous communities, and a research agenda developed that focuses on better understanding of the shifting relationships between people and natural resources over the last 200 years. We discuss how a broad collaboration has led to constructive, culturally appropriate engagement with local communities, providing a portal into the world of scientific knowledge and helping to mobilise both scientific and indigenous knowledge in a mutually beneficial manner.

Keywords: Amazon, Traditional knowledge, Build collaborative relationships, Historical use, Building capacity.

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Aromatic and medicinal plants in Trás-os-Montes on the eighteenth and nineteenth centuries: traditional network knowledge.

Authors: Alves, Victor [1].

Aromatic and medicinal plants are of intemporal use. They answer to diversified issues, arising from the relationship between man and nature, and contribute with flavors, scents and healing and palliative virtues whose millennial experience stand up over the development of human, individual, familiar or communitarian well-being. They are also used in veterinary. These plants have a generalized geography of use, though differential in details. We can assume that all these plants form a single group, but not all exist in every place and at all times. In its relationship with people, and through them, they frequently present differentiabilities in their capacities and in the ways and directions in which they are used. These plants are a “world” whose qualities, when known and recognized, can be transformed in multiple other new “worlds”. They serve everyone, serving excessively to each. The success of its multiple uses is completed by its insertion in a territory that mediates the relationship between men and divinity, the metaphysic nature. They are included in rituals, constructed and practiced in a pragmatic way by the human gender. Our analysis for the eighteenth and nineteenth centuries is an attempt to include this temporary period in a larger long-term chronology, in which we prospect the use of aromatic and medicinal plants as a central element of a set of social practices that are repeated and renewed. We intend to revisit the region of Trás-os-Montes looking at it in a diachronycal way and seeking to establish de differences that can be established by its synchrony. Having established this regional cartography that contemplates its aromatic, condiment, medicinal (human and veterinary) and "other" uses, it is necessary to question the existence of a network of information or knowledge, how it is built, fed and developed and to know the limits that it imposes itself and are imposed on it from its transactional context. We use the elements given by the parochial transformations, dating from 1758, to document the existence or non-existence of medicinal and aromatic herbs. Data from every parish of the region is complemented using constant elements from other dated sources.

Keywords: Medicinal plants, Magical plants, Useful plants, Traditional knowledge, Trás-os-Montes, Northeastern Portugal.

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La dinámica del conocimiento local sobre el alcornoque y el corcho en el suroeste Español.

Authors: Acosta, Rufino [1], Puri, Rajendra K [2].

La comunicacion es resultado del trabajo de campo realizado en el suroeste español entre 2013 y 2016, en que se llevó a cabo observación participante entrevistas y grupos focales en fincas de alcornocal, industrias corcheras e instituciones relacionadas con el sector.

El conocimiento local en este área varía dependientdo de situaciones diferentes: si se desarrolla en dehesas monoespecíficas, en formaciones mixtas o en monte alcornocal. Si son propiedades públicas, comunales o privadas (pequeñas, medianas o grandes). Intervienen diferentes actores sociales: propietarios, trabajadores, gestores, compradores, intermediarios, industriales o expertos de las adminsitraciones y empresas de insumos agroforestales.

Exponemos esta diversidad y nos centramos en el cambio expermientado por los saberes locales, destacando tres cuestiones.

- La saca se realizada cada nueve años, y crea un vacío que supone una rutprua en las formas de reproducción del conocimiento respecto al manejoy los mercados del corcho.

- El corcho es de gran interés tanto para los trabajadores del descorche como para los propietarios, con salarios y precios relativamente altos comparados con los de otras actividades. El descorche es casi el único proceso que se realiza en cuadrillas, un poderoso medio de transmision de los saberes.

- La ecología y el manejo del alcornocal permite, en ciertas fincas, un abandono de labores culturales que se traduce en semiabsentismo y alejamiento del ecosistema.

Por último señalamos algunos problemas, que destacan las gentes del mundo dle corcho, en los que el conocimiento local (y tabién experto) se ven desbordados por las situaciones a las que tiene que enfrentarse, como los ataques de culebrilla y la seca.

Keywords: Local knowledge, Cork.

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2nd Hispano-Portuguese Meeting on Ethnobiology (II EHPE) – Session 2

Chair: Amélia Frazão-Moreira, Universidade Nova de Lisboa, FCSH, Centro em Rede de Investigação Antropológica (CRIA)
Tuesday, June 6, 14h30 – Room G3-S5/01

Global and local in folk plant knowledge: allochthonous plants in Catalan ethnobotany.

Authors: Gras, Airy [1], Brunés, Mireia [2], D'Ambrosio, Ugo [1], Gómez, Carlos [3], Parada, Montse [1], Garnatje, Teresa [4], Vallès, Joan [1].

Our research team is gathering the folk knowledge on plants in the Catalan linguistic area since more than 30 years. Apart from many names and uses referred to autochthonous plants, we have faced from the beginning comments such as “this has been always used” referred to plants that have come, in more or less ancient times, from elsewhere, not being at all rare that informants talk in these terms of an allochthonous plant. In some cases, people do know that the plant they alluded to comes from elsewhere, but in some others this is not so clear, and we have the perception that, in general, people consider “their” plants both those naturally growing in their geographical area and those introduced by any means.

Following these arguments, we have conducted a metaanalysis in our database, containing information on popular names and uses of more than 1,600 plant taxa, coming from more than 1,100 informants, in order to know the reach of allochthonous plants in ethnobotany in the Catalan language territories, and to study some of their aspects. As a first step, in this study we have limited the search to medicinal uses of vascular plants.

We have detected 181 allochthonous taxa with medicinal uses claimed by our informants, roughly meaning 11% of all the taxa present in the database. As for use reports, those referring to allochthonous plants are 9,433, accounting for 27% of all those recorded. This comprises all kinds of non-autochthonous plants, such as introduced, naturalised, invasive and even those plants or plant parts purchased in the commerce. In any case, the number of both taxa and use reports are relevant. Their names, properties, parts employed and other aspects are discussed in this communication.

Keywords: Medicinal plants, Ethnobotany, Allochthonous.

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Wetland ethnobiology of National Parks Tablas de Daimiel and Cabañeros (Spain).

Authors: Verde, Alonso [1], Fajardo, Jose [1], Ríos, Segundo [2], Rivera, Diego [3], Obón, Concepción [4], Laguna, Emilio [5], Pablo, Ferrer-Gallego [6], José, Ruiz-Gallardo [1], Arturo, Valdés [7], Vanessa, Martínez-Francés [8], Estela, Barroso [1], Luis, San Joaquín [1], Rodrigo, Roldán [1].

Since last 30 years, wetlands in Castilla La Mancha (Centre Spain) have suffered a dramatic decline, most of them are today dry or very endangered, so their biologycal resources and associated traditional knowledge are losing. It is therefore that we currently perform the project SPIP2015-01659 about the ethnobiology and traditional management of wetland resources of the National Parks Tablas de Daimiel and Cabañeros (Spain).

During 2016-2018 a field work to collect information through semi-structured interviews to the people from the surroundings of both National Parks (former fishermen, will weeds gathers, artisians, etc) is being done. All of them are familiar with valuable information about the traditional uses of natural resources: medicinal uses, handicraf techniques, basketry, forms of consuption and food processing or behavoir of agroforestry systems, etc. This information is recorded in a database, and a catalog of biological resorces is being elaborated: plants (etnoflora), animal (ethnofauna) and fungi (etnomycobiota), ecosystems and other non biologycal issues such as mineral-medicinal resources (sludge and medicinal waters). All this will allow us to analyze the traditional context of resources management in these areas, which simultaneously form a part of the Biosphere "La Mancha húmeda".

In this framework we found a singular "wetland basketry", former jobs (fishermen, crabmen, etc..) hunt and fish techniques, diseases associated whit these ecosystems and remedies to treat them, as well as a wide repertorie of popular names of plants, algae, funfgi and animals associated whit these wetlands.

In This communication we show the preliminary results about the traditional management of the flora, fauna and mycobiota from these wetlands and its linked traditional knowledge.

Keywords: Traditional knowledge, Ethnobiology, Ethnoflora, Ethnofauna, Ethnomycobiota.

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The Calafito from Vale de Vargo, Serpa.

Authors: Farinha, Noémia do Céu Machado [1], Póvoa, Orlanda de Lurdes Viamonte [2].

The Calafito plant is traditionally used in Portugal and Alentejo for the treatment of various human and animal health problems, especially in topical use. In previous works of the team based on 56 semi-structured interviews carried out in Alentejo, 25 informants (45%) cite the use of calafito, with 72 citations of traditional uses, mainly for the treatment of trauma and affections of the gastro- Intestinal system in animals, but also in people. Of the 8 interviews conducted in Vale de Vargo, Serpa municipality, 7 (88% of the interviews carried out) refer to calafito, which highlights the local importance of this plant. This information on calafito was initially attributed to the species *Hypericum tomentosum* L. Subsequently, the rare species *Hypericum pubescens* Boiss., for which the same common designation was used, was identified in Vale de Vargo. 30 semi-structured interviews were carried out for the inhabitants of Vale de Vargo with the following objectives: (1) to determine if the people of Vale de Vargo distinguish both calafito species, (2) the uses attributed to each species; (3) how often these species are used; (4) to contribute to the in-situ valorisation and conservation of the rare species *H. pubescens*. People often have *H. pubescens* in their backyards (homegardens), so there is some security in preventing the genetic erosion of this species.

Keywords: *Hypericum* spp., Baixo-Alentejo, Veterinary phytotherapy.

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The plants cited in Cante Alentejano.

Authors: Póvoa, Orlanda de Lurdes Viamonte [1].

The Cante Alentejano is part of the tradition and the identity of the region because it is unique, not only in the Alentejo, but in all the places where it's people emigrated. It is a choral chant with two solo voices alternating with a chorus. The declaration of Cante Alentejano as Intangible Cultural Heritage of Humanity was approved by the UNESCO Intergovernmental Committee in Paris on 27 November 2014. The Cante Alentejano expresses what goes in the soul, the melancholy, the homesickness, the love, the wishes and the memories of the homeland. The themes of the songs are usually sad. But they can also be cheerful, including some humorous songs.

Plants are present in the lyrics of songs because they are a component of the field, recurrent theme of many songs. In this work, 12 bibliographic references were analyzed, both in physical and digital support, totally or partially dedicated to Cante Alentejano, totalizing around 790 musical songs. The citations to plants were registered, either in the title of the songs or in the body of the text, identifying the respective botanical species. The list of plants registered was broad, including for example lemon (*Citrus limon* (L.) Osbeck), purple lily (*Iris* sp.), Silva (*Rubus ulmifolius* Schott), oranges (*Citrus sinensis* Osbeck), wheat (*Triticum aestivum* L.), rosemary (*Rosmarinus officinalis* L.) and lemon balm (*Melissa officinalis* L.). The clove (*Dianthus caryophyllus* L.) and the rose (*Rosa* sp.) are among the most cited species.

Keywords: Ethnobotany, Alentejo, Traditional songbook.

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The taste of wild edibles in comparison to commonly consumed products. We prefer them or we discard them?

Authors: Talavera Roma, Marc [1], Ninot Sugrañes, Josep Mª [1], Badia Pujals, Montserrat [3].

The organoleptic value that consumers attribute to products elaborated with wild edibles is a key information topic to achieve the recuperation, and adaptation to present trends, of ancient uses; therefore it has been poorly studied. This project shed some light in this issue, with the aim to assess if the abandonment of wild edibles consumption is related to the poor taste of these products, or if contrarily they are highly accepted by current consumers and the abandonment is not related to their taste. Moreover, we studied if economic and social factors influence on consumers taste preferences.

Data collection took place on blind tasting sessions, with a number of participants ranging between 60 and 200 per session. In each session participants evaluated 6 to 12 samples elaborated with wild edibles, and two control samples elaborated with the most commonly consumed products. Tasting sessions took place on 12th march 2016 and 25th march 2017, as one of the activities of the "Gastronomic meeting of wild edible plants" held at the city of Igualada (Barcelona – Catalonia).

The wild edible samples evaluated consisted in 8 herbal teas, 4 alcoholic drinks, 18 salads, 16 boiled vegetables, 8 condiments, 13 omelettes, 10 jams, and 10 soups. In total, seventy wild edibles were used.

Overall, more than 70% of the samples evaluated obtained an organoleptic value equal or higher than that achieved by controls. When asking to participants if they would consume the sample again, also more than 70% of the samples reached values of repetition equal or higher than those of controls. Moreover, economic and social factors had no influence on the results, showing that the acceptation of wild edibles taste is transversal among society.

Therefore, the abandonment of wild edibles consumption cannot be attributed to their taste. Thus, the reintroduction of these species on the diet is possible if the ignorance and prejudices towards them were broken down. In addition this should favour the development of a more sustainable model of food production and consumption, and a growing societal welfare.

Keywords: Wild edible plants, Food sovereignty, Cuisine, Alimentation trens.

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Adubação em olivais tradicionais: o caso do fósforo.

Authors: Ferreira, Isabel Alexandra de Queirós Morais [1], Rodrigues, M. Ângelo [2], Arrobas, M. [1].

As rochas fosfatadas a partir das quais se preparam os fertilizantes fosfatados representam um recurso finito. Se exploradas aos níveis atuais, o seu esgotamento ocorrerá ainda durante o século XXI. Em Portugal muitos solos apresentam níveis de fósforo muito baixos (quando determinados pelo método Egnér-Riehm, generalizado entre os laboratórios portugueses), o que induz os laboratórios a recomendar a aplicação do nutriente. Contudo, se analisadas as folhas das árvores instaladas nesses solos, as plantas exibem frequentemente um estado nutricional adequado. Por outro lado, a oliveira exporta pouco fósforo, sobretudo nos olivais tradicionais de sequeiro em que as produções são baixas. De forma a melhorar a eficiência de uso deste recurso é necessário conhecer a resposta das plantas à aplicação de fósforo. Foram instalados três ensaios com a cultivar Cobrançosa, dois em campo e um em vasos. Em campo usou-se um olival jovem de três anos e instalou-se uma nova plantação para o efeito. Nestes ensaios usaram-se dois tratamentos: com aplicação de fósforo ao solo e sem aplicação de fósforo. Na experiência em vasos usou-se um fatorial com solos de quatro proveniências e duas doses de fósforo. Os ensaios de campo foram instalados em 2013 e o ensaio em vasos em 2014. Até ao presente não foram detetadas diferenças significativas na performance das árvores, incluindo a produção de azeitona no ensaio de campo, devido à aplicação de fósforo. Contudo, os teores de fósforo nos tecidos (folhas, caules e raízes) são de uma maneira geral significativamente mais elevados nas modalidades fertilizadas. Nas raízes os teores de fósforo são particularmente elevados nas modalidades fertilizadas, parecendo ser um órgão com particular propensão para acumular fósforo. Os resultados indicam que podemos ser conservadores a aplicar fósforo em olival tradicional ajudando a atrasar a exaustão do recurso.

Keywords: Wild edible plants, Food sovereignty, Cuisine, Alimentation trens.

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A longitudinal study of changes in the use and value of provisioning ecosystem services in a rural community in South Africa.

Authors: Shackleton, Sheona E [1], Falayi, Menelisi [2], Cundill, Georgina [3].

Despite several decades of research on the use of provisioning ecosystem services or goods (natural resources) and their importance in rural livelihoods, there have been relatively few studies that have applied repeat surveys to consider whether and how the use of such ecosystem goods is changing (or not) with time. Such an understanding is particularly relevant in the current period of rapid social-ecological change and future uncertainty. This paper explores changes in the use and economic value of provisioning services used by communities in the Kat River Valley of South Africa over a fifteen-year period. As a baseline we used a household survey conducted in 2000, and repeated this in 2015. Qualitative methods, to assist in identifying drivers of changes, included semi-structured interviews, mapping and focus group discussions. Results revealed that a similar proportions of households continue to use some 18 different ecosystem goods despite modernisation of their villages (i.e. electricity and piped water). However, the mean quantities of goods used per household have declined over the past fifteen years, with this being more significant for some than others. The economic contribution of these goods to households has similarly declined. The exceptions were fuelwood and river sand. The changes observed can be related to, amongst others, transformations in both the local landscape and socio-economic environment, such as increases in state social welfare, a decline in agricultural production, bush encroachment, generational preferences, and the expansion of supermarket retailers over the past fifteen years. Understanding such trends is important for considering the sustainable management of ecosystem services and livelihoods into the future.

Keywords: Human-environmental change, Provisioning ecosystem services, Natural resource use, Rural livelihoods, Longitudinal study, South Africa.

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Local dwellers' perception on conflicts between human populations and wild animals in Quiçama National Park (Angola).

Authors: Pereira, Franciany Gabriella Braga [1], Franzini, Lissa D. [1], Alves, Rômulo R. N. [1].

Conflicts between humans and wild animals are triggered by several factors and are a threat to the conservation of involved species. Such conflicts are embedded in complex social-ecological contexts, which must be better understood for the development of more efficient mitigation strategies of such conflicts. In this study, from the traditional ecological knowledge of dwellers of a Conservation Unit in Angola, we aimed to identify wild mammal species involved in conflicts and to rank in categories the reasons that have motived this conflicts. Twenty-seven informants (26 males and 1 female) were selected using the snowball sampling technique. All informants were native from the study region. Semi-structured interviews were carried out and complemented by a checklist with visual stimulus and a guided-tour technique. A total of 30 mammal taxa were registered interrelationships of conflict. Of these, 26 were identified at the species level and three at the family level, as well as the presence of small rodents that could not be identified at a lower taxonomic level based on the method used. Among the taxons identified are, also, species listed as endangered. Among the categories, those with the greatest wealth of animals involved were Animal damage–crops (14 taxa; 33,3%) and Animal damage–livestock (13 taxa; 30,9%). The other classifieds conflict categories were: Animal damage–human safety (8 taxa; 19%); Animal/human overlap of resource use (3 taxon; 7,1%); Animal damage-human safety (myth) (2 taxa; 4,8%); e Animal damage–property a (2 taxa; 4,8%). Small rodents were often associated with attacks on crops and heritage. This is the first study about wild animals involved in conflicts with humans in Angola. Such conflicts should be considered in management and conservation plans, because in some cases, it may increase the pressure on the associated species.

Keywords: Angola, Human–wildlife conflict, Traditional knowledge.

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Working with local people for the conservation of chimpanzees in Guinea-Bissau.

Authors: Frazão-Moreira, Amélia [1], Parathian, Hannah [2], Bessa, Joana [3], Hockings, Kimberley [4].

Recent studies estimate that between 600 and 1,000 chimpanzees (Pan troglodytes verus) are currently present in Guinea-Bissau, living in anthropogenic habitats. The heavily fragmented coastal forests of this country were identified by IUCN as one of seven priority areas in West Africa for urgent chimpanzee conservation efforts (Kormos et al. 2003, Gland. 2003).

In general, conservation initiatives create obstacles to the continuity of forms of organization and survival of human populations, and impose global hegemonic models (e.g. Broch-Due and Schroeder 2000, West, Igoe and Brockington, 2006). It is therefore imperative to actively include local knowledge and consider the economic, social and cultural systems in any conservation strategy (e.g. Orlove and Brush 1996, Cullman, 2015).

Following our interdisciplinary project on human-chimpanzee relations and botanical resource overlap we presented our findings at two participatory workshops in Guinea-Bissau (December 2016). The second goal of these workshops was to hear from a broad range of stakeholders (representatives of local people, governmental officials, NGOs, and researchers) and discuss potential strategies for chimpanzee conservation. In this communication we present challenges and outcomes from this process, discuss the complexity of conservation development programs, how they can be implemented in a way which is ethically in line with human needs and activities, and the importance of interdisciplinary projects including ethnobiological research.

Keywords: Chimpanzee conservation, Local people, Local Knowledge, Guinea-Bissau.

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Homegardens, biocultural diversity and ecosystem services in Mexico.

Authors: Ordóñez Diaz, María de Jesús [1], Lope Alzina, Diana Gabriela [2], Ordoñez Diaz, Jose Antonio Benjamin [3].

In this work, we introduce the first volume of the Atlas Biocultural de Huertos Familiares de Mexico (biocultural atlas of homegardens in Mexico), a book compiling research done by several authors, synthetizing more than 60 years of homegarden research from dis- , Inter-, multi- and trans-disciplinary perspectives. This volume, the first of a series expected to cover all the Mexican territory, shows advances on historical, geographical, biological and cultural heritage research on homegardens across seven states representing biocultural regions of the center, south, and southeast of Mexico. Through the chapters, the authors unravel homegardens complexity, showing that this system holds the greatest biological diversity in species (as compared to other agroecosystems) which is assembled or organized according to social and cultural standards and norms while providing a wide ranges of services such as food provision, CO2 capture, biodiversity preservation and production, and promotion of cultural adherence. Therefore, homegardens are not just socio-ecological systems, but further, they are readily visible evidence of biocultural processes. That is, ecological complexity intertwines with knowledge, use, and management as also linked to cosmologies and thus yielding to complex variations in homegardens, not only within a region but across regions. Grounded on such findings, we propose that homegardens represent a living reflection of the biocultural diversity of Mexico. While important findings as the previously mentioned have been generated, there still exist important gaps to be filled. For instance, traditional management by local people need to be further documented as these represent successful strategies that have been carried out across time and which can potentially contribute to local food production, recovering of traditional foods and valuation and acknowledgement of local diets. Given the bountiful environmental and cultural diversity across Mexico, the biological and cultural heritage that has been documented across homegardens (orchards, lots, patios, bakcyards. etc.) constitutes a wealth of strategies that can potentially aim to adapt to situations such as climate change, biodiversity loss, and social, environmental, and economic constraints.

Keywords: Homegardens, Traditional agroecosystems, Socio-ecological systems, Resilience, Mexico.

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Poster Session

Tuesday, June 6 – 17h00 to 19h00

An ethnobotanical investigation of Gürpınar district and city center of Van (Turkey).

Presenter: Ahmet Dogan (Julia F. Morton Award)

Authors: Dogan, Ahmet [1], Ertas, Fatma Nujin [1], Senkardes, Ismail [2], Bulut, Gizem [3].

This study aimed to identify the plants used as traditional folk medicine in Gürpınar District and City Center of Van (Turkey). The field work was conducted between June 2016-August 2016. During the fieldwork specimens of the plants used as folk remedies were collected and the information such as local names, ailments treated or therapeutic effects, plant parts used, method of administration, dosage, duration of treatment were recorded. The collected plant specimens are kept in the Herbarium of the Faculty of Pharmacy, Marmara University (MARE). As a result of the investigation 43 plant specimens were identified as being used by locals for different purposes. Of these, 29 species were used as traditional folk medicine. The investigation revealed that the majority of these plants were used for similar medical purposes, mostly for gastrointestinal system diseases, urinary system diseases and wound healing.

Keywords: Medicinal plants, Ethnobotany, Van (Turkey).

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Traditional uses of the crab apple tree (*Malus sylvestris* Mill., Rosaceae) in Spain.

Presenter: Alberto Arnal Olivares

Authors: Arnal Olivares, Alberto-Rafael [1], Tardío Pato, Francisco-Javier [1], Lázaro Lázaro, Almudena [1].

The crab apple tree (*Malus sylvestris* Mill.) is a wild species that in Spain grows mainly in the edge of mountainous forests. Although it can reach higher than 7 meters under determinate conditions, it is considered a little tree. The common Spanish name is “maíllo”, but here have been reported other local names such as “maguillo”, “manzano silvestre”, “manzano montés” and “manzano bravío”, most of them with the meaning of wild apple tree. One of the main uses is as human food. The fruits, usually unpalatable when eaten raw, were stored for several months, a process that allowed them to sweeten. They were then consumed during the winter and the spring, when there was no other fruit to eat. They have also been used for making jams or jellies and alcoholic beverages, such as cider elaborated from fermented crab apples and different liqueurs obtained by maceration of crab apple fruits in anisette or liquor. Regarding medicinal uses, most of the remedies were also related with the consumption of the fruits that was considered good against different ailments, especially those of the digestive (diarrhea and stomach ache) and respiratory system (colds), but also for treating other indefinite symptoms (fever and headache) or for the skin (wounds and sunburns) in external use. Another important application, still in use, is as a rootstock for the domestic apple tree (*Malus domestica* Borkh). Wild apple trees were collected for grafting in the nurseries or directly grafted, when they were in the boundaries of the villages. The resultant trees are considered vigorous, well adapted to the environment and with quality fruits. Other secondary uses of the whole tree, apart from firewood, were timber for planks, carpentry and little tools because of its excellent mechanical characteristics. In addition to the interest of the wild species in the improvement of the cultivated apple tree, this rich traditional knowledge referred to the crab apple tree is another reason for its conservation and could be also useful for the future.

Keywords: *Malus sylvestris* Mill., Human and animal feeding, Alcoholic beverages, Patxaka, Medicinal, Grafting.

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Contribution of conserved agrobiodiversity in local development: three experiences in the region of Madrid (Central Spain).

Presenter: Almudena Lázaro

Authors: Lázaro, Almudena [1], Fernández, Isabel [1], Tardío, Javier [1].

To avoid the genetic erosion and crop biodiversity loss, many *ex situ* germplasm collections have being created worldwide, because of their value for future generations, to use them for new varieties development and to face new challenges or, in other words, to guarantee the food security. Only in Spain, 78059 accessions are conserved in 36 public institutions. Among them, the Madrid Institute for Research and Rural Development in Food and Agriculture (IMIDRA) holds 352 accessions of horticultural and fruit-tree landraces, cultivated during generations in the region of Madrid. Though the term “landrace” is currently under revision, most authors stand out the intra-population diversity, the lack of conscious selection, the adaptation to local environments or the pressure of local human culture in its selection and permanence. Some of these conserved landraces are still interesting in modern societies. Present work reports our experience in the recovery of some of this plant material for current consumers, using three examples: an old melon variety, a bean collection and four tomato accessions. The heirloom “Mochuelo” melon that has been maintained by traditional farmers because of its flavour and later evaluated at IMIDRA by sensory analyses and consumers’ studies, has arrived again to market by conventional circuits, such as markets and supermarkets. Some of the landraces of our common bean collection has been cultivated again by new farmers because of its diversity, when chefs and organic farmers have demanded it, and so getting to be consumed again. Finally, the lack of flavour of new tomato varieties, has lead to demand some of our old tomato landraces by experimented and new farmers and also by home and urban gardeners, reaching again to the consumers in many ways. In conclusion and in our experience, the concepts that promote the use of landraces conserved at ex situ collections include some ideas, such as, proximity, organic and seasonal products, local diversity, identity, history and one’s roots with the land. Despite of other uses, landraces could be used as tools for the development of quality products and farmers’ progress, with a positive effect in local development.

Keywords: *None specified*.

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The religioness/spirituality matters: their influence on plant-based local medical systems.

Presenter: André Luiz Nascimento

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Religiosity/spirituality can affect health and quality of life in myriad ways. Religion has been present since the first moments of our evolutionary history, whether it is understood as a byproduct or as an adaptation of our cognitive evolution. We investigated how religion influences medicinal plant-based local medical systems (LMSs). We conducted our research in a rural community in the semi-arid region of Northeastern Brazil. Data were collected through two instruments: a free list to record the local ecological knowledge regarding medicinal plants, and structured questionnaires to assess individual levels of religiosity/spirituality, for that, we used the Brazilian version of the BMMRS “Brief Multidimensional Measure of Religiosity/Spirituality”. To evaluate which of the 10 dimensions of religiosity / spirituality of the BMRS form explanatory models of the variation of the richness of medicinal plants, therapeutic targets and use citations we used the Generalized Linear Model (GLM). Religiosity/spirituality is predictive of structural and functional aspects of medicinal plant-based LMSs. When we broke our measure down into its different dimensions, religious/spiritual history was the explanatory variable with the greatest weight for richness of knowledge of medicinal plants and the number of use citations, whereas commitment best explains the richness of therapeutic targets. Although the other variables in the model (such as forgiveness) do not have the required significance values, the model’s explanatory power is lost when they are removed from the model. Our model encourages a discussion of the role of religion in the health of an individual as well as in the structure of an individual’s support system. Religiosity/spirituality (and the dimensions of Commitment and Religious and Spiritual History, in particular) act to protect structural and functional elements of LMSs. By providing protection, the LMS benefits from greater resilience, both at the individual and population levels. We suggest that the socialization process resulting from the religious phenomenon has contributed to the complexity and maintenance of LMSs by means of the interaction of individuals as they engage in their religious observances, thus facilitating cultural transmission.

Keywords: Ethnomedicine, Ethnobotany, Religion, Traditional medical systems, Cognitive byproduct, Prosociality, Forgiveness, Health.

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Gender and its role in the resilience of local medical systems - effects on structure and functionality.

Presenter: André Luiz Nascimento

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Ethnobotanical studies have been conducted that aim to understand how functionally local medical systems are maintained. However, to date, there have not been any studies that analyze the factors that influence the variation of knowledge. Given the above, this study aims to analyze the influence of gender in the resilience of the system, using utilitarian redundancy and the transmission of knowledge as factors. Information from 198 married couples was collected, using semi-structured interviews in the indigenous community of Fulni-ô (NE of Brazil). Knowledge between men and women was analyzed based on the total number of known plants, therapeutic targets treated with plants and information units, utilitarian redundancy, models of transmission and sharing for each gender. Fulni-ô men know a greater number of plants, therapeutic targets treated with plants and units of information than women. They also had greater utilitarian redundancy. However, regarding knowledge transmission, sharing among women was greater, transmission is related to gender and there is no difference between the number of models of knowledge information. In the system of local medical knowledge, gender exerts an important role in the resilience of the system. This study shows that men have a greater contribution to the structure and function of the system; however, both genders contribute to the flow of information in the system, which makes both genders important in the feedback of information.

Keywords: Intracultural variation, Medicinal plants, Traditional knowledge, Utilitary redundancy.

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A landscape planning perspective on diverse economic approaches and land use structures of small scale farmers in Genalguacil (Andalusia, Spain).

Presenter: Anjoulie Brandner (Julia F. Morton Award)

Authors: Brandner, Anjoulie [1], Damyanovic, Doris [1].

Around 85 percent of the small scale farms and 12 percent of the agricultural area worldwide are farmed by peasants. The promotion of small scale farming is relevant to maintain and evolve ecological, social and cultural knowledge and potential. This study aims to understand the living conditions of peasants in the municipality of Genalguacil, Andalusia, Spain and to make recommendations for improving the framework conditions for subsistence farming. The five month field research period took place during November 2014 and Mai 2015. Methods for data collection were strolling around, farm and field recordings of five farms, semi-structured interviews and mental maps with ten peasants from the recorded farms. Comparative analysis and contextualization of the farms lead to planning principals. The peasants pursue various economic approaches and diverse mainstays. The basis of their economy are subsistence activities, which allow independence from a regular income and from the market economy. This allows self-determined time management, lively exchange, good social relationships and vivid practical knowledge. The implementation of a conceptualised national park in the region should consider these results and be accompanied by participatory processes to involve peasants in planning decisions. Furthermore an ensured access to land and education and training programs, a profound water management plan and the cooperation among the different players in agriculture and regional management are fundamental for future perspectives and high life quality of the peasants in the region.

Keywords: Peasants, Subsistence.

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How does human selection of ethnobotanical plants promote phenotypic variation? The case of the calabash trees in Caribbean islands.

Presenter: Betsabé Castro Escobar
Authors: Castro Escobar, Betsabé [1], Fine, Paul V.A. [1], Carlson, Thomas J. [1].

Plants provide us with raw materials to sustain human life. Over time, contingent on how plants are used, they could be selected for particular traits that are both desirable to people and favorable for the plants success, thus promoting phenotypic variation within a species. It could also happen that artificial selection may narrow the possible traits available to a plant, making it so there is lower phenotypic variation. The model system explored for my study is the genus *Crescentias* (calabash tree, higüero, güira), comprising six species of flowering plants in the family Bignoniaceae. Of the six species, three are from the continental Americas and three are of island origin. Of these species, five are present across the Caribbean as introduced, native, or endemic. The species are moderate-size trees that produce spherical fruits that greatly vary in shape and size, with a thin lignified shell and soft white pulp. *Crescentia cujete* is the most widely spread and commonly used of all calabash trees. As one of my dissertation chapters, I plan on conducting a comparative multi-site study among Caribbean islands in the Major Antilles, aiming to investigate how and why local people select, prepare, and consume these calabash plants; how ethnobotanical practices might be shared or differ across the Caribbean landscape; and where these plants originated and how have they spread across the Caribbean landscape. Studying phenotypic variation of the calabash trees in the Caribbean Basin, my interest is to understand how people have promote the evolution and conservation of these medicinal, material, and culturally significant plants. Thus, examining the evolution of ethnobotanical plants where humans act as selective pressures is a promising research topic. Here, I intend to present preliminary research results of the traditional uses and fruit size morphological variation of calabash trees in several Caribbean islands from recent field seasons in the summer and winter 2016. This endeavor constitutes one of several other projects for my dissertation research at UC Berkeley where I will further work with the ecology, evolution, biogeography, and phylogenetics of the calabash trees in the Caribbean.

Keywords: Plant selection, Variation, Plasticity, Ethnobotany, Caribbean.
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Traditional knowledge and use of medicinal plants in Guinea-Bissau (West Africa).

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Guinea-Bissau's vascular flora comprehends more than 1,500 taxa, of which ca. 90% are native. The two main factors responsible for the distribution of terrestrial vegetation types in the country are the soil features and the climate. The main goal of this communication is to give account on the medicinal plants used by local communities in Guinea-Bissau and to provide biological and ecological information for the species, including in-country distribution, geographical range, growth form and main vegetation types. Data was gathered by means of herbarium and bibliographic research, as well as fieldwork. Our results recorded 218 plant species used for medicinal proposes in Guinea-Bissau. Most of these species are trees, followed by shrubs. The main vegetation types in which the medicinal plants occur are woodland and savanna woodland, but for medicinal purposes most species are collected in the fallows at the vicinity of villages. The main types of diseases treated with recipes made from medicinal plants are presented as well as the plant parts used. The present study also documented other traditional uses of medicinal plant species and their ecological status, highlighting the importance of these plants in terms of livelihoods of rural communities. Finally, it is highlighted that this study can serve as baseline information to drive the research on ethnopharmacology and could be helpful to further strengthen the conservation of this important resource in Guinea-Bissau.

Keywords: Ethnopharmacology, Ethnobotany, Traditional knowledge, Useful plants.
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Paleoethnobotanical and experimental analysis of *Geoffroea decorticans* (Gill. ex Hook. & Arn.) and *Sarcomphalus mistol* (Griseb.) fruits in Cerro Colorado, Córdoba Province, Argentina.

Presenter: Cecilia Trillo
Authors: Saur Palmieri, Valentina [1], Trillo, Cecilia [2], López, María Laura [1].

The aim of this paper is to generate information which will assist in the archaeobotanical recognition of post-harvest processing activities related with different consumption patterns of Chaco wild tree-fruits. Analyses of modern fruits imply the reproduction of traditional post-harvest practices. In this way, to obtain data about past storage, processing and cooking patterns, paleoethnobotanical study and experimental analysis in laboratory were carried out. Ethnobotanical data were recorded in Cerro Colorado community. Placed on Sierras of Norte (Cordoba province, Central Argentina) and near of main archaeological site (Quebrada Norte 7) of the northern region, it offers the possibility to study the refuse of traditional post-harvest practices with to wild tree-fruit: *Geoffroea decorticans* (Gill. ex Hook. & Arn.) ("Chañar") and *Sarcomphalus mistol* (Griseb.) ("Mistol"). Due to mistol fruits couldn't be collected by environmental factors, the processing to cook it was carried out in laboratory following the indications given by Cerro Colorado key-informant. Several samples of sub-products and refuse were collected during processing steps of "arrope" (traditional jam) as well as direct consumption of fruits. Although modern ways of consuming chañar and mistol may not be those used in the past, similar techniques such as boiled could be implemented. Laboratory analysis included finding distinctive features among fruits or part of fruits (epicarps, mesocarps and endocarps) in different processing stages, as well as evaluating the effect of charring on them. Endocarps were the main refuse in all traditional consumption patterns. However, mesocarpo adhered on their surface shows different characteristic qualitative that allowed differentiating among post-harvest practices. In the same way, post-charred mesocarp samples showed different patterns that can be observed in archaeobotanical macro-remains. This research constitute a qualitative step to recognize ancient practices of two wild tree-fruits, chañar and mistol, in Argentina those are added to "algarrobo" (*Prosopis* sp.) research with the same objective carried out in North and Central Argentina.

Keywords: Paleoethnobotany, *Sarcomphalus mistol*, *Geoffroea decorticans*, Quebrada Norte 7 site, Sierras Centrales.

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The use of wild and cultivated cacti in Northern province of Córdoba, Argentina.

Presenter: Cecilia Trillo
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Northern province of Cordoba shows a mosaic of xerophytic forest environments: salt marshes, shrub lands, thorn forest and fragments of agricultural and livestock landscapes. Semi-Arid climate has allowed to a high regional diversity of wild cacti, and It has promoted the commercial and family farming of cultivate species. In such environments are developing, among others, family-based productive systems: handicrafts for sale, touristic services and livestock production for their own consumption and local trade. These kinds of people identify themselves as "Criollos" and they have a local ecological knowledge useful for management of plant resources in this particular environment. In order to investigate the perception, use and management of wild and cultivated cactus among Criollos in Northern Córdoba, we made 10 field trips between 2014-2016, interviewing 49 persons with semi-structured interviews, complemented with photographs of cacti species and tours along domestic and natural environments. Interviewed persons mentioned 12 wild species, 2 cultivated species of the genus *Opuntia* and 6 cultivated etno-varieties corresponding to *Opuntia ficus-indica* (L.) Mill, as well as 15 different uses and 6 management practices, including harvesting, tolerance, protection, induction, transplant and cultivation. Concerning the type of environment in which the species grow: domestic environment or "de la casa" was characterized by the presence of *O. robusta* and 4 etno-varieties of *O. ficus-indica*, associated with food, fodder, cleaning uses, trade, ornamental use, apiculture and fences building, and with transplanting and growing as more frequent practices. Natural environment or "monte" was characterized by the presence of 2 etno-varieties of *O.ficus-indica* and 12 wild species associated with feed and food uses, with collection, protection, tolerance and induction as more frequent practices. For all species and etno-varieties, valuation was important or very important, especially for the inhabitants of villages near salt marshes ("Salinas Grandes"), who have few alternative plant resources for their livestock.

Keywords: Ethnobotany, Small producers, Chaco environment, Farm management.

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Mechanical scarification overcome the dormancy and increase germination on Lala palm tree (*Hyphaene coriacea* Gaertn.).

Presenter: Celia Marilia Martins

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Lala palm tree (*Hyphaene coriacea*) is an important palm specie used by local people as source of food, ornaments, medicines, construction materials for houses, boats and furniture and is also used as a traditional alcoholic beverage, locally called sura. This specie contributes significantly to the household income in Zitundo area, Southern of Mozambique. However, a study showed that heavy harvesting of *Hyphaene coriacea* has resulted in population decline in South Africa. Most of the palm species such as *Hyphaene coriacea* can be propagated from seed and the fruits normally take four years to reach maturity and drop. It has been estimated that more than 25% of all palm species require over 100 days to germinate and they have less than 20% total germination. The reasons for this remain unclear and no previous studies have been assessed on seed dormancy and germination rate. In this study *Hyphaene coriacea* seeds have been submitted to mechanically scarification were the seeds coat was totally and partially removed. The results showed that mechanically scarification, either seeds were totally or partially removed, were effective for germinating *Hyphaene coriacea* seeds with a germination rate of 75% in an average of 46 days. These treatments effectively overcome the dormancy and increased germination. Thus mechanically scarification can be recommended on propagation of *Hyphaene coriacea* and used for restoration of *Hyphaene coriacea* population.

Keywords: Germination, Propagation, Scarification, Restoration.

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Structural and functional dynamics of a traditional cultural landscape element: a diachronic comparison of homegardens in Sillian (Eastern-Tyrol, Austria).

Presenter: Christian R. Vogl

Authors: Vogl, Christian R. [1], Vogl-Lukasser, Brigitte [1], Pliger, Katrin [2].

In Eastern Tyrol homegardens have long been integral parts of the mosaic of agroecosystems managed by farmers, with considerable changes in structure, species diversity and function between the 60ties and the 90ties of the 19th century. This paper presents a diachronic comparison between 1998 and 2013. Sixteen East-Tyrolean homegardens were studied with the same ethnobotanical methods (Vogl et al. 2004) in both years. Structure and management practices did not change between years (e.g. appearance, fertilization). Only the use of homemade herbal teas and the presence of recreational areas in homegardens increased statistically significant in frequency. The average area per garden decreased statistically significant (from 60 m^2 in 1998 to 33 m^2 in 2013; median). According to the respondents, reasons for the decrease of the homegarden area might be the high labour demand for gardening or gardening being seen as hard work (medium age of gardeners in 2013 is 53 years, 10 years elder than 1998, median, not significant). General occurrence of species per garden shows no difference between years (Median for both years 37 species per garden; median; sd = 14) except for a statistically significant increase of occurrence of species used for human medicinal purposes from almost zero in 1998 to a range of 0 – 39 species and 0 – 589 individuals (sd = 10 for occurrence and 155 for abundance), being one garden highly prominent for producing plants for the use category “human medicine”. General abundance for all species per garden shows a significant decrease between the years (1998: 628 and 2013: 327 individuals; median). Small, species-poor “herb gardens” with focus on medicinal and spice plants (until about 1960) increased in size and changed to "diversified ornamental and vegetable gardens" until 1998 (Vogl & Vogl-Lukasser 2003). Although in 2013 gardeners maintain the species diversity, a move towards smaller gardens with reduced individuals grown and an increased importance of human medicinal plant species can be observed. This structural and functional evolution may be interpreted as a gradually change again back to traditional characteristics. Besides this gradual change, a few gardeners follow new, totally different and unexpected pathways.

Keywords: Homegarden.

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African baobab trees (*Adansonia digitata* L.) recorded in Uganda.

Presenter: Cory Whitney (Julia F. Morton Award)
Authors: Jens, Gebauer [1], Whitney, Cory [2], Tabuti, John R. S. [3].

The baobab (*Adansonia digitata* L.) is a key tree species of economic and cultural importance in many African countries. International interest in the species has intensified in recent years, following the acceptance of baobab fruit pulp as a food ingredient by the European Union and the US Food and Drug Administration. The tree is widely known to be absent in Uganda despite its wide distribution in most neighboring East African countries. Not only is the baobab regarded as absent in natural habitats, it is also not known to be cultivated on farmland or in homegardens in Uganda. Research trips to the Central, Western, Eastern and Northern Regions of Uganda were conducted in 2015 and 2016 within the collaborative research project "Reduction of Post-Harvest Losses and Value Addition in East African Food Value Chains" (RELOAD). Assessment of cultivated plant species was made through homegarden and field visits and through interviews with farmers. The objective was to study plant species diversity and its importance for conservation, and for regional livelihoods and nutrition. As a result of our expeditions, four vigorous baobab trees were identified in the Eastern Region of Uganda aged between nine and 22 years, and one was found in the Central region with an unknown age. Two baobab trees were located in a courtyard to the northeast of Soroti town in the Soroti District, two were recorded in a traditional homegarden southwest of Busembatia town in the Iganga District, and one baobab was found in an urban garden in Kampala. Planting materials for the Eastern region baobabs originated in Sudan and Kenya. To our knowledge, these are the first scientific records of the African baobab in Uganda and some research questions can be formulated based on this discovery: How will these baobab trees perform in the future? When will they start to flower and fruit? What fruit quality can be expected and will local people accept it as food? Will this tree species become a common plant of homegardens in the Eastern Region of Uganda? Are there more unknown baobabs in homegardens, on farm-land and/or in the wild of Uganda?

Keywords: *Adansonia digitata*, Baobab, East Africa, Fruit tree, Malvaceae, Uganda.
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Bayesian Networks for impact modeling of development interventions.

Presenter: Cory Whitney
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Agricultural systems are influenced by many economic and socio-political factors. Decision-makers selecting among management options struggle with this complexity, because it normally cannot be adequately described by classical data-driven models, at least not within the budget and time constraints of particular decisions. The holistic approach of decision-modeling with Bayesian Networks (BNs) may offer a solution. By explicitly considering uncertainty and updating prior probabilities, BNs can incorporate various sources of information, including expert judgment on the complex interactions of ecological, socioeconomic, cultural and political factors. BNs can produce probabilistic outcome projections for particular interventions and thereby supply decision-makers with robust science-based support for decisions.

Here we use two case studies to show the use of BNs for agricultural development decisions. BNs were developed to describe the probable nutritional status of households over the course of a year under different agricultural development decisions with a focus on horticultural systems and botanical resources. The first study concerned Kenyan farming households and their decision to plant, or not to plant, fruit plants of *Carica papaya* L., *Mangifera indica* L., *Passiflora edulis* Sims. and *Persea americana* Mill. The second BN describes the impact pathway for transitioning from small-scale farming systems to industrial-scale agriculture proposed in Uganda's National development plan.

At the heart of the process is a participatory workshop, which is convened before any other analysis begins. Workshops sought to develop a decision-centered model based on the knowledge of a wide range of local experts. Participants were trained to estimate their own state of uncertainty and thereby reduce errors of judgment, under-confidence or overconfidence in order to facilitate the most accurate BN structures and variable estimates. Input variables were identified and their values quantified as probability distributions that describe participants' current state of uncertainty.

BNs show a high probability that the nutritional status of households will be positively impacted by planting fruit trees in Kenya and negatively through agricultural development in Uganda. This approach shows how using expert knowledge in participatory BNs can generate plausible household nutrition outcomes of agricultural development decisions. The methodology can be expanded to inform more of these difficult decisions.

Keywords: Bayesian Networks, Participatory methods, Decision analysis, Agricultural development, Kenya, Uganda.
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Testing the Doctrine of Signatures: are plants with milky sap galactogogues?

Presenter: Daniela Robles (Julia F. Morton Award)
Authors: Robles, Daniela [1], Gaoue, Orou G. [2].

The Doctrine of Signatures (DOS), which purports that plant form recapitulates therapeutic functions, has been used to explain how peoples discover and select their medicinal plants. Recently, it has been called into question if people really use plant's morphological signatures to discover their medicinal uses. We perform a statistical analysis on compiled data from the literature to test one of the prepositions made by the DOS. We use binomial regression to determine if plant species with white or milky exudate, the anecdotal signature for increasing milk production, are more likely to be galactogogues than plants without milky sap. We search the botanical literature and selected 150 plant species that produce milky or white sap from Africa, the Americas, Europe, and Asia. We also selected 150 plant species randomly from the same regions. We then search medicinal plants books to determine for each of the 300 plants species if there are used to increasing milk production in mothers. Our results show a significant relationship between the presence of white latex and the use of the plant species to treat lactation problems in mothers, providing evidence in support of the doctrine of signatures. Such test of the DOS is rare but necessary to establish if we have global support for the DOS, as an idea that explains how some medicinal plants are selected or as a mnemonic device, the alternative conception proposed.

Keywords: Doctrine of Signatures, Galactogogues, Milky latex.
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A quantitative review of the medicinal plants used in the Chocó biogeographic hotspot (Colombia and Ecuador).

Presenter: Diana Valoyes (Julia F. Morton Award)
Authors: Milan, Diana Carolina Valoyes [1], Macía, Manuel J. [2].

We compile a bibliographic revision to understand the patterns of utilization of the medicinal plants in the Chocó biogeographic hotspot (wet Pacific coast) of Colombia and Ecuador. We compare this ethnomedicinal knowledge between both countries and among different human groups: afroamericans, indigenous, and mestizos. We only reviewed publications based on data gathered from the field, including scientific papers published both in spanish (at the national level) and english (at international journals) in order to avoid duplication of the data. All uses gathered from the references were classified in 19 medicinal categories, although when a use description was incomplete or could not be assigned to a a specific category, we use the term "*Not specified*". A total of 2304 use-records were found in the ecoregion of which 1344 were accepted names for Colombia and 960 for Ecuador. The number of families was similar in Colombia (104) and Ecuador (105), but the number of genera was higher in the first country (360) than in the second one (296). When the most cited famillies were compared, the same similar pattern emerged in both countries, with four families ranked higher among the most important five families: Piperaceae (132 use-records in Colombia vs 65 in Ecuador), Asteraceae (127 vs 83), Arecaceae (66 vs 46), and Gesneriaceae (51 vs 99). From the 167 ailments and diseases treated in Colombia, snakebites (194 use-recods), malaria (100), fever (74), liver disorders (74) and headache (62) were the most cited. In Ecuador, the most important treatment was for snakebites too (209 use-recods), followed by wounds (77), diarrhea (58), fever (58), and kidney disorders (41). The indigenous people had most of the knowledge in the Chocó (54.4%), followed by afroamericans (37.1%), mestizos (8.1%), and non-identified (0.4%). We obtained data for the indigenous groups Tsáchila (348 use-records) and Chachi (299) living only in Ecuador, and Kuna (191), Emberá (43), Zenu (126), and Aúna (6) only in Colombia, and finally Awá living both in Colombia (55) and Ecuador (99). This first approach indicates that still we are far from the understanding of the medicinal flora of this hotspot.

Keywords: Medicinal plants, Chocó biodiversity hotspot, Ethnopharmacology, Quantitative ethnobotany, Tropical Plants, Tropical forests, Ecosystem services.
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The thousand-year history of fig tree and its wasp.

Presenter: Egizia Falistocco
Authors: Falistocco, Egizia [1].

The fig, *Ficus carica* L. is a classical fruit tree of antiquity, it goes back to the beginning of horticulture in the Mediterranean basin. Domestication produced substantial modifications on the primitive characteristics of the fig tree, for example by increasing the sugar content and the size of the fruit and determining a gradual shift toward vegetative propagation. However, in the wild the spreading of the species is entirely dependent on seed. Therefore, wild populations constitute a rich source of genetic variability that should be exploited for the spreading of the fig cultivation and its reintroduction in the areas where it declined. The reproductive biology of *F. carica*, is regulated by a mechanism of extraordinary complexity characterized by the mutual symbiosis between the plant and its pollinator wasp *Blastophaga psenes*, three functional floral forms and two forms of tree. Most cultivars do not need pollination for the development of their fruits because they are parthenocarpic, however they can benefit from pollination to increase the quality of their fruits. From time immemorial the fig has been cultivated along the costs of the Mediterranean Sea where it constituted an essential element in the diet of the populations living in those areas. These people understood well the favourable action of the tiny wasps and devised a special technique, called caprification, to facilitate their entry into the syconia of domestic plants. The conservation of the knowledge of the breeding system of *F. carica* may help to avoid the risk to interrupt the symbiotic relationship between fig plants and their pollinating wasps with the consequent decline of the species. Today interest in this fruit tree goes beyond the productive aspects and extends to its extraordinary adaptive capacities. The fig tree is naturally adapted to dry and arid climates. Due to of its thermophilic characteristics it can be cultivated in marginal conditions and in view of climate change and global warming. The fig tree may grow in hot and dry areas where other species cannot survive.

Keywords: Fig tree, Breeding system, Caprification.
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Einkorn and emmer wheat traditional processing: documentation and comparison from Italy, Turkey and Armenia.

Presenter: Filippo D'Antuono
Authors: Giambanelli, Elisa [1], Ferioli, Federico [1], D'Antuono, Filippo [2].

Einkorn (*T. monococcum* L.) and emmer (*T. dicoccum* (Schrank ex Schübler) Thell.) are hulled wheat species, still grown at different scale and technology level, from Europe to the Caucasus, which uses were recently recovered after a period of decay, especially in Western Europe.

A key step for making them suitable to human consumption is glume removal, that is traditionally achieved by means of stone mills; this operation, however also determines the crushing of kernels in pieces of different size. Therefore, crushed kernels have everywhere represented a basic traditional product from hulled wheats. An exception is represented by the area of Garfagnana, in Italy, where stones of the mills operate at higher distance, so that most kernels are pearled, but not broken.

Recent investigation carried out in different countries, highlighted that in Bulgaria, Turkey and Armenia, broken emmer or einkorn wheat kernels of different grade are still widely used, as typical ingredients for local staple foods, especially in marginal areas, where hulled wheats can still compete with modern cultivars, because of their adaptability and yield stability. In Turkey, einkorn spikelets are generally pre-boiled, then dried, before being crushed for the preparation of bulgur. In Italy the use of crushed kernels is conserved only in some areas, with a tendency however to be replaced by pearling and the use of flours to prepare different kind of also non-traditional products. More modern processing plants, although still operating at small scale, were implemented, to comply with the new needs of obtaining pearled kernel and flour, and a limited amount of crushed kernels.

Investigations were carried about by on-place sampling the processing outputs from two community plants in Turkey, one in Armenia and a small scale modern plant in Italy.

Calculated yield factors varied in the following ranges: dehulling: 0.73-0.81 kg kg^{-1}; food product: 0.82-0.96 kg kg^{-1}; overall yield: 0.42-0.74 kg kg^{-1}. Phytosterol content generally decreased, with respect to whole kernels; higher losses occurred in smaller kernel fractions, due to the loss of the germ.

Apart for the level of technology and demand of labour, traditional and modern plants showed similar physical efficiency.

Keywords: Hulled wheat, Traditional foods, Glume removal, Broken grains, Pearling.
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Kales, underutilised traditional crops from Europe to the Caucasus.

Presenter: Filippo D'Antuono

Authors: Giambanelli, Elisa [1], Ferioli, Federico [1], D'Antuono, Filippo [2].

Kales are primitive leafy forms of *Brassica oleracea* L., locally grown generally at small farm scale, in several European and Black sea area countries. The present interest of kales depends on: a) their deep connection with traditional uses and recipes; b) their content of potentially health promoting compounds, especially glucosinolates.

Kales are often staples in traditional food systems based on local resources, because of their adaptability to relatively low temperatures, making them one of the few fresh leafy vegetables available during the cold season. Within their quite ample native areal, ranging from west Europe, at different latitudes to the Caucasus, their present distribution is quite discontinuous, with areas where they still represent very popular foods and others where they are virtually absent. Kale growing is therefore rather unevenly scattered, and local populations somewhat isolated.

Some common characteristics are however detectable, as a prove of cultural convergence of the use of these plants.

Kales are mostly employed in combination with energetic ingredients, that vary according local availability, from potatoes, to cereal meals, most time corn. When used in soups, these are very often thickened with leftover bread. Kales may also be ingredients of salty pies or simply bread fillings. All these uses generated a series of traditional foods in the different areas.

Some kale populations and local "Cavolo nero" population from the norther Apennines, Portuguese “Couve galega” and Turkish “Kara lahana”, were recently considered for both a comparative analysis of their utilisation schemes and analytical evaluation.

Local populations presented a different level of variability, and selection of different intensity have been applied by farmers or local seed firms. Home consumption is in force everywhere, but the level of exploitation varies from mere selling on local markets, to cutting and packaging, pre-cooking and freezing.

Kales are rich of carotenoids and positively rated indolic glucosinolate glucobrassicin. Glucosinolate retention following boiling was subject to a drastic decrease after 5 minutes of boiling, with some significant differences among populations.

Kales are an example of traditional crops for which the link to local food systems and putative health promotion properties can enhance consumer interest.

Keywords: Kales, Local populations, Traditional foods, Boiling, Glucosinolates.

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Quality of Saint John’s wort (*Hypericum perforatum* L.): an investigation of marketed products.

Presenter: Francesca Scotti (Julia F. Morton Award)

Authors: Scotti, Francesca [1], Agapouda, Anastasia [1], Booker, Anthony [1], Frommenwiler, Debora [2], Reich, Eike [2], Heinrich, Michael [1].

Herbal products are available on the market in different forms. Although in the European Union traditional herbal medicines are now well regulated under the Traditional Herbal Medicinal Products Directive (THMPD), this regulation does not extend to food supplements and, subsequently, safety and quality for such products cannot be guaranteed. In other systems ‘botanicals’ often remain poorly regulated.

Value chain analysis of herbal products aims at promoting better manufacturing practices and more effective regulation, while acting as a driving force for companies to produce better quality products.

An investigation conducted with 42 samples of *H. perforatum* products available for purchase in the UK, Germany, USA, and through the internet has shown significant variations in their chemical profile. The products were investigated using NMR-metabolomics combined with SIMCA Principal Component Analysis and HPTLC for analysis of phenolic compounds.

Extracts and the other investigated preparations were clearly distinguishable and a cluster of products was found showing an extra zone in the HPTLC fingerprint seemingly recurrent in samples coming from China. Among the latter, some also showed adulteration in the form of added dyes (tartrazine, amaranth, sunset yellow and brilliant blue) which possibly helped reaching a (fraudulent) reading compliant to an older pharmacopoeial requirement for hypericin content based on a spectrophotometric assay.

Comparison between THR labelled products and food supplements showed that (except in one case) the THR products are compliant to the HPTLC identification of USP (presence of characteristic bands corresponding to rutin, hyperoside, hypericin and pseudohypericin in comparison to the USP reference extract).

These findings highlight the poor control over the quality of marketed products, which might derive from poor manufacturing practices and insufficient control during production or during gathering of raw material. Following up on this outcome, analysis of the value chain of *H. perforatum* L. products will continue via assessment of the quality of the raw material coming from different cultivation or wild collection sites around the globe.

Aknowledgements: We are grateful to Dr. Willmar Scwhabe GmbH & co. KG, Germany for the funding of this project.

Keywords: *Hypericum perforatum*, Value chain analysis, Herbal remedies, Quality control, Metabolomics, HPTLC.

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First record of Angola's medicinal animals: a case study on the use of mammals in local medicine in Quiçama National Park.

Presenter: Franciany Braga Pereira (Julia F. Morton Award)

Authors: Pereira, Franciany Gabriella Braga [1], Santoro, Flávia Rosa [2], Santos, Carmen Van-Duném [3], Alves, Rômulo R. N. [4].

The products use derived from animals for zootherapy is widespread throughout the world, and it represents a practice dating from pre-history that continues into modern times. The African continent has a rich traditional medicine that employs a variety of products derived from wild animals, including large mammals. However, studies on this topic are rare and in some countries, such as Angola, no research on this subject has been published. Thus, the objective of this study, which was conducted with the human populations living in the Quiçama National Park in Angola, was to investigate the local medicinal uses of mammals. Data were collected between March and August 2014. Informants were selected using the snowball sampling method, in which 27 specialists (26 men and one woman) were chosen from the community. The individuals interviewed were natives of the region, varying in age from 30 to 85. The species that were used for medicinal purposes were identified through semi-structured interviews, which were complemented by a checklist with visual stimuli and the guided tour technique. The animals were identified in the following ways: 1) by their vernacular names, with the help of taxonomists familiar with the fauna in the study site; 2) through the checklist used during the interviews; and 3) by analysing part of the specimens presented by the interviewees. Eight species of wild mammals are used in remedies for treating 12 health problems, with the most frequently cited problems being body pain, weakness and rheumatism. The parts of the species used here included fat, bones, skin, fur and faeces. The mode of application occurs in the form of ashes, cooked to eat, grated to eat and paste, decoction, paste, oil for massage and used to cover the place where the people sleep. In some cases, the exploitation of the species could increase the pressure on them. By contrast, there are cases in which the medicinal exploitation of these animals does no direct harm to the species because their use does not involve the animal's death, as in the case in which the animal's faeces is the principal object sought for medicinal use.

Keywords: Angola, Ethnomedicine, Medicinal Animals, Zootherapy.

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The folk medicinal plants of Dereli (Giresun - Turkey).

Presenter: Gizem Bulut (Julia F. Morton Award)

Authors: Bulut, Gizem [1], Arslan, Ozcan [1], Tuzlacı, Ertan [2].

This paper contains significant ethnobotanical information on folk-medicinal plants and their ethnopharmacological uses in Dereli. The aim of the study was mainly to collect and identify the plants used therapeutically by the local people, and to make available information about traditional herbal medicine. It was undertaken during the period 2004-2005 and is based on plants collected during field work. Sixty-nine plants used in folk-medicine and belonging to 28 families were identified in this study. Of these, 62 species were wild, and 7 species were cultivated plants. The most common families were Rosaceae (14%), Asteraceae (13%) and Lamiaceae (8.7%); and the most common preparations were decoctions (36.7%). In addition, a cultural importance index (CI) and use report (UR) were calculated for each species. Based on the cultural importance index (CI), the most important plants were *Cydonia oblonga* (0.66), *Ecballium elaterium* (0.62), *Allium sativum* (0.65), *Chelidonium majus* (0.57), *Plantago lanceolata* (0.55) and *Plantago major* subsp. *major* (0.55). Traditional folk remedies are still important and used in therapy, especially in the villages in mountainous areas.

Keywords: Ethnobotany, Medicinal plants, Giresun, Turkey.

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Guided wild plant tours and their contributions to the cultural transmission of knowledge in the city of Vienna (Austria).

Presenter: Hanna Grossauer (Julia F. Morton Award)
Authors: Grossauer, Hanna [1], Schunko, Christoph [1], Vogl, Christian [1].

During the 20th century, plant gathering activities decreased due to diverse socio-economic changes, leading to a decline of cultural transmission of knowledge. However, there can also be seen an increased interest in wild plants, reflected by media reports and publications of scientific and popular science. Also in the urban context, gathering is rediscovered in connection with a changing understanding of urban green space functionality, modern lifestyles and new trends in nutrition and self-medication and knowledge gets transmitted through different organized events such as guided tours, workshops, seminars and trainings. The intention of this study was to understand how guided tours on wild plants contribute to the cultural transmission of knowledge about wild plant gathering in urban areas. The transmission of knowledge during five tours in Vienna in autumn 2015 was investigated. Data was collected using participant observation during the tours, structured questionnaires (convenience sampling: 35 excursion participants) and biographical time-line interviews (purposive sampling: 4 guides and 6 participants). Data was analyzed using Spearman's rank correlation coefficient and content analysis. During the five tours, information on 64 plants and their possible applications as food and medicine but also natural cosmetic, custom and construction material was given. The participants were informed about botanical characteristics and distinctive features of plant species and families, suitable gathering spaces and sustainable gathering practices. Knowledge was transmitted by interactively involving the participants and appealing different senses, including plant identification, tastings and simple processing. The informants derive knowledge on wild plants from various sources. Informants, who received practical knowledge within their families, already gathered wild plants as a child and were also predominantly performing gathering activities within the last 3 years. In accordance to this, participants value practical learning, which is provided during guided tours especially for gaining safety in species identification and thereby being able to perform gathering activities. Excursions on wild plants are a comparably new form of knowledge transmission that might contribute to the revaluation of gathering practices in urban areas by providing practical, interactive learning and the exchange of local knowledge on urban gathering.

Keywords: Ethnobotany, Local ecological knowledge, Knowledge sources, Cultural transmission of knowledge, Wild plant gathering, Foraging, Urban non timber forest products.
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Humulus lupulus L. analysis and comparison of volatile of spontaneous and commercial varieties: phytotherapeutic potentialities.

Presenter: Hugo Goes
Authors: Goes, Hugo [1], Sousa, Maria João [1], Pedro, Luis [2].

Humulus lupulus L. is a species in the Cannabaceae family. Hop, as it is commonly known, is a perennial, dioecious and normally diploid (2n = 20) herbaceous plant [1]. It is in beer production that hops have their greatest economic value at the international level. Due to the production of compounds with bactericidal action, in particular against Gram-negative bacteria, the hops came to solve problems related to the conservation of beer [2]. In addition Hops contain compounds that confer sedative, diuretic and antiarthritic properties [3]. In the ethnobotanical use, the dried flowers were used in pillows called "hop pads", to combat insomnia [4]. The use of dried and green hop inflorescences for diuretic uses and disorders of the digestive tract, were verified in the Montesinho park area [5]. In China, alcoholic extracts of hops were used to treat leprosy, tuberculosis and dysentery [2]. Its use in infusions as a tonic, since the middle Ages where it considered a medicinal herb [6]. The results obtained show a certain similarity in the monoterpene component, with β-myrcene as the major compound (more than 64% in cultivar and spontaneous samples) and notorious differences in the sesquiterpene component, evident in cases of α-humulene (12% in cultivars, 0.2% and in spontaneous) and trans-β-farnesene (not detected in cultivars, 9% in spontaneous). Also important is the richness of the sesquiterpene component in spontaneous clone, in particular in the oxygenated compounds. This profile, of both cultivar and spontaneous, shows potential for antiseptic effects in the digestive tract, especially when these are associated with bacteria such as *Helicobacter pylori* [7], which will be in agreement with ethnobotanical uses of Hop. Since there is spontaneous hops in a large part of Portugal, the collection and analysis of the aromas of these hops may lead to the development of new and more fragrances, with interest in different areas, like beer production or cosmetics. The volatile components extracted from spontaneous hops collected in the Bragança area were analyzed and compared with those of commercial varieties.

Keywords: *Humulus lupulus* L., Hop, Medicinal, Monoterpene, Sesquiterpene, *Helicobacter pylori*, Volatile.
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The folk medicinal plants of the surroundings of Lake Abant (Bolu-Turkey).

Presenter: Ismail Senkardes (Julia F. Morton Award)
Authors: Senkardes, İsmail [1], Arslan, Kadriye [2].

This study was made to reveal the plants used as traditional folk medicine in the surroundings of Lake Abant. Lake Abant is a freshwater lake in Bolu Province in Northwest Anatolia, formed as a result of tectonic collapses. The lake covers 1.28 km^2 area and lies at an altitude of 1328 m at a distance of 18 km from the district of Mudurnu and 34 km from the center of Bolu city. On the other hand, the lake and its surroundings are a natural park as called 'Lake Abant Nature Park' which has a rich and various flora due to factors such as climate and land structure. There are 672 taxa (belong to 84 families) included in the flora of the nature park. For this purpose, the field work was done between June - September 2016. The specimens of the plants used as folk remedies, have been collected and the information about the local names, the part(s) used, the ailments treated, the therapeutic effect, the preparation, the methods of administration and the duration of treatment has been recorded.The information was obtained from the native people living in the research area by personal interviews. The plant specimens which are the materials of this study were identified using the "Flora of Turkey and the East Aegean Islands" and they are kept in the Herbarium of the Faculty of Pharmacy, Marmara University (MARE). As a result of identification of the plant specimens, total 57 taxa used as a traditional folk medicine in Abant, were determined. According to the majority of the plants which have similar usage, the plants are mostly used for the integumentary system, digestive system and urinary system diseases.

Keywords: Ethnobotany, Folk medicine, Abant (Bolu), Turkey.
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Geographic variation in ethnobotanical knowledge, value and practice related to *Castanea sativa* in Turkey.

Presenter: Jeffrey Wall
Authors: Kose, Nesibe [1], Wall, Jeffrey [2], Elif, Aksoy [3], Coskun, Kose [4], Taner, Okan [5].

Beginning with the early biogeographical assertions of Nikolay Valilov, there has been an acknowledged correlation between the present-day morphological and genetic diversity of important plant species and the geographic area of their domestication. However, the anthropogenic maintenance of this diversity over millennia is less well understood. Our study approaches knowledge, value and practice related to European chestnut Castanea sativa in its center of diversity in Turkey as indicative of operating sociocultural behaviors toward the species. We conducted interviews and ethnobotanical exercises with 96 chestnut-utilizing households in 10 provinces across Turkey. Our exercises focused on 1.) varieties used, 2.) estimated number of trees of each variety, 3.) uses and plant part used, and 4.) the plant trait most important to each use. Presented here are the results and analyses from this study. Utilized parts of the tree included timber, nut, flower, leaves, and husk. The value and knowledge of these respective plant parts to communities as well as their relative proportional usage varied significantly geographically. As a plain example, in the Eastern Black Sea region, flowers of the tree were reportedly much more valuable than the fruit due to a local preoccupation with honey making. On the other hand, chestnut fruit production is a recent, yet premier economic activity for people in the Aegean region. This geographic variation in utilization is associated with assemblages of ethnobotanical knowledge of, value for and practices with the species, as evidenced by various culinary traditions, locally adapted livelihood technologies, linguistic variation, poems, legends and more. Additionally, globalization in the form of rural out-migration and relentless exotic pathogen outbreaks guarantees that time and age is a prominent factor in our study. In some cases, where the tree no longer produces anything of value, knowledge and value linger on. In other cases, where local tree populations are abundant, knowledge and value face extinction. We observed that ethnobotanical knowledge and value maintained by the old is more substantial than that of the young. For this reason, we argue that it is important to promptly engage ethnobotanical knowledge, value and practice related to threatened tree species in rapidly-developing nations.

Keywords: *Castanea sativa*, Turkey, maintenance of diversity.
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Inchatoshi, *ivenki*, *ivinishi* - plants from the forest and the garden of the Asháninka people from the Peruvian Amazon.

Presenter: Joanna Sosnowska
Authors: Sosnowska, Joanna [1]; Monika Kujawska [1]

Asháninka indigenous people from the Tambo river region in Peruvian Amazon are the largest group of the Arawak linguistic family in Peru. They are renowned for their long trajectory of horticulture and their preference to settle along big navigable rivers. Nowadays, these peoples dedicate themselves to subsistence agriculture and fishing complemented with cash crop growing, such as cocoa and coffee. We display methodological considerations in conducting ethnobotanical studies among indigenous groups of the Amazon. We also present preliminary results from our fieldwork among Asháninka people done in 2016. We put the emphasis on medicinal plant use in the whole spectrum of ethnomedical practices among the study community. The special classificatory categories evoked here are plants from the forest *(inchatoshi*) and plants from the garden (*ivenki, ivinishi*).

Keywords: Arawak linguistic family, Ethnomedicine, Free listing.
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The tradition of using Devil Rib (*Cirsium oleraceum*) as a magical remedy in Poland.

Presenter: Joanna Sucholas
Authors: Sucholas, Joanna [1].

During research conducted in Poznan (capital of Great Poland), on plants offered in the open-air market places, dried cabbage thistle (known as devil rib) was discovered to be sold as a healing and magic remedy. The tradition of using devil rib can be traced back to the 19th century. The oldest source, from 1898, says that devil rib played a large role in the folk medicine of polish people lived in Great Poland. They used it to cure disease caused by witchcraft, by adding the dried herb to a bath. In that time, devil rib was the main remedy used by the old women who were local healers, known as “madre”. The baths were recommended to ward illnesses such as weakness, nervousness, headache (caused by so called “bad or evil eyes”). Research conducted between 2013-2017 shows, that the sale of devil rib in open market places is diminishing and is shifting to pharmacies and herbal stores. The customers and sellers interviewed were from the area of Poznan and smaller, surrounding towns. There is still a large demand for devil rib. Typically, clients are women at the age of 30 or about 70. Most buyers use devil rib regularly. The interviewers use it for every disease as first aid also when other treatments do not help, or if they cannot explain the illness. Most commonly described uses are to treat “bad or evil eyes”, nervous children, bad mood, unhappiness, bad luck and skin problems. Nowadays people also make a bath with this herb. The knowledge about the magical properties and uses of cabbage thistle is transferred orally from generation to generation (from grandmothers, aunts, etc.). Worth underlining is that this belief was, and is, currently limited to the capital of Great Poland and the surroundings. It is difficult to find information about the magical purposes on the internet. *Cirsi oleracei* herba is described in herbal books but recommended as a tea for inflammation but without any magical purpose. Further research is needed to evaluate the range of usage and to gain deeper understanding of this social phenomenon.

Keywords: Magical herb, Urban ethnobotany.
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Garifuna plant knowledge and natural resource management in the Sarstoon-Temash Region.

Presenter: John Stepp
Authors: Stepp, John Richard [1].

This project was undertaken to document the traditional knowledge and natural resources management of Garinagu people living adjacent to a recently created national park. The goal was to document their long term use of the land and sea along with their sophisticated understanding of the local environent. Land tenure in the region is tenuous at best and community leaders expressed interest in using this research to strengthen their claims. A comprehensive inventory of plant (and animal but not included here) resources (both wild and cultivated) was compiled. Community members were asked to provide a free recall listing of all plant species of which they have knowledge. After the inventories were elicited from each subject, the interviewee was queried about who normally consumes each item, whether and when the respondent has ever eaten it, and whether there are any special uses for it. All survey instruments were done in Garifuna. Cultivated plant surveys were also undertaken. Homegardens often contain a great diversity of cultivated, semi-managed and tolerated plant species. Micro-ecological differences, food preferences and access to productive arable land are reflected in the wide variability of species composition of homegardens. Survey methods were based on prior homegarden research and included walk-through interviews, transect mapping, plant name eliciting exercises, and follow-up semi-structured interviews on homegarden resources and productive practices. Complementary environmental and cultural information was collected through ethnographic interviews and audio/video recordings. These interviews were conducted mainly in Garifuna and involved elicitation of histories, songs and rituals related to the biophysical environment and region. An effort was made to interview a broad range of community members. Before recording any cultural information the team consulted with the community regarding any sensitive information.

Keywords: *None specified*.
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Magical-religious remedies for remove warts: an ethnobotanical study in the Arribes del Duero Natural Park (Salamanca-Zamora, Spain).

Presenter: José Antonio González
Authors: González, José Antonio [1], Ramírez-Rodríguez, Rubén [2], Amich, Francisco [2].

Caused by infection with the human papilloma virus, warts are-were an important dermatological illness in Spanish ethnomedicine, not only for its frequency (very common), but also for the large volume of traditional knowledge amassed. At the present day, there are many treatments and procedures associated with wart removal: cutaneous treatments containing, for example, salicylic acid in a higher concentration, cryotherapy, laser treatment, etc., but in rural communities many folk remedies based on the topical use of some plant species are still in use. Additionally, a variety of plant-based rituals claim to be able to remove warts were-are implemented. Considering the process of disarticulation of the traditional agrarian systems, the depopulation and population ageing of the rural areas, and the breakdown of oral transmission of the local knowledge, in this communication we are presenting the list of rituals used in the Arribes del Duero area, located to the west of the provinces of Salamanca and Zamora (western Spain). Based on 116 semi-structured interviews of 80 non-specialist people (mean age, 72 years), different healing rituals were reported, highlighting the magical use of 10 species of trees and shrubs, belonging to seven botanical families. The two most important ritual types involve the making of small rings with the flexible branches of certain shrubs (e.g. *Cytisus scoparius* (L.) Link, *Retama sphaerocarpa* (L.) Boiss) or the collection of leaves of emblematic tree species such as the holm-oak (*Quercus rotundifolia* Lam.) or the olive tree (*Olea europaea* L.). These mentioned rings and leaves (as many as warts you want to remove) are passed over the warts and then placed under a stone in a place away from the village (you cannot go back there until the warts disappear). It is believed that when these vegetal elements dry out, the warts will dry out as well.

Keywords: Healing rituals, Herbal remedies, Warts, Spanish ethnomedicine.
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When we abandoned the cultivation of chestnut trees (*Castanea sativa* Miller) and began to collect wild chestnuts?

Presenter: José Martínez

Authors: Martínez González, Jose [1], Díaz González, T.E. [2], Lastra Menéndez, J.J. [3].

Asturias, is located in the south-western end of Europe and in the north-west of the Iberian Peninsula. According the bioclimatic characteristics and its vegetation, it is located biogeographically in the *Eurosiberian Region*, *Atlantic Province*, *Cantabro-atlantic* and *Orocantabrian subprovinces*. Its macrobioclimate is *temperate atlantic* with a certain *submediterraneidad*, concentrating the maximum precipitations in spring and winter, and it is characterized by the lack of a summer drought period. These bioclimatic conditions, together with favorable soil conditions, facilitates growth in the low zones (thermotemperate (0-90) and *mesotemperate* (90-700 (900))m), of chestnut forests of anthropic origin, that harbor a wide biodiversity. The total surface area of chestnut forests in Asturias is 120,000 ha, mostly in mountain forest for timber products. The chestnut tree has had great cultural importance in Asturias. The diversity of uses, the great amount of phytonyms found, the wide variety of fruits, chestnuts, which are only propagated by grafting, and the wealth gastronomic linked to its consumption, make it clear. At present, the abandonment of the rural world, coupled with the changes in overcoming food, they have changed traditional uses of chestnut tree. The chestnut isn't longer a crop, it is a wild fruit collected. In this work we collect the Traditional Knowledge about the popular uses related to the consumption of chestnuts and the management of chestnut tree in Asturias. Knowledge and uses today are nearly lost, that only survive in the memory of our elders. The loss of traditional knowledge associated to management of chestnut tree, is one of the largest and most important cultural losses in the Asturian rural world, where the grafted varieties are also missing, assuming a significant loss of biodiversity. However, the different varieties of chestnut trees in Asturias have been collected and characterized by the technicians and researchers of the SERIDA (Servicio Regional de Investigación y Desarrollo Alimentario) and, mainly, of the CETEMAS (Centro Tecnológico y Forestal de la Madera), sponsored by the Government of Asturias, in order to alleviate the loss of biodiversity.

Keywords: Traditional knowledge, *Castanea sativa*, Neglected and underused resources, Chestnut trees, Chestnuts.

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Traditional Use of wild plants in Samobor Area (Northwest Croatia) – loss of knowledge within a century.

Presenter: Katarina Malovec (Julia F. Morton Award)

Authors: Malovec, Katarina Husnjak [1], Mitić, Božena [2], Alegro, Antun [2], Łuczaj, Łukasz [3].

Only scarce and unsystematically gathered data is available on traditional knowledge of wild plants use in the continental part of Croatia. Recently, this knowledge has been exposed to irreversible loss, especially in rural areas suffering rapid depopulation and disappearance of elderly inhabitants, the ones still keeping the knowledge, and both influenced and modified through diverse modern media.

Supported by the former *Yugoslav Academy of Sciences and Arts*, Milan Lang gathered and systematized altogether ethnographic material on the folk heritage in Samobor area at the beginning of the 20th century, including wild plants use. Lang's records had been published through 8 volumes of *Collection on the Folk Life and Customs of the Southern Slavs* from 1911 to 1915, when it was finally printed as one tome, containing more than 1000 pages, entitled *Samobor – the Folk Life and Customs*. Although considered the top piece of Croatian ethnology, Lang's work has been unfairly overlooked and unknown to the wider public.

The aim of this research was to gather the traditional knowledge of wild plant use in this area nowadays, and also to observe and analyse changes which have appeared within the last century. According to data gathered during contemporary field work that has been conducted among the inhabitants of Samobor area, there has been evident loss of traditional knowledge and many local specificities. Many of the wild plants Lang recorded as useful 100 years ago are no longer in use, some of them are not even known amongst local inhabitants any more, at least not by the local names. This indicates that the traditional knowledge is disrupted and it becomes unified under the influence of modern media. As a result of significant lifestyle changes, such as the abandonment of extensive agriculture and the traditional way of living, also gradual changes of vegetation have occurred. This process leads to habitat loss, which can affect some wild plant species, including those important in traditional use.

Keywords: Traditional use, Ethnobotany index, Wild food plants, Samobor, Croatia, Traditional knowledge, Medicinal plants.

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"*The Virgin and Child with St. Anne, St. Joachim and a Donor*" - a botanical perspective.

Presenter: Luis Mendonça de Carvalho

Authors: Carvalho, Luis Mendonça de [1], Fernandes, Francisca Maria [2], Nunes, Maria de Fárima [3], Lopes, Miriam [4], Costa, Ana Maria [5], Nozes, Paula [6], Albuquerque, Sara [4].

We studied the Flemish painting *The Virgin and Child with St. Anne, St.Joachim and a Donor*, created by an unknown painter in the middle of the XVI century to identify the plants depicted on it and the Christian symbology associated with them (grapes, carnations, iris, flax, cedar, cypress, roses, etc.). This painting is currently kept at the National Museum of Ancient Art, in Lisbon.

Keywords: Symbology of plants, Christian art.

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Gastronomic ethnobiology of *Terites*: indigenous food specialty of Batak Karo people in North Sumatra, Indonesia.

Presenter: Lukas Pawera (Julia F. Morton Award)

Authors: Purba, Endang Christine [1], Pawera, Lukas [2], -, Nisyawati [1], Silalahi, Marina [3].

Terites is a traditional food of Batak Karo ethnic group, which is cooked with a juice of partly digested food (chyme) of slaughtered cattle. The stomach juice serves as a soup base, cooked together with certain wild and cultivated vegetables, aromatic herbs and possibly also meat. The objectives of this ethnobiological study were to describe Terites preparation, document plant species used and to discuss possible implications for the human nutrition. The data were gathered through individual interviews and group discussions with informants from 6 villages in Karo regency of North Sumatra. The plant specimens were collected in the field and identified taxonomically. A total of 29 plant species belonging to 17 families were used to prepare Terites. The main rationale behind consuming this indigenous food was its perceived medicinal value, particularly for the treatment of digestive disorders. Karo people use several lesser-known wild food plants for preparation of this local specialty. To best of our knowledge, consumption of chyme in tropical Asia is so far unique solely to the Batak Karo people. The present ethnographic record of consuming chyme as a medicinal food is also discussed in the context of paleodietary reconstructions. This extraordinary food heritage of Karo indigenous gastronomy, based on traditional knowledge, indicates rich foodscapes and bio-cultural diversity of the Batak Karo ethnic group.

Keywords: Medicinal food, Indigenous gastronomy, Stomach content, Wild food plants, Food diversity.

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Ethnobotany in the Sanabria region (Spain) and its potential in rural development.

Presenter: Luz María Muñoz

Authors: Rubio Guerrero, Esther [1], Delgado Sánchez, Luis [1], Muñoz Centeno, Luz María [1].

The loss of the traditional knowledge that has been accumulated during thousands of years and that has contributed to the survival of the communities, implies a cultural impact that causes the reconsideration of the significance and the need of gathering this knowledge before its total disappearance. Sanabria (Zamora, Spain) is an area floristically rich and little studied from the ethnobotanical point of view, with the aggravating fact that it is suffering a great depopulation. This study tries to gather the traditional knowledge in this area through the municipalities of Galende, Puebla de Sanabria, Robleda-Cervantes, Cobreros, Rosinos de la Requejada, San Justo, Pedralba de la Praderia, Galende, Requejo de Sanabria, Porto de Sanabria, Palacios de Sanabria, Lubian, Hermisende y Pias. More than 100 informants have been interviewed with an average age of 75 years old. The traditional knowledge obtained is variable, finding some informants, which shows a good knowledge of the traditional use of plants. The species most often cited are *Sambucus nigra* L., *Urtica dioica* L., *Chelidonium majus* L., *Achillea millefolium* L. y *Gentiana lutea* L. We have found 130 species and subspecies with popular uses, of which the majority are wild. Traditional use compilated was diverse: medicinal, veterinary, human and animal food among others. This work, tries to contribute to the recovery of the traditional cultural heritage related to the use of plants that the inhabitants of the Sanabria have developed during a long time. We will study how the ethnobotanical knowledge can promote sustainable rural development in this area.

Keywords: Ethnobotany, Sanabria, Spain.

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Herbal markets of the Pucallpa city, Peruvian Amazon.

Presenter: Manuel Pardo-de-Santayana (Julia F. Morton Award)

Authors: Lipenský, Jiří [1], Bortl, Ludvík [2], Horáčková, Jana [3], Chuspe Zans, Maria-Elena [3], Jauregui García, Xabier [4], Clavo Peralta, Zoyla Mirella [5], Pardo-de-Santayana, Manuel [4], Mixa, Miroslav [1], Lojka, Bohdan [1].

Urban environment usually provides dynamic exchange of plants and knowledge amongst different cultures and societies. Pucallpa, the capital of the Ucayali region, is one of the fastest growing cities in the Peruvian Amazon, and is considered the center of the country's timber industry. Medicinal and magical plants commercialized in informal local markets were studied in the timespan of 2003-2008 and 2013-2016, in order to document and analyze their taxonomy, management status, plant parts and products used, indications, preparations and administration. Semi-structured interviews with 42 respondents were carried out. Detailed information about all the unpackaged plants sold in the markets was collected. From collected material, a total of 242 plants were identified to genus so far (ca 168 to species) and 14 still remain unidentified. They belong to 69 plant families; the commonest being Fabaceae with ca 11% (28 spp.) of all species, followed by Araceae (19 spp.), Moraceae (13 spp.), and Solanaceae (11 spp.). The mostly used were herbaceous species 49% (127 spp.) succeeded by trees 29% (75 spp.), shrubs 10% (25 spp.), and vines 8% (21 spp.). Other life forms include three palm species, two species of cacti, ferns and one cycad. About 50% of the species were collected in the wild, 31% were both collected from the wild and/or managed, and only 19% were exclusively managed. The majority of marketed species are native to Amazonian lowlands habitats, although a few come from tropical montane forests, Andes or the coast. But many species were introduced from different regions of the world. Most often used parts were leaves and whole aerial parts, than roots/tubers and bark/stems (wood). Other plant parts used were bulbs, flowers, fruits, seeds, and exudates such as resins or latexes. The remedy with the most cited uses was bark of *Maytenus ebenifolia* Reissek/*M*. sp. (75), followed by oleoresin of *Copaifera* spp. (71), and by aerial part of *Jatropha gossypiifolia* L. (54).

Keywords: Medicinal plants, Peruvian Amazon, Traditional medicine, Urban ethnobotany.

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Fruits and seeds diversity consumed by *Dipodomys phyllipsii* in Oaxaca, Mexico.

Presenter: Margarita García-Luis (Julia F. Morton Award)

Authors: Martínez Ayón, Yazmín del Mar [1], García-Luis, Margarita [1], Briones-Salas, Miguel Ángel [1].

Dipodomys phillipsii oaxacae is a subspecies of rodent endemic to the state of Oaxaca, considered threatened by Mexican government regulations (NOM-059-SEMARNAT-2010), and is subject to a strong fragmentation process of its habitat. Based on a year of sampling, the potential dietary diversity of this subspecies was determined between transects and seasons in Cosoltepec, Oaxaca. Mice were captured manually and the seeds were removed from their pockets. Seeds were counted on 86 individuals, 48 morphospecies were obtained, 70% smaller than 6 mm in length, *Crusea diversifolia* was the most frequent species (FA = 0.3605, PA = 14.97). Among transects, significant differences were found, the School Parcel recorded the highest number of seed species with 36. In terms of diversity, Tres Cruces recorded the greatest diversity (H'= 2.27), a dominance of 0.206 and equity of 0.689. During the dry season, there was a greater diversity (2.47) in relation to the wet season (2.22), and no significant differences were found in both seasons. For the genus *Dipodomys*, six species have been reported as part of their diet and for the species only one has been reported (*Taraxacum* sp.), So this work increases six times the potential list of seeds consumed and is the first contributions to Know the diet of the species. However, it is necessary to continue studying their diet, because according to the estimated, there are still missing species to register.

Keywords: *Crusea diversifolia*, Diet, Rodents, Seed diversity.

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Comparative functional anatomy of three endangered woody species in Nigeria.

Presenter: Maria Nwosu

Authors: Nwosu, Maria Obiageli [1], Ayogu, Virginus Okwudili [1].

Functional wood anatomy of three timber species *Prosopis africana* Guill. and Per. (Fabaceae), *Artocarpus heterophyllus* Lam. and *Treculia africana* Decne. (Moraceae) in Nigeria was studied using representative samples of each species randomly collected from its natural region of provenance. All species are trees of moderate or lofty heights. fibre length (FL), fibre diameter (FD), fibre lumen diameter (FLD), fibre cell wall thickness (FCWT), vessel diameter (VD), vessel lumen diameter (VLD), vessel cell wall thickness (VCWT), Slenderness ratio, Runkel ratio and coefficient of Suppleness were used for assessment. Significant differences occurred in the three species in their fibre length (FL), fibre cell wall thickness (FCWT), vessel diameter (VD), vessel lumen diameter (VLD) and vessel cell wall thickness (VCWT) at ($P \leq 0.05$). Some qualitative differences were observed; aliform-confluent axial parenchyma in *A. heterophyllus* and *T. africana* and vasicentric axial parenchyma in *P. africana*; end walls slightly nodular in *P. africana*; end walls dissolved in *A. heterophyllus* and *T. africana*. The tangential longitudinal section (TLS) of *A. heterophyllus* showed the longest ray width with multi-seriate rays 1-5; 1-3 cells in *T. africana* and *P. africana*. Rays are heterocelullar - procumbent/upright cells in radial longitudinal section in *A. heterophyllus* and *T. africana*; predominantly procumbent in *P. africana*. The three species exhibited reticulate pitting in their perforation plates; vessels are diffuse porous and in radial multiples in the three species; vessel frequencies of *T. africana* and *A. heterophyllus* differed significantly from that of *P. africana* ($P \leq 0.05$). Annual rainfall has a reverse influence on the vessel frequencies of the three species in the two ecological zones. The properties of fibres and vessels of the woods of the three trees were used to determine which one was the most suitable for pulp/paper or toilet tissue production and timber; which of the three species proved to be the most resistant to compression, tension, stresses eg. as poles for electricity, railway sleepers, ship/canoe, termite attack as well as microbial degradation and the suitable for building. By extrapolation, *T. africana* and *A. heterophyllus* will make better pulp/paper and tissue than *P. africana*.

Keywords: Wood-Anatomy, Anatomy, Endangered, Nigeria.

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Join the Biocultural Collections!

Presenter: Mariah Huelsmann (Julia F. Morton Award)
Authors: Huelsmann, Mariah Elisabeth [1], Salick, Jan [2].

Biocultural Collections are plant and animal based objects of social significance. These items have practical and/or spiritual importance. From religious relics, medicines, and clothing to baskets and tools, biocultural items are found everywhere. At least 215 Institutions house biocultural collections and are members of SEB's Biocultural Collections Network. These members are Botanical Gardens, Museums, and Universities to Research Institutes, Tribes, and Foundations. The countries represented come from every continent, except Antartica; at least nine North and South/Central American countries, South Africa and the Congo, at least thirteen European countries, four Asian countries, Australia, New Zealand, and Guam. To join the Biocultural Collections Network, see us or go to the Society for Economic Botany's home page (www.econbot.org), click Education and Outreach Tab, click Resources, and click Biocultural Collections.

Keywords: Biocultural, Biocultural collections, Ethnobotanical, Ethnobotanical collections.
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Medicinal and other useful plants in *Historia Naturalis Brasiliae* (1648): have plant uses and names changed in Brazil over time?

Presenter: Mireia Alcántara Rodríguez
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The *Historia Naturalis Brasiliae* (1648) is one of the first treatises on medicinal tropical plants and human diseases. The authors, the naturalist George Marcgrave and the physician Willem Piso, depicted the characteristic flora, plant uses and plant vernacular names in Dutch Brazil. We aim to identify the useful plant species and find out if they are still used the same way and are known by the same names in Brazil today. We used herbarium vouchers and taxonomic tools to identify the species described in Marcgrave and Piso's work. We used historical and contemporary literature to compare the past plant uses and names with the modern ones. In addition, we highlighted the species of African origin because their presence proves the plant dispersion overseas via the transatlantic slave trade, and the consequent exchange of African ethnobotanical knowledge with Amerindians. Out of the 378 species reported by Marcgrave and Piso, we encountered 256 (68%) useful plants. These plants were mostly used as medicine and food, both in the 17th century and present-day Brazil, showing greater differences in medicinal use and fewer changes in food use over time. Brazilians have now also extended their plant use to other categories, like ornamental. We found that several vernacular names (63%) are still used in Brazil. More species are being used for medicinal purposes today than in the past, and several vernacular plant names have been preserved, which has contributed to the preservation of the native language. The presence of species of African origin proves that they were used by African slaves and other ethnic groups in Brazil in the 17th century. In this study, we demonstrated the ethnobotanical importance of the *Historia Naturalis Brasiliae* as a tool to preserve Amerindian plant uses and names throughout the past 350 years.

Keywords: Marcgrave, Piso, Medicinal plants, Dutch Brazil, Vernacular names, Ethnobotany.
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Gathered food plants in the Northern of Morocco.

Presenter: Mohammed Ater (Julia F. Morton Award)
Authors: Ater, Mohammed [1], Bensbih, Hasnae [2].

Gathered food plants are not domesticated species, but consumed by the local populations. Besides the food and economic interest, they have an important sociocultural value as traditionalknowledge. An ethnobotanic study was done to contribute to the knowledge of these plants, the know-how associated with their uses and their marketing. The inventory of the species used for the research was taken, as well as the recognition and typology of the usesby the local population. Research was conducted in the popular markets of the northwest zone of Morocco. Culturally and ethnically this region is a part of the country Jbala. Research schedule consisted of the following two different timetables:

i) Weekly follow-up which lasted one year for an urban souk (SaniatRmel, Tétouan)

ii) Seasonal follow-up for urban and rural souks covering a wide territory. The results obtained showed an important floristic diversity. Indeed, we have identified 37 species consumed and which are distributed among 19 botanical families; mainly Asteraceae and Lamiaceae. These plants are mainly weeds harvested from cultivated fields (68%), the rest is harvested in natural formations (32%). A typology of uses has been made;the species are consumed in four forms: fruit (17%), vegetable (59%), salad (12%) or condiment (12%). The commercial and cultural aspects are discussed.

Keywords: Gathered plants, Local, Ethnobotanic knowledge.
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The neglected and/or underused forest tree species: case of the carob tree (*Ceratonia siliqua* L.) from picking to practice and use diversity.

Presenter: Mohammed Ater
Authors: Younes, Hmimsa [1], Salama, El Fatehi [2], Ater, Mohammed [3].

According to FAO, more than 7,000 species are grown or harvested in the wild for food, throughout the world. However, Agronomic research has concentrated all its efforts on a small number of so-called major crops, because they form the basis of global food security. So, there are many species in natural ecosystems as well as in traditional agroecosystems that can be described as neglected (No research or promotional efforts) or underused (Potential under-estimated or under-exploited). Because they have been neglected by researchers, their agronomic characteristics, the potential for improvement in their yields and quality is little known. Of the same, a little effort has been made to identify markets and marketing. Therefore, no framework exists to promote their use and maximize their economic value. In Morocco, The carob tree is an excellent example of a neglected resource where it is considered as a forest tree. Indeed, despite its economic importance, exploited populations are exclusively spontaneous. There is no carob orchard's to and there is no selected variety However, compared to cereals or fruit species in unfavorable conditions, the carob tree is economically more profitable. Through this communication, we will present some characteristics of this tree with fruit potential (Agro-ecological zone, exploitation forms, productive potential, income, uses, ...), its place in the traditional agroecosystems and the interest it raises in the local population (practices, traditional knowledge, …). The prospects of valorization through the development of a sector of the culture of carob tree in Morocco will be discussed.

Keywords: Rif, Agroecosystems, Carob, Neglected and underused resources.
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Traditional knowledge and valorization of low value fruit in the oasis of southern Morocco.

Presenter: Mohammed Ater

Authors: Ater, Mohammed [1], HOUSNI, Mhamed [2], EL MAHROUSSI, Mohamed [2], Younes, HMIMSA [3].

The oasis agroecosystem is characterized by its structure in three strata: i) the date palm stratum, ii) the fruit tree stratum, and iii) the herbaceous stratum (legumes, cereals and market gardening. While this production system is very intensive, it is based on the exploitation of a great wealth in agrodiversity. Indeed, although the first stratum is formed by a single species, the date palm (*Phoenix dactylifera* L.), the varietal diversity is impressive. There were two groups of exploited varieties: (i) The khalt from natural spontaneous seedlings (hybrids whose parents are unknown) and accounting for more than 55% of the total of palm tree; (ii) The varieties and cultivars identified and vegetatively propagated that recognized 453 cultivars. It is therefore normal that varieties producing dates with satisfactory quality for commercialization represent a small percentage and a large part of the production is unfit for commercialization. For this reason, the farmers have sought to increase the value of the low-value dates by different processing methods such as the production of traditional syrup of dates "Tahlaoute" or a date juice flavored by plants "Tassabounte". At the level of the fruit tree stratum we observe also great diversity. Among the fruits exploited, the peasants resort to processing whether for the low value of the fruit or because of the overproduction. In some oasis, grenadier (*Punica granatum* L.) offers a particular example to be compared with that of the date palm but on another scale. In fact, in the oasis, we can observe the coexistence of two types of varieties, known and vegetatively propagated varieties and other spontaneous varieties derived from the germination of seeds. The latter type produces acidulous fruits and is inappropriate for consumption. The farmers have developed traditional methods to enhance this unsuitable production by the production of syrup "Amghaouss" with food and medicinal properties. The recognition, valorization and conservation of this traditional knowledge are discussed and the gender dimension is highlighted.

Keywords: Local knowledge, Low value fruit, Oasis.

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Traditional medicine in a modern world.

Presenter: Nanci Ross (Julia F. Morton Award)

Authors: Patel, Arti [1], Ross, Nanci [2].

In the United States, traditional medicine is commonly viewed as non-scientific and backwards. Despite this, the use of herbal and traditional remedies has persisted, especially in immigrant populations. Studies in large urban centers like New York have shown that immigrant populations are still utilizing alternative and traditional medicine from their home countries. This study investigated the use of traditional medicine by 1st and 2nd generation Indian-Americans in the United States. Common remedies, their biochemistry, and integration of Western medicinal practices with traditional medicine were examined using standardized questionnaires, semi-structured interviews, and lab analyses of the most commonly cited herbal components. As traditional knowledge systems are constantly evolving and adapting to changes, this study offers insight into current public health perceptions in a multicultural society.

Keywords: Urban ethnobotany, Traditional medicine, Indian-American, Herbal remedies, Urban center.

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Bringing together technologies from past and present to discover the "food of the gods", *Diospyros virginiana*, American persimmon.

Presenter: Nanci Ross (Julia F. Morton Award)

Authors: Ross, Nanci [1], LeFevre, Gabriella [2], Dhugga, Kirpal [1].

Archaeological and historical records provide evidence of the extensive use and management of American persimmons by Native Americans prior to European arrival. Such management has been shown to have evolutionary effects. Variation in the sexual system of American persimmon (*Diospyros virginiana*, Ebenaceae) suggests selective effects of ancient Native Americans for increased fruit production. American persimmon today is a rare, weedy species that is classified as strictly dioecious, yet, divergence from dioecy has been reported. DNA was extracted from both field collected and herbarium specimens from across the range as well as from five different American persimmon cultivars for Genotyping-by-Sequencing (GBS) analyses. GBS is a conceptually simple, yet powerful form of genome-wide genetic analysis, especially for resolving challenging phylogenies. The goal is to begin building a map of genetic structure and diversity of extant *D. virginiana* populations that will be compared with historical records of Native American settlement patterns. This project combines modern next-generation sequencing technologies, traditional morphological field studies, and biogeographic analyses to explore the complex question of long-term legacies of ancient selection in a historical managed native fruit tree.

Keywords: *Diospyros virginiana*, Persimmon, GBS, Land-use legacies, Leaky dioecy.

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Local ecological knowledge of the Kuy people in Prey Lang, Cambodia.

Presenter: Nerea Turreira (Julia F. Morton Award)

Authors: Turreira Garcia, Nerea [1], Argyriou, Dimitrios [1], Chhang, Phourin [2], Srisanga, Prachaya [3], Theilade, Ida [1].

Indigenous peoples and forest-dependent communities are known to hold a unique knowledge on natural resources within their surrounding environment. However, worldwide environmental degradation diminishes the availability of natural resources threatening the bio-cultural survival of indigenous and local people. The aim of this study was to document the local ecological knowledge (LEK) of the Kuy people that live in the vicinity of one of Cambodia's last remaining lowland rainforests. Fieldwork took place during September 2014, from April to May 2015 and in December 2016. Participatory mapping exercises and free-listings with 31 informants and botanical collections and focus group discussions with 12 key informants were conducted across three villages in Preah Vihear and Stung Treng provinces. A total of 372 useful ethnospecies were recorded of which 330 were collected (300 taxa). The species were mostly used for medicinal (69%), edible (29%) and construction purposes (21%) with many species having multiple purposes. Most important forest resources for the Kuy people were resin trees of the genus *Dipterocarpus*, species of which are listed as endangered by the IUCN. Men and women knew a similar number of useful plants; their knowledge differed in the specific plants used, especially regarding medicinal and edible plants. Remoteness from asphalt roads and closeness to the core of the forest related to higher number of plants known. Respondents collecting useful plants in a variety of habitats possessed more unique plant knowledge. This indicates that landscape level conservation including a mosaic of forest types is essential for the LEK of indigenous peoples.

Keywords: *None specified*.

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Global medicinal plant markets: panacea or disaster - a SWOT analysis.

Presenter: Patrick Van Damme
Authors: Van Damme, Patrick [1].

Worldwide, but especially in Africa, people have been, are still and will continue to use medicinal plants to cure all types of human (and animal) diseases. Numerous plants have compounds of interest for the pharmaceutical industry. However, overexploitation/ overharvesting from the wild, driven by 'promising' markets and prospects of quick benefits may alter and even annihilate the often precarious natural resource basis. Through a number of telling examples from the field (with an emphasis on perennials from the African tropics), we will try to address/define strengths, weaknesses, opportunities and threats (SWOT) to developing medicinal plant markets. Recommendations for improvements on existing mishaps will be sought and discussed.

Keywords: Ethnomedicine, Value chains, Medicinal plants
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Plant uses and shifts in two communities from a coastal environmental protected area in southern Brazil.

Presenter: Rafaela Ludwinski (Julia F. Morton Award)
Authors: Ludwinski, Rafaela H [1], Hanazaki, Natalia [2].

Coastal areas in tropical countries are rapidly evolving due to tourism and urbanization. The development of infrastructures and economic growth, and the creation of protected areas to conserve the nature remnants in this complex scenario, can transform coastal areas in a short period. These transformations can influence local knowledge and its practices, causing changes over time. This ethnobotanical study investigated local knowledge of plants and its shifts, in terms of plant use losses, in two communities, Areias de Baixo and Costeira da Armação, within the Anhatomirim's protected area in Governador Celso Ramos, Santa Catarina – Brazil. We interviewed 125 inhabitants after prior informed consent, and identified 231 plants species. Most of them are still in use, mainly as food and medicine. It was also observed that most of the cited plants were exotic and cultivated in home gardens. Plants with past uses composed a set of memories most related to childhood, while another was related to daily practices. The loss of plant uses from daily practices, such as species used for construction, can be a combined result of two situations. The first is related to a change in career choice of the residents and the second is related to environmental protection legislation of the Atlantic Forest and the creation of the protected area. While recognizing the importance of the protected area to keep local people and their traditions, we documented a shift in plant use mainly correlated to construction that disappeared from daily practices.

Keywords: Atlantic forest, Changes in plant use, Coastal areas, Ethnobotany.
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Population structure and productivity of pequi (*Caryocar brasiliense*) in the context of income generation and conservation of the Cerrado.

Presenter: Sarah Alves Melo (Julia F. Morton Award)

Authors: Xavier, Eric Reno Souza [1], Pinto, Lorena Cristina Lana [1], Rodrigues, Irla Paula Stopa [2], Melo, Sarah Alves [1], Drumond, Maria Auxiliadora [1].

Caryocar brasiliense, known as pequi, is a species native from Cerrado that is an important non-timber forest product (NTFP) for the income of rural communities. Fluctuations in fruit yield and threats on this species are important aspects to investigate before establishing extractive activities on a larger scale to ensure their sustainable use. The study region is one of the few Cerrado remnants located in a protected area. It is situated in Paraopeba, in the state of Minas Gerais, Brazil. We sampled the individuals of pequi from 60 plots in the study area, and measured the stem diameter at ground level, diameter at breast height, total height and canopy projection area. We also recorded the threats to *C. brasiliense* in the plots. We then counted the production of fruits by 24 adult pequi trees with local community help, from 2013 to 2014. The population structure does not have a reverse-J pattern, and it is under threat from factors such as selective logging, pasture establishment and extractivism of the giant earthworm (*Rhinodrilus alatus*), a giant oligochaete that is the main source of income for the rural community. The average fruit production was high and significantly different between 2013 (515 fruits ind-1) and 2014 (344 fruits ind-1) ($t=2.32$, $p<0.01$), with 33% less fruit production in 2014. The canopy area ($r2=0.28$, $p<0.01$) was the only population parameter related to productivity in 2013, which had greater rainfall (1351 mm) than 2014 (838 mm). The changes in climate will likely reduce Cerrado areas in Brazil and, consequently, the number of pequi trees, and the study region is one of the few Cerrado remnants where this species may occur. Thus, the effects on the *C. brasiliense* population may be reversed by valuing the Cerrado for the commercial use of this fruit. We support the hypothesis that high pequi fruit productivity makes the extraction of this resource viable. The evidence provided by this study shows that the proposals for the use and management of this NTFP cannot be based solely on this species' population aspects but must also consider the socioecological complexity and environmental uncertainties.

Keywords: Ecology, Extractivism, Income, Rural community, Socioecological system

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Extractivism and commercialization of native fruits: the case of pequi *Caryocar brasiliense* in the state of Minas Gerais, Brazil.

Presenter: Sarah Alves Melo (Julia F. Morton Award)

Authors: Melo Teixeira, Sarah Alves de [1], Amorim, Sarah Linhales Abrahão de [1], Victor, Guilherme Batista [1], Xavier, Eric Reno Souza [2], Drumond, Maria Auxiliadora [1].

The extractivism of the fruit pequi comprises a significant source of income and food for agro-extractivists and traditional communities. The pequi tree (*Caryocar brasiliense* Camb.) is a symbol of the Cerrado and its cut is prohibited by law. Another legislation proposes the Pro-Pequi Program, which encourages the sustainable cultivation, extraction and consumption of pequi and also stimulates its productive chain. However, the lack of information on the species and the ecological and socioeconomic impacts of its exploitation makes it difficult to apply the police. Therefore, we aim to understand the potential of the extractivism of pequi in Minas Gerais, Brasil, more especifically its ecological, socioeconomic and organizational aspects and also propose new policies for its sustainable management. To get more knowledge on its productive chain we got information on quantity and origin of pequi marketed from 2012 to 2014. Semi-structured interviews were conducted with EMATER-MG Local Units technicians to know the origin, occurrence, biology, use and valorization of pequi. The data were qualitatively and quantitatively analyzed and mapped. In the analyzed years, the production of pequi increased 330.34% in relation to the previous three years, totaling 22,840t from 96 municipalities of Minas Gerais. Through units of CEASAs of Belo Horizonte, Uberlândia and Goiânia, 8,419t were sold of 87 municipalities. We thus found an underestimation of data and discrepancy regarding the municipalities that supply pequi. Many municipalities were registered as productors of pequi although they do not have occurrence of the species. The records on its commercialization have grown during this period, however we can say that the volume registered is still below the volume marketed. This information shows the fragility of this productive chain, since there is an expressive increase in the commercialization of pequi, but without any management practices in its extraction, which can impose a risk of extinction on the species. At the same time, the harvest of pequi moves the economy in these municipalities, although this market is still "invisible" to the government, hindering the implementation of public policies. Thus, our results show the need to create a Pequi's Sustainable Use Management Plan in Minas Gerais.

Keywords: Extractivism, Productive chain, Cerrado, Management.

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The journal Mountain Research and Development anticipates the publication challenges of Future Earth's vision.

Presenter: Sarah-Lan Mathez-Stiefel
Authors: Mathez-Stiefel, Sarah-Lan [1].

The vision of Future Earth is for people to thrive in a sustainable and equitable world. This requires contributions from a new type of science that links disciplines, knowledge systems and societal partners to support a more agile global innovation system. In this poster, we present *Mountain Research and Development* (MRD)'s unique editorial structure and policy, which enable it to publish the three different forms of scientific knowledge needed to support sustainable development, namely systems knowledge, target knowledge, and transformation knowledge. MRD is an international peer-reviewed journal that aims at fostering sustainable development in mountains by supporting interdisciplinary, disciplinary, and transdisciplinary research on mountains, developing scientific capacity, capitalizing on development experiences, promoting policy dialogue, and strengthening networks within the mountain community.

Keywords: Scientific journal, Sustainable development, Mountains
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Livestock breeding and forage production in Trás-os-Montes: Rural Development Policies and Measures supporting farmers' decisions and protecting biodiversity.

Presenter: Silvia Nobre
Authors: Nobre, Silvia [1].

In Trás-os-Montes, farming strategies concerning livestock (mainly sheep, goats and cattle) are based on the use of particular meadows, so called *Lameiros*, (e.g. semi-natural perennial, rainfed or irrigated grasslands), that are pastured or managed for dried baled hay. Animal fodder also includes rainfed cereal crops, as well as herbaceous vegetation from oak tree forests, chestnut and olive tree groves. These habitats of low productivity due to soil and climatic limited conditions are also essential for supporting the existent wild fauna. Typically such agroecosystems are related with autochthonous breeds of different species, some of them currently threatened or in danger of extinction. Therefore, several combined available strategies and measures were created and implemented in order to protect habitats and species. Some examples are Natura 2000 Network and European and Portuguese Rural Development Measures (2007-2013). These initiatives support farmers' decisions by funding non-intensive production systems and sustainable agriculture alternatives, activities that contribute to the conservation of agricultural and wildlife diversity, as well as, to maintain these ecosystems biodiversity in general.

Keywords: Grassland, Wildlife, Livestock breeding, Sustainable development, Rural Development Policies, Trás-os-Montes, Northeastern Portugal.
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Bioactivity against prostate cancer discovered in a Caribbean medicinal plant.

Presenter: Sonia Peter

Authors: Peter, Sonia [1], Alleyne, Trevor [2], Ignacio, Diane [3].

Prostate cancer is the leading cause of cancer mortality in males from Trinidad and Tobago, Barbados and Jamaica in the Caribbean. Recent estimates indicate that the Caribbean has the highest age standardized prostate cancer specific mortality rate in the world of 26.3/100 000/yr. In particular, the mortality rate from prostate cancer is high among men of African descent in Trinidad and Tobago and the Americas for which aggressive cancers are often less responsive to available therapies. Already, some tropical plants e.g. periwinkle and Pacific yew, have been a source of anti-cancer therapies. We hypothesize that phytochemical screening of Caribbean plants, coupled to cell culture studies, would lead to the discovery of other potential treatments for prostate cancer. A root sample of one plant (Plant A), that is indigenous to the Caribbean and important in the regional pharmacopoeia, was dried, crushed and suspended in 100% methanol. The classes of natural products present in the extract were determined by Thin Layer Chromatography (TLC) after fractionation according to polarity. The ability of the extract to halt the growth of or kill PC-3 and LNCaP-Luc prostate cancer cells was then assessed by trypan blue and MTT assays. Cell cycle studies were performed to determine probable mechanism of action of Plant A. Results from the trypan blue and MTT assays showed that, compared to the control cells (treated with buffer only), treatment with the Plant A extract significantly ($p<0.05$) inhibited the growth of the cancer cells with decreases as large as 91% being observed. On the other hand, the Plant A extract had a limited or delayed effect on the “normal” PNT1A cells. Results from the cell cycle assay demonstrated that the Plant A total methanol extract at 25µg/ml caused an arrest of G1/S phase of PC-3 cells i.e. leading to an increase in the number of cells that remained in the growth phase. This suggests that Plant A has potential for use as an anticancer drug. We propose that the extract is somehow interfering with the checkpoint mechanism that allows the cell cycle to progress from G1 phase to the S phase.

Keywords: Tropical plants, Anticancer agents, Cell assays.

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Attracting & retaining minority students to Ethnobotany.

Presenter: Sunshine Brosi

Authors: Brosi, Sunshine L. [1].

Ethnobotany emphasizes people as part of the natural world with legacies of sustainable forestry and adaptive management incorporating local traditional ecological knowledge. Using the lens of culture in teaching science attracts and engages minority students. In addition, ethnobotany focuses on intercultural proficiency including cultural sensitivity, communication skills, openness to cultural diversity, and global mindedness. This creates a comfortable and engaging learning environment for minority students. Ethnobotany programs, when embedded in place-based projects or field courses, engage minority students through relevancy in their lives and highlight potential careers that benefit communities and value their cultural traditions. At Frostburg State University in the rural Appalachian Mountains of the USA I coordinate an Ethnobotany program with an embedded Biology minor. Graduation rates are 41% female and 22% African American or Hispanic. To build communities and increase retention I have developed several field-based courses designed for teaching ethnobotany. A blended short-term course taught in Cherokee, North Carolina focuses on the scientific method to solve sustainability issues for materials for artisan basketry. I also instruct courses in a 2-year Ethnobotany certificate program through a rural college in Alaska, USA with 67% Alaskan Native students. I teach a freshman-level pathway to science ethnobotany course in rural villages in Alaska with students from diverse geographic locations. This course has been taught in Scammon Bay, Kotzebue, and Bethel and brings students from Hawaii, rural Appalachia, and Baltimore, Maryland for a cultural exchange with Alaskan natives. Course activities allow for interaction with Indigenous cultures on applied scientific problems while maintaining key cultural relevance. All of these courses have been evaluated using quantitative methods from the Research in the Integrated Science Curriculum surveys. These surveys are being used to design qualitative methods to determine the impacts of a field course on retention and post-graduation achievements across demographic lines. My goals are to quantify the impacts of emphasizes people as part of the natural world with legacies of sustainable and adaptive management incorporating local traditional ecological knowledge assists in attracting and retaining diverse students to science. These methods could be applied to other ethnobotany focused programs.

Keywords: Education, Minorities, Engagement, Field courses.

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Evolutionary history of the *Allium ampeloprasum* L. polyploid complex and its crop relatives in Algeria (North Africa) based on karyological and molecular data.

Presenter: Thinhinan Khedim

Authors: Khedim, Thinhinan [1], Ainouche, Abdelkader [2], Amirouche, Nabila [1], Ainouche, Malika Lylie [2], Amirouche, Rachid [1].

Allium L. (Amaryllidaceae) is the most species-rich genus of petaloid monocots including several crops such as Onion (*A. cepa*), Garlic (*A. sativum*) and Leek (*A. ampeloprasum*). The economically important edible species *Allium ampeloprasum* L. exhibits significant taxonomic richness in the Mediterranean region. This taxon constitutes a polyploid complex (4x, 6x and 8x), comprising horticultural cultivars (Great Headed Garlic) and several traditional varieties (Summer leek, Bulbous leek, Kurrat). However, the wild representatives of this taxon were already indicated as rare in most part of Mediterranean region, except North Africa where endemic varieties were formerly described (var. *typicum* Regel, var. *getulum* Batt., var. *duriaeanum* (Gay) Batt. and var. *tortifolium* Batt.). This study aims to examine the diversity within the *A. ampeloprasum* complex and its wild relatives and to explore the origin of polyploidy that remains enigmatic. Natural populations of this complex were sampled in Algeria along the north-south bioclimatic gradient, then submitted to karyological and molecular analysis. Phylogenetic treatments were based on nuclear rDNA ITS region. Comparative analyses were performed with *Allium* sequences available from Genbank, representing Mediterranean species. Chromosome counts revealed an unexpected high frequency of diploid (2n=16) than tetraploid (2n=32) cytotypes. The ITS phylogenetic trees show that all varieties constitute a single clade. The Algerian diploid and tetraploid populations share direct ancestor suggesting autopolyploidization as major evolutionary process within this group. The results clearly indicate that the Algerian diploids most likely contributed to the formation of other euro-Mediterranean allopolyploid crops. For instance, Algerian diploids appear as progenitors of the cultivated 6x-8x GHG and 4x Leek group. The diversity of Algerian populations as wild gene pool is from a great interest for tracing the origin of crops domestication and for agricultural improvements.

Keywords: *Allium*, Agrobiodiversity, Polyploidy, Algeria.

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New chromosome number and taxonomic revision of the West Mediterranean *Allium baeticum* Boiss. polyploid complex.

Presenter: Thinhinan Khedim

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Allium baeticum is a wild member of section *Allium* L. that includes important edible species (Garlic and leek). This taxon is known as endemic to southern Iberian Peninsula and western North Africa, where it occurs from the littoral to the Saharian border. Its taxonomic status remains controversial with several infraspecific taxa and synonyms. In this study, karyological and molecular investigations were conducted to understanding the role of polyploidy in the ecological and taxonomic diversification of this unexplored taxon. Plant material sampled from various bioclimatic sites in Algeria, was subjected to multivariate analyses based on 26 vegetative and floral diagnostic characters. Chromosome counting and karyotyping were established for each population. Molecular phylogeny based on nuclear ribosomal ITS1-5.8S-ITS2 DNA sequences, was performed with parsimony and bootstrap methods. Two cytotypes were found with 2n=2x=16 and 2n=4x=32 chromosomes. Significant ecological diversity was found between diploids and polyploids without morphological differences. The diploids were localized mainly in eastern part of Algeria in rocky crevices and sandy soils whereas the tetraploids were widespread throughout western parts in garrigues and fields. *A. baeticum*, has been previously recognized as tetraploid only in the Iberian Peninsula, the diploid chromosome number (2n=16) is reported here for the first time. Parsimony analyses clarified relationships of these populations within section *Allium* compared to related species of the *A. ampeloprasum* complex. Evolutionary reconstruction based on ITS amplicons suggests that the Algerian diploids represent a parental lineage involved in the formation of all the tetraploids included in this study. Extensive sampling and multidisciplinary approach allowed significant data on diversity of the Algerian materiel as wild gene pool for plant breeding.

Keywords: *Allium baeticum,* Taxonomy, Polyploidy, Algeria.

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Morphological characterization of tomato (*Solanum lycopersicum* L.) landraces accessions preserved at the Portuguese genebank.

Presenter: Valter Martins (Julia F. Morton Award)

Authors: Martins, Valter Filipe Reis [1], Rocha, Filomena [2], Carvalho, Ana Maria [3].

The Portuguese genebank (Banco Portugues de Germoplasma Vegetal - BPGV) develops strategies for the conservation of plant genetic resources and its mission is the collection, conservation, multiplication and regeneration of germplasm, as well as the evaluation and characterization of the preserved accessions. This characterization is performed at different levels such as morphological, agronomical, molecular, chemical and nutritional and provides important information about each accession, promoting the use of these resources for food and agriculture purposes through programs of reintroduction in cultivation and genetic improvement. Morphological characterization aims to discriminate the phenotypes present in the tested populations, to identify the genetic diversity, and to classify the main transmissible morphological traits, by listing, describing and identifying peculiarities and distinctive characteristics of each plant population. The tomato (*Solanum lycopersicum* L.) was the species chosen because it is one of the plants most cultivated worldwide and has great economical, nutritional and socio-cultural value. The fruits are part of the so-called Mediterranean Diet and are widely consumed. Moreover they are associated with health benefits due to their typical composition in nutraceuticals. The morphological characterization and preliminary evaluation was conducted in 2016, at the BPGV in S. Pedro de Merelim, Braga. A total of 20 accessions of Portuguese landraces of the BPGV tomato collection were characterized. Accepted international descriptors for tomato characterization were used. The main descriptors applied were: 18 for plants, 6 for leaves, 5 for inflorescences and 21 for fruits. The analysis of the data of this morphological characterization and preliminary evaluation are presented and discussed, highlighting the potential interest of these Portuguese landraces of tomato.

Keywords: Tomato landraces, Germoplasm conservation, Morphological characterization, Plant genetic ressources, Banco Português de Germoplasma Vegetal.

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Effect of the microencapsulation of the natural pigment curcumin, from *Curcuma longa* L., on its chemical stability at different pHs.

Presenter: Valter Martins

Authors: Martins, Valter Filipe Reis [1], Valero, Margarita [2].

Curcumin is a natural pigment from *Curcuma longa* L; which is a plant from the family of Zingiberaceae. The officinal part is the dry and crushed root, called "turmeric". This plant is worldwide known for its uses like food spice (the curry), traditional cosmetic and medicine. In our days in medicine, curcumin are proved to have interesting properties such as anti-inflammatory, antioxidant, antitumoral, cardiprotective, hypo-glycemic, anti-arthritic and immunostimulant. Although these useful therapeutic properties, curcumin is highly unstable against hydrolysis which strongly limit its use. For this reason, in the present work we study the effect of microencapsulation of the pigment on its stability. For this purpose, the hydrolysis of curcumin in the presenceof different nanosystems: a) cationic vesicles of dioctadecyl dimethylammonium bromide (DODAB), b)non-ionic micelles of Pluronic F127 (F127) and mixture aggregates of both surfactants, have been studied at different pH values and compared to the behaviour in water. The results show that the hydrolysis of curcumin depends on the environment in which is solubilized. Interestingly, all the aggregates, F127, DODAB and F127:DODAB, independently of its structure or charge, protect the pigment against hydrolysis. But in all the systems, there is a clear dependence of the kinetic rate constant value on the pH. This dependence suggests that hydrolysis of curcumin is strongly influenced by the ionization degree of the molecule. Overall, microencapsulation was shown to be effective in the aqueous solubilisation of the pigment and in preventing the hydrolysis.

Keywords: Microencapsulation, Hydrolysis, Kinetic, *Curcuma longa* L..

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Farmers' seed production in organic horticulture in NW Portugal.

Presenter: Verena Wallner
Authors: Wallner, Verena [1], Carvalho, Ana Maria [2], Vogl, Christian, R. [1].

Organic agriculture aims to provide organic farmers with organic seed. The EU regulation on organic agriculture supports this aim by implying the obligatory use of organic seed and planting material. Nevertheless, derogations for using un-treated GMO-free non-organically produced seeds are granted, because organic seed is not sufficiently available and an absolute restriction would impede organic farmers in terms of diversity and competition.

To understand a seed system, both, its formal and informal parts should be considered. The informal part of the seed system, which covers farmers' seed production and bartering between farmers, can play an important role for supporting the availability of and granting access to organic seed. In Portugal, the informal part of the seed system has still importance in traditional farming systems.

The aim of this paper is to identify the importance of organic farmers' seed production in organic horticulture in Portugal. Twenty-two organic vegetable farmers in NW Portugal were selected through purposive and snowball sampling. Inventories of the crops grown during 2016 were made with the farmers and the sources of seed were documented based upon structured interviews. This data was complemented with qualitative data collected with semi-structured interviews about seed saving practices and reasons for choosing organic seed, for purchasing, bartering or saving seed.

Twenty-one of the respondents use saved seed for obtaining seed and planting material for one or more of the crops they cultivated during 2016. Crops which are mainly reproduced by the farmers are tomato and cucumber, peas, beans and pumpkins. Ten of the respondents reproduce the typical Portuguese vegetable marrow-stem kale, whereas most of other leaf vegetables are not being reproduced by the farmers themselves. Saving seed is indicated by the respondents to be important due to economic reasons; to guarantee access to organic material and availability of certain crops and varieties and to generate local adapted crops.

Keywords: Organic horticulture, Seed systems, Seed production, Seed saving, Northwestern Portugal.
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Enhancement of medicinal plant biodiversity in Lithuanian rural areas.

Presenter: Vitalija Povilaityte-Petri
Authors: Povilaityte-Petri, Vitalija [1], Ragazinskienė, Ona [2], Maruska, Audrius [3].

Lithuania has long traditions of medicinal plants use. Geographical, climatic conditions, cultural and political changes through the centuries strongly influenced the traditional use of medicinal plants found in the wild or being cultivated locally. Since 2008 the craft of herbalist was listed in the Law of Lithuanian Traditional Crafts and so cultivation, collection, storing and preparation of specific medicinal plants was officially approved.

Our new scientific project supported by United Nations Development Programme Global Environment Facility Small Grants programme aims to develop sustainable farming methods and new cultivation of medicinal plants activities in Lithuanian rural areas. The activities were developed in two different geographical locations. One site is located in Babrungas and focuses on cultivation and protection of rare medicinal plants. The second farm of Panara is located in the protected area of Dzukija National park and aims to cultivate medicinal plants in environmentally friendly way.

Both projects are focusing on creation of new green spaces rich in biodiversity and revealing abundance of medicinal and aromatic plants. Education activities offered on the sites aim to improve children and adults knowledge in medicinal plants, competences in natural sciences, invite to take care of human and environmental health.

Medicinal plants raw materials grown and prepared in the sites are further investigated by the scientists of Vytautas Magnus University to perform the quantitative and qualitative biological, anatomical and phytochemical analyses of raw materials in order to assess biological productivity, influence of meteorological factors to plant development, relevance of these medicinal plants for food and pharmaceutical use. One of the goals is to prepare recommendations and guidelines for growing and harvesting of perspective medicinal plants adapted to Lithuanian climatic and ecological conditions that contribute to improvement of human health and enrichment of biological diversity.

The collections and plantations of medicinal plants created in the framework of this project have cognitive-practical, scientific-educational and socio-economic values. Besides new business opportunities, created local working places, especially for people with social difficulties, the places also offer harmony with nature, contribute to responsible, safe, sustainable and rational use of herbal products and healthy lifestyles.

Keywords: Medicinal plants, Rural development, Biodiversity, Cultivation, Traditional knowledge, Sustainable development, Phytochemical analyses, Social inclusion, Local/traditional knowledge, Local communities.
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Big Picnic: Big Questions - Engaging the public with Responsible Research and Innovation on Food Security.

Presenter: Vitalija Povilaityte-Petri

Authors: Povilaityte-Petri, Vitalija [1], Kleber, Jutta [1], Charavel, Valerie [1].

Big Picnic: Big Questions – Engaging the public with Responsible Research and Innovation on Food Security' is a new European Union project on food security, funded of Horizon 2020, for three years period. It operates in 18 European institutions ans one African, coordinated by Botanic Garden Conservation International (BGCI). The Big Picnic is working with the public to open up the debate on the future of our food. The project aim is to encourage collaboration and conversation to build public understanding of food security issues and enable people to articulate their views to decision makers. Due to the international cooperation and engagement of various actors, representing different interests related to the food it is going to support local communities and find solutions that might be implemented. It offers various types of activities, participatory events, travelling exhibitions designed through joint creative collaboration in local context and science cafes. Botanic Garden Meise is situated close to Brussels and spanning 92 hectares. The mission of Botanic Garden Meise is to increase and disseminate knowledge about plants and fungi and to contribute to biodiversity conservation. Garden has a long tradition of collaboration with several African botanic gardens and research about food crops important for Africa. In the framework of Big Picnic project Botanic Garde Meise is developing activities around four main topics. The first focus is 'sustainable catering' - how can organisations make their catering more sustainable and meanwhile inform and sensitize their clients about sustainable food? The second focus, called 'your food – our food' will bring Belgians of different cultural backgrounds together to discuss and learn about each other's food traditions and food security problems. A third focus, 'So sweet', explores the role bees and pollination play in our food security. Finally, a fourth focus will explore traditional, biocultural and innovative ways of food production and transportation.

Keywords: Food security, Sustainable food, Traditional food systems, Pollination and food security, Food production, Food transportation, Biocultural diversity, Traditional knowledge, Edible plants.

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Could bio-cultural *refugia* safeguard important reservoirs of traditional plant knowledge in highly industrialized countries? A case study of the White Carpathians, Czech Republic.

Presenter: Zbynek Polesny (Julia F. Morton Award)

Authors: Pawera, Lukas [1], Łuczaj, Łukasz [2], Polesny, Zbynek [3].

The field study has been conducted across the mountain chain of the White Carpathians, which is a Protected Landscape Area and UNESCO Biosphere Reserve on the border of Czech Republic and Slovakia. This region and biosphere reserve is well-known for persistence of traditions and Moravian folklore. The place might be considered as a *bio-cultural refugium*, particularly when considering the context of a post-communist and industrialized country. The reserve is a botanical treasure trove, as the flora encompasses 1,900 species including 1,432 native plant species on 747 km^2. The data about species collected and their traditional food, medicine and veterinary uses were collected through numerous visits of the study area in 2013-2016. Altogether, 67 custodians of knowledge from 25 villages were purposively selected and interviewed. In total, 134 medicinal and 78 wild food plant taxa are used traditionally in the area, resulting together in 143 useful plant taxa. There is a significant overlap between medicinal and food plants (48%), with 89% of wild food plants being used also as a medicine. The most culturally important wild food plant taxa are *Sambucus nigra*, *Rubus* spp., *Rosa canina* and *Urtica* spp., respectively; while *Agrimonia eupatoria*, *Urtica* spp., *Tilia* spp. and *Hypericum* spp. are the most salient in a medicinal domain. Majority of species is still used contemporary to some extent. Thirty-two food taxa are in fact wild relatives related to European food crops. The persisting plant knowledge and uses documented in the White Carpathians represent a remarkable cultural heritage in an area, where local flora has contributed to the human livelihood and cultural identity. The mutual reinforcement of traditional plant culture and biosphere reserve management may offer ecologically and culturally oriented tourism and sustainable development of the rural areas. The results reinforce the idea that through the social memory, bio-cultural refugia play a crucial role in the preservation of traditional ecological knowledge even in highly industrialized nations, where local knowledge might have been considered lost.

Keywords: Traditional knowledge, Medicinal plants, Wild food plants, Bio-cultural heritage, Moravia.

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Candidates Edmund H. Fulling Award

Symposium 1: Ethnobotany of Mountain Regions

Presenter	Authors	Abstract Title	Affiliation	Country
Hira S Dhami	Kunwar, Ripu M; Sapkota, Prabhat; Dhami, Hira S; Joshi, Sangita U; Fadiman, Maria; Bussmann, Rainer W.	Cross-cultural Ethnobotany in Kailash Sacred Landscape, Nepal	Florida Atlantic University	USA
Richard W. Tate	Tate, Richard W.; Kalatozishvili, Tatia ; Kereselidze, Konstantin; Ozbetelashvili, Levan; Golubiani, Gocha; Bedinadze, Vazha	Patterns of contemporary plant use in Adjara, Georgia (Caucasus)	Florida Atlantic University	USA

Symposium 2: Economic botany: approaches from Archaeobotany, Ethnography and History

Presenter	Authors	Abstract Title	Affiliation	Country
Clarissa Cagnato	Cagnato, Clarissa	Wood for the Gods: An Anthracological Study of an Ancient Maya Fire Shrine at El Peru-Waka, Guatemala	Université Paris 1 Panthéon-Sorbonne	France
Fiona Shannon	Shannon, Fiona; Heinrich , Michael; Sheridan , Helen; Sasse , Astrid	Traditional Medicinal Knowledge in Ireland in the 1930s – Exploring botanical treatments	Trinity College Dublin, School of Pharmacy and Pharmaceutical Sciences	Ireland
João Pedro Tereso	Tereso, João Pedro; Jesus, Ana; Gaspar, Rita	Crops and agricultural fields in the Sabor Valley during the Bronze Age: carpological remains from Foz do Medal and Terraço das Laranjeiras	CIBIO - Research Center in Biodiversity and Genetic Resources, Environmental Archaeology	Portugal
Lorena Villanueva-Almanza	Villanueva-Almanza, Lorena; Sanders, Andrew; Garcillán, Pedro P. ; Ezcurra, Exequiel	Early botanical history of the genus Washingtonia	University of California, Riverside, Botany and Plant Sciences	USA

Symposium 3: Ethnobotany, ethnopharmacology and natural products: challenges and trends

Presenter	Authors	Abstract Title	Affiliation	Country
Afika Njwaxu	Njwaxu, Afika; Shackleton, Charlie	Assessing the abundance of non-timber forest products in relation to forest succession on the Wild Coast, South Africa	Rhodes University, Department of Environmental Science	South Africa
Ahmet Dogan	Dogan, Ahmet; Bulut, Gizem; Senkardes, Ismail	An ethnobotanical review on uses of the Turkish Gundelia genus	Marmara University, Faculty of Pharmacy	Turkey
Charles Wagner	Wagner, Charles Stephen; De Gezelle, Jillian; Robertson, Maureen; Robertson, Keith; Wilson, Mickey; Komarnytsky, Slavko	Novel Ethnopharmacology of Antibiotic Plants from Medieval Celtic Herbal	North Carolina State University, Plant and Microbial Biology	USA
Charlotte van 't Klooster	Klooster, Charlotte van 't; Andel, Tinde van; Reis, Ria.	Patterns in medicinal plant knowledge and use in a Maroon village in Suriname	Leiden University Medical Centre (LUMC), Department of Public Health and Primary Care	Netherlands

Custódio Roriz	Roriz, Custó Lobo; Pinela, José; Pereira, Carla; Fernandes, Angela; Prieto, Miguel Angel; Barros, Lillian; Oliveira, M. Beatriz P.P.; Carvalho, Ana Maria; Barreiro, Maria Filomena; Ferreira, Isabel C.F.R.	Globe amaranth as an alternative source of natural red-violet colorants: An optimization study addressing current needs of the industrialized world	Instituto Politécnico de Bragança, Escola Superior Agrária, Centro de Investigação de Montanha (CIMO)	Portugal
David Picking	Picking, David; Delgoda, Rupika	Medicinal plant safety: An overview of the drug interaction screening program for popular Jamaican medicinal plants at the University of the West Indies	University of the West Indies, Natural Products Institute (NPI)	Jamaica
Gizem Bulut	Bulut, Gizem; Dogan, Ahmet; Senkardes, Ismail; Tuzlac, Ertan	An Ethnobotanical Review On Uses Of The Turkish Salvia Species	Marmara University, Faculty of Pharmacy	Turkey
Ismail Senkardes	Senkardes, Ismail; Bulut, Gizem; Dogan, Ahmet; Tuzlac, Ertan	Onopordum Species of Turkey and Their Ethnobotanical Uses	Marmara University, Faculty of Pharmacy	Turkey
Janneke Nortje	Nortje, Janneke	Quantitative ethnobotany of Namaqualand, South Africa	University of Johannesburg	South Africa
José Pinela	Pinela, José; Roriz, Custódio Lobo; Pereira, Carla; Fernandes, Angela; Barros, Lillian; Oliveira, M. Beatriz P.P.; Carvalho, Ana Maria; Ferreira, Isabel C.F.R.	From famine wild plants in mountain regions of Northeastern Portugal to gourmet foods in contemporary diets: A nutritional-based revalorization study	Instituto Politécnico de Bragança, Escola Superior Agrária, Centro de Investigação de Montanha (CIMO)	Portugal
Julien Blanco	Blanco, Julien; Carrière, Stéphanie M.	Should LEK be shared in a changing world? Evidences from an ethnobotanical survey in Morocco	French National Institute for Agricultural Research (INRA), UMR Dynafor	France
Matthew Bond	Matthew, Bond; Orou, Gaoue	Disentangling Biocultural Roots of Medicinal Plant Knowledge	University of Hawaii at Manoa, Botany	USA
Sugir Selliah	Selliah, Sugir; Heinrich, Michael; Weckerle, Caroline.	Incense plants: interdisciplinary approaches to species diversity and ethnobotanical uses	University of Zurich, Department of Systematic and Evolutionary Botany	Switzerland

Symposium 4: Agrobiodiversity and traditional knowledge: conservation strategies and sustainable development

Presenter	Authors	Abstract Title	Affiliation	Country
Ashley Glenn	Glenn, Ashley	Strategies for traditional knowledge retention and adaptation in a migrating world: a case study of Bosnian refugees in St. Louis, Missouri, USA	Missouri Botanical Garden, William L. Brown Center	USA
Binsheng Luo	Luo, Binsheng; Liu, Bo; Zhang, Hongzhen; Zhang, Hongkang; Li, Xuan; Li, Jianqin; Yang, Jun; Wang, Yizhou; Bai, Yujia; Ma, Lijuan; Long, Chunlin	Diversity of Wild Edible Plants in Hani Terraced Paddy Rice Agroecosystem in Honghe Prefecture, Yunnan, China	Minzu University of China, College of Life and Environmental Sciences	China
Christoph Schunko	Schunko, Christoph; Vogl, Christian R.	Assessing the contribution of wild plants to organic food systems in Austria	University of Natural Resources and Life Sciences, Department for Sustainable Agricultural Systems	Austria
Eurydice Sogbohossou	Sogbohossou, Eurydice Olga Deedi; van Andel, Tinde; Achigan-Dako, Enoch; Schranz, Eric	Pathways from the wild to cultivation: drivers of management schemes and prospects for spider plant (Gynandropsis gynandra L.) utilisation in Benin and Togo.	Naturalis Biodiversity Center, Biodiversity Dynamics	Netherlands

Francesca Fagandini Ruiz	Fagandini Ruiz, Francesca; Bazile, Didier	Trends in agrobiodiversity for quinoa and some wild relatives Underutilized crops and wild species for sustainable agricultural production in Peru	CIRAD, Recherche agronomique pour le développement. GREEN	France
Gorka Menendez-Baceta	Menendez-Baceta, Gorka	Local ecological knowledge as a tool for a sustainable territorial management in Gorbeialdea (Biscay, Basque Country)	Universidad Autónoma de Madrid, Departamento de Biología	Spain
Harriet Gendall	Gendall, Harriet; Sørensen, Marten; Theilade, Ida	Remembering Mauka: Biocultural diversity conservation and the case of the 'lost' Andean crop Mirabilis expansa (Ruiz & Pav.) Standl.	University of Copenhagen, Department of Plant and Environmental Sciences	Denmark
Jeffrey Wall	Wall, Jeffrey; Kose, Coskun; Okan, Taner; Kose, Nesibe; Aksoy, Elif	The Case for Folk Valuation of Plant Genetic Resources	Cornell University, Natural Resources	USA
Lukas Pawera	Pawera, Lukas; Barbora, Tumova; Celine, Termote; Zbynek, Polesny; Danny, Hunter	Diversity of edible plants in food systems of Bugis, Mandar, Minang and Acehnese cocoa farmers in Indonesia	Czech University of Life Sciences Prague, Department of Crop Sciences and Agroforestry	Czeck Republic
Matthew Bond	Matthew, Bond; Barbara, Anderson; Priscilla, Wehi	Biocultural impacts of climatically shifting plant distributions	University of Hawaii at Manoa, Botany	USA
Myrna Rivera-Veja	Dutra Elliott, Daniela; Bost, Jay; Rivera Vega, Myrna Berlitz; De la Pena, Gustavo; Harris, Alina	Varietal crop research as a tool to engage with agrodiversity: An open door to interdisciplinary learning for STEM and farmer training programs	University of Hawaii, Leeward Community College	USA
Sonali Chaunan	Chauhan , Sonali H; Yadav , Santosh; Takahashi , Taro ; D'Cruz, Lancy; Okada, Kensuke	Consumption of wild edibles by Vasava tribals: Implications for sustenance and conservation of indigenous nutritional knowledge	The University of Tokyo, Global Agriculture Sciences Department, Graduate School of Agricultural and Life Sciences	Japan
Tomaz Ribeiro Lanza	Lanza, Tomaz Ribeiro; Ming, Lin Chau; Haverroth, Moacir; Ferreira, Almecina Balbino	Cultivated Plants in the Kaxinawá Indigenous Land of Nova Olinda, Acre, Brazil	Universidade Estadual Paulista, Faculdade de Ciências Agronômicas, Dept. Horticultura	Brazil
Tomaz Ribeiro Lanza	Lanza, Tomaz Ribeiro; Ming, Lin Chau; Haverroth, Moacir; Ferreira, Almecina Balbino	Wild Food Plants in the Kaxinawá Indigenous Land of Nova Olinda, Acre, Brazil	Universidade Estadual Paulista, Faculdade de Ciências Agronômicas, Dept. Horticultura	Brazil

SEB Free Topics Session

Presenter	Authors	Abstract Title	Affiliation	Country
Alex McAlvay	McAlvay, Alex; Emshwiller, Eve	Redomestication of feral turnips in Mexico: phenotypic and genetic evidence	University of Wisconsin - Madison, Botany	USA
Angelina Martins	Martins, Angelina Rosa de Oliveira; Shackleton, Charlie M.	The production and commercialization of palm wine from Hyphaene coriacea and Phoenix reclinata in Zitundo area, Southern Mozambique.	Rhodes University, Department of Environmental Science	South Africa
Annae Maria Senkoro	Senkoro, Annae Maria; Shackleton, Charlie M.; Voeks, Robert A.; Ribeiro, Ana Isabel	Uses, local knowledge and management of the Pepper-bark tree (Warburgia salutaris), a threatened medicinal plant species in southern Mozambique	Rhodes University, Department of Environmental Science	South Africa
Karen J. Heeter	Heeter, Karen J.; Brosi, Sunshine L.; Smith, Laura G.	Dendrochronological analysis of old-growth forest and the pre-European cultural landscape of the Appalachian region, USA	Frostburg State University, Biology	USA

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