Potchefstroom 2520, South Africa
School of Environmental Science and Development, North-West University, Private Bag X6001, Potchefstroom 2520, South Africa
Laboratory for Electron Microscopy, North-West University, Private Bag X6001, Potchefstroom 2520, South Africa

Namibia is the centre of diversity for Boerhavia L. and Commicarpus Standl. in southern Africa and these two genera have the ability to grow on soil rich in gypsum. Namibia is known to be a dry, hot country. This arid environment poses challenges to the survival of species and as a result plants have developed morphological and anatomical adaptations that assist them to survive. The adaptations of the leaves and anthocarps of two endemic Boerhavia species, B. deserticola Codd. and B. hereroensis Heimerl, as well as six Commicarpus species found in Namibia, were investigated using light- and scanning electron microscopy. Both the abaxial and adaxial surfaces of the leaves are covered with multicellular, glandular trichomes that secrete mucilage. The trichome layers are very dense in the two Boerhavia species but less so in the Commicarpus species. These trichomes decrease transpiration and lower the leaf temperature by increase reflection of solar radiation. The Boerhavia species also show Kranz anatomy. The cuticle is thick and impregnated with calcium oxalate crystals. These crystals, tannin and mucilage cells are scattered throughout the leaves. The anthocarp of the Boerhavia species has five ribs which are glabrous in B. deserticola but pubescent in B. hereroensis. The anthocarp of the Commicarpus species has ten obscure ribs and large, dark, glands scattered over the surface with very few trichomes. The anthocarp of both genera produces mucilage which might aid in seed dispersal and germination, and they have abundant sclerenchyma for structural support.

doi:10.1016/j.sajb.2010.02.046

Species with potential for Industrial Crops in South Africa

K.M. Swanepoela, W.G. Albertsb
University of Zululand, Coral Str 111, Lynnwoodglen, Pretoria 0081, South Africa
Karwil Consultancy, PO Box 462, Newlands, Pretoria 0049, South Africa

The demand for natural products is estimated growing at 25% per year. This includes essential oils, plant extracts, and medicinal plants amongst others. A pressure on natural resources can be prevented if careful sustainable measures are taken in time. Industrial crops are plant species that need processing before utilisation. Species with potential for development as industrial crops in South Africa has been identified and studied. The focus was on medicinal, essential oils, beverages and fibres. Ten species were chosen under each category and a data base was formed. International production, market trends and international standards were documented against the production of South African producers. Advantages and problems have been identified with potential of crop development. This study could assist role players of community projects, agricultural and rural development in the decisions of choosing alternative crops and entrepreneurship for skills development and poverty alleviation. The information from the study can also be applied by small scale and emerging farmers in the feasibility studies of utilisation of natural products as enterprises.

doi:10.1016/j.sajb.2010.02.047

The value of anatomy in pharmacognosy and forensic studies

P.M. Tilney, B.-E. Van Wyk
Department of Botany and Plant Biotechnology, University of Johannesburg, PO Box 524, Auckland Park 2006, South Africa

Anatomical characters are potentially useful to identify small fragments of commercially important herbal products as well as toxic plants that may be of relevance in forensic investigations. An increasing number of indigenous medicinal plants are being used both in the formal and informal economy so that the positive identification of species and infraspecific taxa has become important. Unfortunately very few of these plants have been studied anatomically. Plants are often the cause of fatalities due to the inappropriate use of herbal medicines or the use of misidentified plants (or sometimes intentionally used in homicide and suicide). The large number of toxic plants in South Africa often leads to stock losses. Anatomical characters can be useful as supportive evidence in forensic work to help identify the plant species in question/anatomical evidence may often give additional clues as to the identity of the plant when medical diagnosis/ chemical forensic studies turn out to be inconclusive. Anatomical characters of potential diagnostic value will be presented for a selection of herbal medicines and highly toxic plants. Herbal medicines include Agathosma betulina, Aloe ferox, Aspalathus linearis, Catha edulis, Cyclopia intermedia, Elytropappus rhinocerotis, Harpagophytyum procumbens, Lippia javanica, Myrothamnus flaccumfolius, Pelargonium sidoides, Sceletium tortuosum, Siphonochilus aethiopicus, Sutherlandia frutescens and Warburgia salutaris. Poisonous plants discussed will include Nicotiana glauca, Boophone disticha, Nerium oleander, Datura stramonium, Calilepis laeaeola, Abrus precursor, Jatropha curcas and Ricinus communis.

doi:10.1016/j.sajb.2010.02.048

Consideration of factors associated with Euphorbia ingens decline in the Limpopo Province of South Africa

J.A. Van der Lindea, D. Sixb, M.J. Wingfielda, J. Rouxa
Department of Microbiology and Plant Pathology, Tree Protection Co-operative Programme (TPCP), Forestry and
Conservation, University of Montana, Missoula, MT, USA

Euphorbia is a large genus including more than 2100 species having a wide global distribution. Several Euphorbia spp. occur in South Africa, of which Euphorbia ingens (naboom) is the largest. During the course of the last 10 years, increasing numbers of E. ingens trees in the Limpopo Province have become diseased, followed by rapid death. Initial studies conducted in 2006 and 2007 recorded various insects and fungi associated with the decline, but a clear cause of disease was not found. Symptoms observed included grayish discoloration, rotting and browning of the succulent branches, white and yellow spots on succulent branches, blue stain of the main woody stems and insect infestation. Various genera of fungi were isolated including several undescribed genera and species. Insects found included genera in the Curculionidae and Pyralidae. A more extensive study was initiated in 2009 in which multiple factors associated with the decline of E. ingens were considered. These factors included symptom and disease development as well as animal damage, elevation, fire damage, grazing levels, rainfall, site aspect, size of each tree, slope, temperature and the vegetation surrounding the trees. Sites in the Limpopo and North West Provinces were monitored in 2009. Damage caused by a moth was found to be devastating in both provinces with over 64% incidence. Differences in the occurrence of graying symptoms were observed in the Limpopo and North West Province with 74 and 4% incidence respectively. It is hoped that the knowledge emerging from this extensive study will shed light on the factors responsible for the decline and death of E. ingens in the Limpopo province in the future.

doi:10.1016/j.sajb.2010.02.049

The role of cytokinins in seed germination

J. Van Stadena, W.A. Stirka, O. Novákb, M. Strnadb

aResearch Centre for Plant Growth and Development, School of Biological and Conservation Sciences, University of KwaZulu-Natal Pietermaritzburg, Private Bag X01, Scottsville 3209, South Africa
bLaboratory of Growth Regulators, Palacký University & Institute of Experimental Botany ASCR, Šlechtitělů 11, 783 71 Olomouc, Czech Republic

Endogenous cytokinin levels were monitored during germination and early seedling establishment in monocotyledonous (oats and maize), dicotyledonous (lettuce and lucerne) species and thermoinhibited Tagetes minuta achenes. Endogenous cytokinins were identified using UPLC-ESI-MS/MS. Cis-zeatin types (cZ) were the predominant cytokinins present in dry seeds of lettuce, lucerne and oats while dihydrozeatin (DHZ) derivatives and benzyladenine (BA) occurred in the highest concentrations in maize. Following imbibition there was a transient peak in cytokinins prior to radicle emergence in lettuce due to an increase in BA and various topolins, in lucerne due to an increase in cZ- and topolin-forms and in oats due to an increase in trans-zeatin (tZ) forms. Another transient cytokinin peak was detected following radicle emergence due to an increase in cZ-, BA- and topolin-forms in lettuce, cZ- and topolin-forms in lucerne, BA- and isopentenyldadenine—(ip) forms in oats and a very large increase in cZ forms and smaller peaks in ip-, iz- and BA-forms in maize. DHZ-type cytokinins occurred in the highest concentrations in dry T. minuta achenes. Following imbibition at 25 °C, there was a three-fold increase in the cZ-type cytokinins. Aromatic BA-type cytokinins showed the largest fluctuation, increasing between 26 and 40 h and dropping to low concentrations by 48 h. The thermoinhibited achenes imibed at 36 °C had a similar cytokinin profile to the achenes germinated at 25 °C even though germination was arrested. In view of the high concentrations of cZ isomers and aromatic cytokinins detected in these seeds, it is necessary to re-examine the origin and physiological functions of these cytokinins during germination and seedling establishment.

doi:10.1016/j.sajb.2010.02.050

Freshwater algae (excluding diatoms) of the Sub-Antarctic Marion Island

W. Van Stadena, S. Janse Van Vuurenb, V. Smithb, L. Van Rensburgb

aSchool of Environmental Science, North West University, Private Bag X6001, Potchefstroom 2520, South Africa
bDepartment of Botany and Zoology, University of Stellenbosch, Private Bag XI, Matieland 7602, South Africa

Marion Island is a unique, isolated natural freshwater ecosystem. Algae play an important role in the island’s freshwater ecosystem, because the aquatic food web is dominated by plankton species. This represents the first taxonomical survey on cyanobacteria and eukaryotic algae (excluding diatoms) present in the freshwaters of Marion Island. The composition of freshwater algal communities, in relation to different types of freshwater bodies, was also studied. A total of 85 algal genera from 7 major divisions were present in the freshwaters of Marion Island. These divisions include Chlorophyta, Chrysophyta, Craspedophyta, Cyanophyta, Euglenophyta, Pyrrophyta and Tribophyta. Lyngbya, Tribonema and Ulothrix were present in all water bodies. Chlorophyta was dominant in terms of diversity, followed by the Cyanophyta. Environmental variables such as pH and PO$_4$–P, and to a lesser extent conductivity and NH$_4$–N influenced the algal composition of the freshwaters of Marion Island. Different types of freshwater bodies are inhabited by specific algal assemblages due to the extreme variability in chemical composition of the freshwaters. The main ecological factors that influence the algal community include enrichment, caused by sea spray, and biotic fertilization. An in-depth study on the algal species composition of the freshwater bodies of Marion Island will provide further