remain unexplained. It is well recognised that interactions between plants, humans, the environment, insects and micro-organisms are complex and difficult to characterise. Pilot studies of declining *A. erioloba* and *E. ingens* have revealed a number of undescribed fungal genera, emphasizing the lack of knowledge regarding fungi in Africa. Likewise, apparently undescribed insect species have been found associated with these dying trees. There is clearly an urgent need to increase our understanding of the interacting factors associated with the wide-scale mortality of native South African trees that is occurring in various parts of the country. Solutions, and a chance to save some species that are apparently threatened with extinction will require inter-disciplinary research initiatives and also different approaches to those that have been used to understand tree health problems in the past.

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Comparison of secondary metabolite content and antimicrobial activity of four *Hypoxis* species used in traditional medicine

N.R. Sathekge[a,b], Q. Kritzinger[a], G. Prinsloo[b]
[a]*Department of Plant Science, University of Pretoria, Pretoria 0002, South Africa*
[b]*Agricultural Research Council (VOPI), Private Bag X293, Pretoria 0001, South Africa*

Hypoxis (African potato) is a genus of the family Hypoxidaceae. The rootstocks of *Hypoxis* species are used in traditional medicine for the treatment of different ailments such as urinary tract infections, prostate cancer, wounds etc. Several visits have been made to the Faraday medicinal market in Johannesburg to check the prices and availability of *Hypoxis*, however, it was discovered that different *Hypoxis* species are harvested and sold under the same name i.e. African potato. This is a concern where plant preparations are taken orally and the information regarding the plants being used not correct. This might be dangerous in the event where secondary metabolites of these plants are not the same. The aim of this study is to compare the secondary metabolite content and microbial activity of four *Hypoxis* species namely, *H. acuminata*, *H. hemerocallidea*, *H. iridifolia* and *H. rigidula*. Thin layer chromatography and high performance liquid chromatography were used to analyse secondary metabolite content of the plant extracts. Different bioassays were used to determine the antibacterial, antioxidant and cytotoxicity activity of these species. Column chromatography was used to isolate the compounds. Compounds observed on the TLC fingerprints were similar in all four species. There was one compound that was present in *H. rigidula* and *H. acuminata* which was absent in *H. hemerocallidea* and *H. iridifolia*. The antibacterial activity also showed a similar profile against three microorganisms, namely *Escherichia coli*, *Enterococcus faecalis* and *Staphylococcus aureus*. All four species showed no toxicity when tested *in vitro* on Vero cells however, the plant extracts seemed to be toxic to cancer cells (U937 cells) in particular *H. iridifolia*. Hypoxoside was isolated and identified as the purple band on TLC fingerprint. The HPLC results showed major differences in fresh material. After the material was stored, the results showed the same profile in all the species.

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Protective effect of the anti-ozonant, ethylenediurea (EDU), on development and photosynthesis of *Glycine max* under ambient and elevated ozone levels in an OTC system

C.C.W. Scheepers, J.M. Berner, G.H.J. Krüger
School of Environmental Sciences: Botany, North West University, Potchefstroom 2520, South Africa

Tropospheric ozone (O_3) is one of the most important phytotoxic air pollutants. Due to the growing energy demand and increasing industrial activity, O_3 levels are expected to rise in southern Africa. Ozone affects natural vegetation, forests and crops due to the oxidative stress it imposes on biochemical level. Ozone affects photosynthetic capacity, patterns of carbon distribution and leaf senescence. It also promotes foliar injury. These effects are reflected by loss of chlorophyll, change in chlorophyll a fluorescence kinetics and gas exchange parameters. The anti-ozonant, N-[2-(2-oxo-1-imidazolidinyl) ethyl]-N′-phenylurea (EDU) is known to prevent ozone damage in many plants, which makes it a key research tool in assessing the effects of O_3 on plants. A field study was conducted with soybean plants (*Glycine max)* grown and exposed in an open-top-chamber (OTC) system to controlled different levels of O_3. Non-EDU-treated plants were markedly affected by the O_3 treatment. The effects of O_3 on PSII and PSI function and photosynthetic gas exchange of the treated plants were analysed and interpreted. Apart from visible symptoms and reduced yield induced by elevated O_3 levels, the CO_2 assimilation rate (A) was reduced by 26%, mainly due to a corresponding 36% decrease in the carboxylation efficiency (CE). Parallel chlorophyll *a* fluorescence data indicated that a concomitant decrease occurred in the photosynthetic performance index (PI_{ABS}), which was mainly due to inhibition of the quantum yield of reduction of end electron acceptors of PSI. The study clearly demonstrated that EDU alleviates the unfavourable effects of O_3.

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Morphological and anatomical adaptations of *Boerhavia* L. and *Commicarpus* Standl. to survive in arid environments of Namibia

M. Struwig[a], A. Jordaan[b], S.J. Siebert[a], L.R. Tiedt[c]
[a]*A.P. Goossens Herbarium, School of Environmental Science and Development, North-West University, Private Bag X6001,*

Potchefstroom 2520, South Africa
[b]*School of Environmental Science and Development, North-West University, Private Bag X6001, Potchefstroom 2520, South Africa*
[c]*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.

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Species with potential for Industrial Crops in South Africa

K.M. Swanepoel[a], W.G. Alberts[b]
[a]*University of Zululand, Coral Str 111, Lynnwoodglen, Pretoria 0081, South Africa*
[b]*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.

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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*, *Harpagophytum procumbens*, *Lippia javanica*, *Myrothamnus flabellifolius*, *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 laureola*, *Abrus precatorius*, *Jatropha curcas* and *Ricinus communis*.

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

J.A. Van der Linde[a], D. Six[b], M.J. Wingfield[a], J. Roux[a]
[a]*Department of Microbiology and Plant Pathology, Tree Protection Co-operative Programme (TPCP), Forestry and*