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[*]**SAAB student award: Best oral presentation by an MSc student under the age of 30**

Mortality rates in Africa are very high, with breast cancer being the second most common form of cancer in women. *Dodonaea viscosa* L. Jacq.is used for a vast range of diseases as a traditional medicine and has illustrated anti-cancerous properties in previous studies. In this study, a metabolomic and physiological approach was used to differentiate chemotypic differences among populations of *D. viscosa,* and elucidate bioactivity of plants. A non-invasive estrogen receptor positive human cancer cell line (MCF-7), a metastatic estrogen receptor negative human cancer cell line (MDA-MB-231) and a normal breast epithelial cell line (MCF-12A) were used together with an in vivo tumour-bearing mouse model to evaluate bioactivity. Liquid LC/MS-based metabolomic profiling was used to assess samples collected from different locations in the Western Cape. The MTT assay was used to assess cell viability after treatment in MCF-12A cells, MCF-7 cells and MDA-MB-231 cells. The efficacy of the plant extract was compared with a conventional chemotherapeutic agent, doxorubicin, using a tumour-bearing mouse model. There is evidently chemotypic variation in populations of *D. viscosa*, with the Stellenbosch population exhibiting the highest cytotoxic potential. Extracts illustrated bioactivity against the breast cancer cells, but had limited toxicity to normal breast epithelial cells. Apoptosis was evident by the apoptotic markers detected in Western blot analysis after treatment of the extract. Doxorubicin (Dox) and the extract exhibited equivalent reduction tumour size in the tumour-bearing mice model. The vital potential of *D. viscosa* as adjuvant treatment for breast cancer has been demonstrated in this study.

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Pollinator sharing: Competition, facilitation or interference in the co-flowering *Oxalis namaquana* and *Romulea citrina*?

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Plant species that occur together, flower at the same time and have the same pollinators may interact by competing for visits, facilitating visits or interfering with each other's pollination through heterospecific pollen transfer (HPT). The presence and strength of these interactions will depend on absolute and relative densities of the plant species, as well as pollinator behaviour and pollen placement on pollinators. *Oxalis namaquana* and *Romulea citrina* are co-flowering species with similar looking yellow flowers that co-occur in seasonally damp areas in Namaqualand. We hypothesised that pollen limitation would occur due to competition and HPT, especially at low absolute and relative density of the focal species. We identified honeybees as the primary pollinators of both species as they were by far the most frequent visitors and carried substantially more pollen than other visitor species. Although most individuals displayed constancy when foraging, some switched between the two species frequently. Pollen load analysis showed that the areas of the honeybee body that the plants used for pollen transport overlapped substantially. These results indicate a pathway for HPT to occur and we indeed observed heterospecific pollen on both species, although significantly more on *O. namaquana* than *R. citrina*. Breeding system data suggest that *O. namaquana* is largely pollinator dependent and show that *R. citrana* self-fertilises autonomously, so the former should be more vulnerable to pollen limitation than the latter. We will present analyses of the effects of conspecific and heterospecific density on pollinator visitation, conspecific and heterospecific pollen receipt and pollen limitation.

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Morphometrics in *Encephalartos*

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The African endemic cycad genus *Encephalartos* (Zamiaceae), although morphologically well known, is still difficult to identify to species level when geographic data is discounted. In addition, much of the morphological variation know within the genus were described from cultivated specimens, thus giving a potentially distorted picture of the prevalence and stability of the various character states. Reliable identification of species is also made difficult because many diagnostic characters employed in existing keys require the availability of reproductive structures. However, such structures are infrequently present as members of the genus have slow growth rates, long juvenile phases and are known to mast with intermittent periods up to decades long. Emanating from continued studies on the systematics of the genus, we present some provisional findings on comparative vegetative morphology based on in situ observations (except for “Extinct in the Wild” taxa). Data are of ~100 vegetative characters including quantitative and qualitative measurements, from 150 individuals representing 15 currently recognised taxa and numerous informally recognised forms. Included were both phylogenetically distant and sister taxa. We use principal component analysis to determine the stability of vegetative characters within and between populations of the same species, their usefulness for distinguishing among species, various ratios and associations between traits, how distances between taxa could be interpreted in terms of ranking, and how the phylogenetic content of the data compares with that of other sources of taxonomic evidence.

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Heading for an unknown future: We must do more to protect our native plants from attack by invasive pests and pathogens

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Invasive alien pests and pathogens are having a greater impact on native woody plants and their associated ecosystems than ever before. Add to this the increasing impact of climate change is also changing the behaviour of some pests and pathogens, resulting in a potentially bleak future for these sensitive environments. South Africa, and indeed the rest of the African continent have seemingly been spared from some of the extensive outbreaks of pests and pathogens on native woody plants that have plagued other parts of the world. However, this situation could change rapidly as a result of increasing movement of people and products, land transformation, climate change and other factors. During the course of the past two years, at least two non-native organisms have been detected on

native South African woody plants. These are the myrtle rust pathogen, *Puccinia psidii*, and the cycad aulacaspis scale (CAS), *Aulacaspis yasamutsii*. Both these organisms most likely entered the country on non-native plants, possibly linked to the nursery trade. Despite quarantine efforts and other plant protection strategies, these and other pests continue to enter the country. While this is not unexpected due to the magnitude of the task, it is of great concern that there is almost no action post entry to deal with non-native pests and pathogens. Without the active involvement of all plant and conservation specialists, enthusiasts, scientists and the government, South Africa faces potentially devastating loss of iconic native and other woody plants. Indeed we might expect the transformation of entire ecosystems as has occurred elsewhere in the world.

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The effects of elevated copper and zinc concentrations on hydroponically cultivated soybean (*Glycine max* [L Merr]) at the vegetative growth stage

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Pollution and subsequent contamination of the environment with heavy metals are generated by mining and smelting activities, long term use of heavy metal containing fertilisers, sewage sludge application and waste water irrigation in agricultural lands. Soybean is an important agricultural crop, which has been reported to accumulate high concentrations of heavy metals when grown in contaminated areas, without showing any visible symptoms. In this study we determined the effects of elevated concentrations of copper and zinc on the photosynthetic pigments, phenolic compounds, stomata structures and plant growth on hydroponically grown soybeans. Plants treated with 100 μM and 150 μM copper showed severe symptoms such as chlorosis, necrosis and death of aerial parts which were metal concentration and duration of exposure dependant. Zinc treated plants did not show any symptoms or reduction in growth and biomass production. Increased carotenoid and phenolic compounds contents were observed in plants treated with 50 μM copper and 200 μM, 250 μM and 300 μM zinc, where minimal to no foliar symptoms were observed. Stomatal density was significantly increased in the higher metal concentration treatments. These findings are important for understanding how cultivating this crop in contaminated areas affects its physiological function and subsequently its yield and quality.

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A review of the taxonomy and phylogenetic relationships of *Gerbera* section *Gerbera* (Asteraceae: Mutisieae) in the Cape Floristic Region

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Gerbera L. is a genus of perennial herbs commonly known as Barberton daisies and comprises about 29 species, 13 of which occur in southern Africa. The genus is placed within the largely South American tribe Mutisieae and, together with *Perdicium*, are the only African members within this early diverging lineage. Recent phylogenetic analyses place *Gerbera* sister to the *Leibnitzia*, a genus of six species found in America and Asia. However, its putative close relative *Perdicium* has not been included in any phylogenetic studies to date. The African species of *Gerbera* were last monographed by Hansen in 1985 who divided them into four sections (*Parva*, *Piloselloides*, *Lasiopus* and *Gerbera*). Section *Gerbera* is endemic to the Cape Floristic Region of South Africa and consists of approximately five perennial species with bracteate scapes and shortly beaked achenes with obtuse or inflated hairs. However, two undescribed species from this section have since come to light and need to be formally described, and the keys and distribution data for the species of section *Gerbera* as a whole revised. The monophyly of sect *Gerbera* and the phylogenetic placement of *Perdicium* will be also assessed, using an expanded sampling of the Mutisieae, based on analyses of nrITS, *rpl32* and *trnL-F* sequences.

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Ecological associations between leaf domatia and mites: How does the mutualism work?

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Leaf domatia, plant produced cavities usually found in the axils of major veins in the abaxial side of leaves, are usually associated with mites and mediate mutualistic relationships with predacious mites. In plants, mites inhabit leaf domatia for shelter and to reproduce and develop. In turn, the plants benefit from increased defense against pathogens and small arthropod herbivores. The aims of this study were to generate a better understanding of the ecological patterns of mites found within leaf domatia from an African perspective. Here we report on three aspects of mite diversity and ecology. Firstly, a survey of plant species that possess leaf domatia from Eastern Cape forests was collected and examined. The majority of mites found within the domatia of these tree species are predaceous mites from the families Tydeidae and Phytoseiidae. However, Phatophagous (Tethranychidae) and even saprophytic species (Oribatei) were also found. Secondly, seasonal fluctuations in mite abundance and diversity over time were observed, and thirdly, an assessment of mite occupation throughout the tree canopy suggests that mites may prefer older leaves found in the lower regions of the tree canopy and avoid young leaves at the top. This study contributes to a better understanding of the mutualisms association between plants and mites from an African perspective.

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Ethnobotanical survey of plants used by rural people in the Eastern Cape to control field arthropod pests of maize

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