Potent poisonous compounds from *Elaeodendron croceum*

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Several authors have reported that most parts of *Elaeodendron croceum* are poisonous. “Witch doctors” apparently previously used the species to cause death and the bark has been reported to be fatal to humans, presumably due to the presence of alkaloids. The plant has also been suspected as the cause of human death in at least two court cases. A phytochemical investigation of the poisonous leaves of *E. croceum* guided by cytotoxicity against Vero cells, led to the isolation of five compounds; 20-hydroxy-20-epi-tingenone (1), tingenone (2), tingenine B (3), 11α-hydroxy-β-amyrin (4), and naringenin (5). Compounds 1 and 2 showed extremely high toxicity against Vero cells (IC₅₀: 2.65 mM and 384 µM respectively). Cytotoxicity of the isolated compounds against three human cancer cell lines, HeLa, MCF-7, and SNO was also determined. Compounds 1 and 2 again showed the highest cytotoxicity with IC₅₀ values ranging between 2.47–0.43 µM. This is the first report on the isolation of these highly toxic compounds from *E. croceum* and in all probability explains why it is so poisonous.

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Non-destructive estimation of content using near-infrared spectroscopy to rapidly assess kraft pulp yield of *Eucalyptus grandis*

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Kraft pulp yield is important for plantations profitability, but traditional assessment is time consuming and costly. Cellulose content is one of the properties which strongly influences the Kraft pulp yield. However, the determination of cellulose still involves wet chemistry measurement which limits the number of samples that can be processed within a tree breeding program. In this paper, the utility of near infrared (NIR) spectroscopy for predicting cellulose contents in *E. grandis* was examined. *E. grandis* is one of the major species in South Africa grown for pulp and paper production. Wood samples were collected from 16 sites in different regions of SA to capture the widest possible variation in the investigated property. NIR spectra, collected from both sawdust and solid wood samples, were combined with their respective cellulose concentrations to develop NIR predictive models. The results of the NIR models including the different sampling strategies used are discussed. The developed models were used to predict the cellulose profiles on pith-to-bark strips sampled at breast-height from 28 trees. The weighted mean values for cellulose representing the whole disc were then determined. Results showed that the species was strongly correlated with screened pulp yield, highlighting that NIR spectroscopy can be a valuable tool in a tree breeding program for the rapid and non-destructive assessment of Kraft pulp yield.

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A novel phenolic compound and an alternative biosynthetic pathway for flavonoids in *Helichrysum aureonitens*

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A new chlorophenol, 1-hydroxy-5-chlorophenylhepta-1,3,5-triene (triyne), was isolated as the major phenolic compound from a *Helichrysum aureonitens* cell suspension culture. The methyl ether form of triyne has been previously isolated from *H. coriaceum*. The flavonoids, galangin and kaempferol, which are present in leaves of *H. aureonitens* was not detectable in the cell suspension extract. The results of GC/MS analyses on the leaves of *H. aureonitens* showed that the species contain 4′ hydroxylated and non-hydroxylated flavonoids as well as their respective precursors, pinobanksin and naringenin. This finding has not been reported before and our investigation on the biosyntheses of these flavonoids resulted in the detection of a new variation on the C4H gene that is playing a key role in an alternative biosynthetic route for 4′ hydroxylated flavonoids.

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Posters

Do *Isoglossa sensu lato* and relatives belong to their own subtribe *Isoglossinae* or are they just specialized *Justiciinae*?

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*Isoglossinae* comprises 50 species in the Old World tropics, of which twelve are recorded in southern Africa. Various classifications of the Acanthaceae have led to contrasting positions of the genus *Isoglossa*. The superficially most similar genus to *Isoglossa* in southern Africa is *Justicia*. Notable differences include the gülert pollum which characterises *Isoglossa* and relatives. This study seeks to determine whether *Isoglossa sensu lato* and relatives should be recognised at subtribal level. Further, we seek to determine whether or not a formerly recognized genus, *Ramusia*, should be resurrected and whether macro-morphological differences support the placement of *Isoglossa pawekiae* in a new genus. Thus, morphological relationships of Old World *Justiciinae* and *Isoglossinae* (Acanthaceae:Justicieae) were studied with a taxon sample including one species from each section (fidd Imelman) within the genus *Justicia* and eleven species from the two Old World *Isoglossinae* genera, *Bra-chystephanus* and *Isoglossa*. The *Isoglossa* species were selected to include those previously recognized as the genera *Strophacanthus* and *Ramusia*. *Rhinacanthus gracilis* var. *latilabiatus*, as well as a *Pennisetum* species were also included. *Asystasia gangetica* was chosen as the outgroup. A morphological data matrix was compiled and run through PAUP 4.0b10 (Alvite). The results support the recognition of the sub-tribe *Isoglossinae*, including *Isoglossa sensu lato* and relatives. On the basis of morphological characters, the resurrection of *Ramusia* is inconclusive, as is the placement of *Isoglossa pawekiae* and highlights the necessity for molecular research.

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An investigation of the rate of biogenic volatile organic carbon emission from commercial crops and plantation species in the Mpumalanga Province

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Biogenic volatile organic carbon (BVOC) emissions were measured for three crop and two plantation species (*Banana, Mango, Avocados, Pine* and *Eucalyptus*) grown in the Mpumalanga area. Screening procedures showed that all five species were emitters. No differences in isoprene and terpene concentrations were observed between crops and plantation species. All species showed a strong temperature and time (sunsne and sunset) dependence in their emissions. *Banana* and *Pine* emissions were low whilst *Mango* emitted
much higher concentrations. Concentrations of isoprene and terpene emitted from Mango and Eucalyptus were significantly greater than emissions from other species. Isoprene emissions from Avocado were greater than from Pine and Eucalyptus whereas terpene emissions were highest from Mango and Avocado. Leaf level emissions of the isoprene and terpenes (α-pinene, β-pinene, α-terpineine, linalool and limonene) were also measured using a leaf cuvette in combination with a gas chromatograph. The experimental design as well as initial results will be presented in the poster.

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National Plant Collecting Programme: Is it worth the trouble? Progress on collection in Tankwa Karoo and Namaqua National Parks

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The National Plant Collecting Programme (NPCP) uses the PRE Computerised Information System (PRECIS) database to identify areas of poor specimen representation at the National Herbarium (PRE) and then target them for collection. In 2004 a facet under the NPCP was registered as a long-term project within all South African National Parks (SANParks) to focus specifically on the aims of the NPCP within the enlarging SANParks. This poster compares the state of the holdings at PRE before commencement of the project (December 2003) with the state after three collecting expeditions to Namaqua National Park (2004–2006) and two trips to Tankwa Karoo National Park (2004 and 2006). General collecting increases our understanding of plant biogeography, assists in solving taxonomic problems and increases the predictive value of plant distributions in the PRECIS database. In Namaqua National Park 161 and in Tankwa Karoo National Park 357 new records were added to PRE. Our focused collection over two years contributed more to the botanical knowledge of the Tankwa Karoo National Park than other collections had contributed over the previous 100 years. In the Namaqua National Park the impact was less because of more extensive collecting in the past.

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Diverse beta-rhizobia nodulate the indigenous genus Hypocalypthus and related genera of the tribe Podalyrieae

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The monogenic tribe Hypocalyptheae (subfamily Papilionoideae) includes three species, Hypocalypthus sporocephalus, H. oxalidifolius and H. coluteoides, all of which are restricted to the Cape floristic region. They share some characteristics with members of the largely indigenous tribe Podalyrieae. Like most papilionoid legumes, the Hypocalyptheae and Podalyrieae are involved in nitrogen-fixing symbioses with rhizobial bacteria. Within the Podalyrieae, some Cyclopia species are known to be nodulated by so-called beta-rhizobia, which are mostly represented by the Beta-Proteobacteria genus Burkholderia. Our aim was to determine whether Hypocalypthus species and the Podalyrieae genera Podalyria and Virgilia are also nodulated by beta-rhizobia. For this purpose, bacteria were isolated from the root nodules of the Hypocalypthus species, as well as Virgilia oroboides and Podalyria calyptrata. For each isolate, the 16S ribosomal RNA gene was amplified, sequenced and subjected to phylogenetic analyses to obtain putative identifications. Our results showed that all the examined bacteria indeed represent Burkholderia species, some of which were most closely related to type-strains of known nitrogen-fixers (e.g. B. xenovorans) and/or nodulators (e.g. B. pynmatum and B. tuerber). However, the majority of isolates from the Hypocalypthus species, V. oroboides and P. calyptrata root nodules represent novel lineages of Burkholderia. Taken together, these data indicate that diverse Burkholderia species are likely to also nodulate other Virgilia and Podalyria species and that the root nodules of indigenous legumes probably represent unexplored reservoirs of vast beta-rhizobial diversity.

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Response of indigenous legumes of the Cape Floristic Region to P supply

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Plants growing in nutrient-impoverished soils of the Cape Floristic Region (CFR) are adapted to low levels of P. The fabaceae (legumes) are the second largest family in the CFR with 760 species. The effect of different levels of P supply was investigated on seven indigenous legumes: Crotalaria capensis, Indigofera frutescens, Indigofera hyalii, Lessoria frutescens, Podalyria calyptrata, Psoralea pinnata and Tephrosia grandiflora grown in hydroponics. The plants were subjected to four levels of P: 1, 10, 100, and 250 µM P. Six species received 1/5 dilution Hoagland nutrient solution and 0.5 mM N, while C. capensis received a 1/4 dilution. Plants were harvested at 65 d after exposure to P-treatments and assessed for dry matter yield, concentration of total non-structural carbohydrates (TNC) and tissue nutrients. The results showed that biomass accumulation in response to the levels of P whether on whole-plant or per organ basis varied with legume species. The highest level of P (250 µM P) stimulated whole-plant growth of C. capensis and I. frutescens but decreased growth of P. calyptrata relative to plants receiving 1 µM P. Similarly, supplying the plants with 100 µM P stimulated growth of I. hyalii and L. frutescens where as 10 µM P increased growth of T. grandiflora. In contrast, growth of P. pinnata was not affected by P supply suggesting that this species is not sensitive to P supply or the P levels were not high enough to stimulate growth response. The effect of P levels on concentration of TNC and nutrients in the tissue were discussed. The results suggest that there was wide variation of plant response to P levels in hydroponically grown plants such that increased P supply enhanced plant growth in some legume species.

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The salicylic acid signalling pathway confers tolerance to a biotrophic rust pathogen in pearl millet

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Studies were undertaken to assess induction of defence response pathways in the indigenous African crop, pearl millet, in response to infection with the leaf rust fungus Puccinia strastiata. Pathology studies indicated that pretreatment of pearl millet with salicylic acid (SA) conferred resistance to a virulent isolate of the rust fungus, whereas methyl jasmonate (MeJA) did not significantly reduce infection levels. These results suggest that the salicylic acid defence pathway is induced in response to rust infection. Large scale gene expression profiling was performed in order to contrast MeJA and SA responses in pearl millet, and identify transcripts that are uniquely expressed in response to SA treatment. Gene expression analysis revealed substantial overlap in gene expression responses between treatments, with MeJA and SA treatments exhibiting 75 coinduced transcripts. However there were 108 transcripts that were differentially expressed in response to SA treatment, but not in response to MeJA treatment. Sequence analysis indicated that these SA responsive transcripts included genes involved in SA biosynthesis, defence response, signal transduction, cellular detoxification in response to pathogens/oxidative burst, protein synthesis and photosynthesis, as well as transcripts