A R6 million commercial scale *Spirulina* algal biotechnology production plant was built at Musina, Limpopo Province answering amongst others the South African Government and the Department of Science and Technology call to place South Africa amongst the world leaders in the application of biotechnology and economic empowerment. World-wide the dietary supplement industry is extremely lucrative and amounts to US$ 23 billion per annum in the USA alone. Major other consumers are the Europeans and Japanese, and the market is growing at around 20% per annum. The transition from the laboratory to large scale production units is not a simple task, with many unforeseen problems, mostly related to scale. Downstream processing, product production, handling, quality and marketing are additional challenges, not experienced at the laboratory scale. The large outdoor production units offer exciting experimental and research possibilities and they were used, amongst others, to follow midday photosynthetic depression and the switching off of reaction centres.

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Preliminary cladistics of the genus *Hermannia* and intriguing morphological adaptations

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A preliminary cladistic analysis of some 100 species of the genus *Hermannia* section Mahernia is presented. Features of the plants are discussed with an emphasis on morphological adaptations to pollination and the environment. Flower colour changes may drive speciation through pollinator shifts, whereas dispersal mechanisms and geological specialisation appear to be key factors in explaining current species distributions.

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Micro-location of elements in leaves of *Leucadendron* 'Safari Sunset' (Proteaceae) with phosphorus toxicity

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Efficient phosphorus (P) uptake by Proteaceae cluster roots is an adaptation to highly weathered soils that are typically low in inorganic P and proteas consequently experience P toxicity at lower rhizosphere P concentrations than do crop plants. This study aimed to determine the sites of P toxicity in Proteaceae by mapping the distribution of elements in leaf tissue using micro proton-induced X-ray emission spectrometry. Phosphate supply up to 0.01 mM in a fertigation solution resulted in increased stem length of *Leucadendron* 'Safari Sunset' while P concentrations in excess of this resulted in decreased stem length, increased leaf [P] (up to 0.25% (w/w)) and caused typical P toxicity symptoms. In general, P toxicity resulted in increased non-metals P, S, and Si in some tissues, increased halides Cl and Br, and decreased transition metals Fe, Zn, Cu although Mn increased dramatically in some tissues. Phosphorus concentrations in all leaf tissues except the phloem and mesophyll increased in plants supplied with high (5 mM) compared to no (0 mM) added P. While the P concentration in the mesophyll and epidermis of plants supplied with 5 mM P stayed remained low (0.01% (w/w)), those in the xylem cambium were much higher (0.93% (w/w)). High xylem and bundle sheath P concentrations could bind Ca exiting the xylem and/or freely exchangeable Ca present in the middle lamellae of cell walls, resulting in precipitation as $CaHPO_4$ and causing the observed decrease in epidermal [Ca] and necrosis of leaf margins. Reduced [Fe] in all leaf tissues except the sclerenchyma, as well as increased vascular and bundle sheath [Mn] co-occurred with chlorotic leaves in P-stressed plants while reduced vascular [Zn] co-occurred with leaf rosetting.

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Bioactivity of plant extracts against methicillin-resistant *Staphylococcus aureus*

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The rise of infection caused by 'superbugs' is alarming and one of the most problematic resistant bacteria is methicillin-resistant *Staphylococcus aureus* (MRSA). This bacterium can cause a range of ailments like pneumonia, mastitis, meningitis, urinary tract infection, post operational infection etc. Novel drugs are needed for diseases caused by MRSA due to the toxicity of existing drugs. Ten medicinal plants were investigated for their efficacy against drug-sensitive and drug-resistant strains of *S. aureus*. Ethanol extracts of *Melianthus major*, *M. comosus* and *Dodonaea angustifolia* were found to have good inhibitory activity against both drug-sensitive and drug-resistant strains of *S. aureus*. Minimum inhibitory concentrations of all these plants ranged from 0.391 mg/ml up to 1.56 mg/ml. These active extracts were also tested against a Gram-negative bacterial species, *Escherichia coli*. *M. major* and *M. comosus* both showed a minimum inhibitory concentration (MIC) of 1.00 mg/ml against *E. coli*. Ethanol extracts of all the plants were tested for cytotoxicity on Vero cells using the XTT method. The lead extract, *M. major* had a 50% inhibitory concentration (IC_{50}) of 52.76 μg/ml and was therefore selected