distinguished in transverse section by, for example, the presence of palisade parenchyma on both sides of the leaf in *Pteronia* and a conspicuous hypodermis in *Agathosma*.

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Cluster roots of Proteaceae exude acid phosphatase enzymes as an adaptation to low-P soils, facilitating access to soil organic phosphate

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Proteaceae are adapted to the nutrient-poor soils of the Cape Floristic Region (CFR). These soils are generally acidic and low in plant-available phosphorus (P), with a significant proportion of soil P occurring in organic form. Soil P acquisition by Proteaceae is largely facilitated by cluster roots which are composed of densely branched determinate lateral roots and root hairs. Cluster roots are known to exude P-solubilising compounds into the rhizosphere, notably organic acids and phosphatases. It is known that phosphatase hydrolyses organic phosphate esters to produce orthophosphate (Pi), but the extent to which this makes soil organic P available for plant uptake is poorly understood. Phosphatase activities in cluster roots of wild populations of Proteaceae (*Leucadendron foedum*, *Ld. salignum*, *Ld. meridianum*, *Leucospermum praecox*, *Protea obtusifolia*, *P. repens*) were measured in limestone, acid sandstone, alkaline sand and clay sandstone soils. Cluster root phosphatase activity ($\mu M\ P_i g^{-1}\ min^{-1}$) differed ($p<0.001$) between soil types, where average phosphatase activity in limestone soil was 16.25±3.07; alkaline sand was 69.52±6.54; clay sandstone was 79.36±7.31; and acid sandstone was 92.83±16. Cluster roots isolated from alkaline calcareous soils had lower activity than those from acidic soils, including those of *P. repens*, which occurred in all soils. From this it was concluded that the activity of exuded phosphatase makes a significant contribution to plant phosphorus nutrition in certain soils, and is of variable importance according to plant species and soil type. Data from pot trials and hydroponic experiments, depicting the relationship between cluster root phosphatase activity and availability of P, are presented and discussed.

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Reproductive potential and seedling establishment of the invasive alien tree *Schinus molle* (Anacardiaceae) in South Africa

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Schinus molle (Peruvian pepper tree) was introduced to South Africa more than 150 years ago and was widely planted, mainly along roads. Only in the last two decades has the species become naturalized and invasive in some parts of its new range, notably in semi-arid savannas. Research is being undertaken to predict its potential for further invasion in South Africa. We studied pollination, seed production, dispersal and predation, and seedling establishment in relation to land uses at three sites, namely ungrazed savanna once used as a military training ground; a savanna grazed by native game; and an ungrazed mine dump. Pollination experiments demonstrated that seed set was greater in female flowers exposed to natural pollinators than in those from which pollinators were excluded. Some seed set in treatments protected from pollinators and not treated with pollen may indicate that some *S. molle* flowers might be bisexual and capable of self-pollination. Seed production and seed-rain density of *S. molle* varied greatly between study sites, but was high at all sites (384,864 - 1,233,690 seeds/tree/year; 3,877 - 9,477 seeds/m^2/yr). Seeds were dispersed to distances of up to 320 metres from female trees, but most seeds were deposited within 50 m of putative source trees. *S. molle* seed rain below canopies of *Acacia tortillis*, the dominant native tree at all sites, was of significantly better quality than seed rain below conspecifics which was much reduced by endophagous predators. The seed wasp *M. transvaalensis* typically develops inside the seeds of indigenous *Rhus* species but has formed a new association with *S. molle* was identified as the main predator of *S. molle* seeds. To predict patterns of future invasion in semi-arid savannas, we investigated the effects of soil type, microsite condition (microsite), and herbivory by large mammals on growth and survival of *S. molle* seedlings. Results suggest that protection provided by canopies of large indigenous *Acacia* trees facilitates *S. molle* invasion into semi-arid savanna. Whether exposed or protected from large herbivores, no seedlings planted in open grassland survived the first winter.

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The incredible journey of an *Albuca* pollen grain

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We studied the pollination biology of several *Albuca* species in the Western Cape and KwaZulu-Natal. Flowers in this genus are highly unusual on account of their tightly closed inner tepals with glandular hoods. Observations showed that nectar-seeking bees

prise open one of these tepals, clamber into the flower with their legs around the style, and receive pollen on the dorsal surface of their thorax from one of the primary anthers. When entering another flower, this pollen is deposited on the glandular hood of the inner tepal being prised open. The pollen germinates and penetrates the style only when the flower wilts and the tepal hoods are appressed against the stigma. Megachilid (leafcutter) bees are apparently the most important pollinators of *Albuca* species; this was confirmed by experiments involving virgin flowers in which we found that megachilids deposited and removed more pollen grains per visit than did honeybees. We also established that pollen transfer in *Albuca* populations is generally more efficient than in plants with conventional stigmatic pollen receipt. The floral conservatism in the genus *Albuca* apparently reflects the dedicated function of the inner tepals for mechanically filtering flower visitors, protecting the primary anthers from pollen-collecting insects, and transferring pollen to the stigma.

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An overview of the biological properties of volatile compounds - examples from the South African flora

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For many decades, essential oils produced by aromatic plants have been used to treat various ailments such as malaria and microbial. Many indigenous plants used in traditional health care are aromatic and this has prompted scientific investigations into the biological activities and chemical composition of several indigenous species. The antimicrobial, antimalarial, anti-oxidant and anti-inflammatory activities of selected South African aromatic plants used in traditional medicine will be discussed with emphasis on the Lamiaceae, Verbenaceae, Rutaceae, Geraniaceae and Asteraceae. The essential oil of *Vitex poora* exhibited good antimalarial activity (IC_{50}: 6.6×10^{-4} μg/ml), however the oil was also very toxic to kidney cells (IC_{50}: 4.2×10^{-6} μg/ml). The essential oil of *Salvia africana-caerulea* exhibited good antibacterial activity against *Bacillus cereus* (MIC value: 0.75 mg/ml) and also showed promising antimalarial activity (IC_{50}: 4.76 μg/ml). *Agathosma betulina*, often used topically to treat inflammation, inhibits the 5-lipoxygenase enzyme which is involved in the inflammation process (IC_{50}: 35.2 μg/ml). The paper will unequivocally illustrate the diverse biological properties of aromatic plants and emphasise the importance to record the pharmacological activity of ethnomedicinally important species.

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The use of aeroponics to investigate desiccation tolerance in the roots of the resurrection plant, *Xerophyta viscosa*

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The ability of resurrection plants to tolerate desiccation in vegetative tissues has fascinated researchers in the field. In order to understand the whole plant mechanism of attaining desiccation tolerance, we undertook to investigate the root tissues of the resurrection plant *Xerophyta viscosa,* as previous work has only been conducted on the leaf vegetative tissues of resurrection plants. An aeroponic plant growth system was designed and optimised to observe the roots response to desiccation without the restrictions of a soil medium and enable easy access to roots. The growth of both *X.viscosa* and control maize (*Zea mays*) plants were accomplished by regular spraying of roots with nutrient solution and dehydration was conducted through reduction of nutrient spraying. For the rehydration process *X. viscosa* plants were flooded with solution and were able to recuperate in under 48 hrs. Root relative water content and changes in antioxidant activity in response to desiccation were monitored. It was found through taking root water content samples that the roots are able to dry at a rapid rate aeroponically, in comparison to control plants dehydrating in soil. The antioxidant potential during dehydration was monitored and found to be active at a constant level between 80% and 5% RWC for antioxidant enzymes and at relatively high concentrations of 70 μM and 100 μM for the housekeeping antioxidants, ascorbate and glutathione, respectively.

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Molecular characterisation of pathogenesis-related protein 10 from *Xerophyta viscosa*

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Xerophyta viscosa is a poikilochlorophylous, desiccation tolerant plant that is able to withstand long periods of drought. The protective mechanisms that allow survival under abiotic stress conditions are being studied at the molecular level. A cDNA clone encoding a pathogenesis-related family 10 protein from *X. viscosa* (designated as XvIPR10) was isolated and characterised. *XvIPR10* encoded a 152 amino-acid, hydrophilic polypeptide with a molecular weight of 16.5 kDa and pI of 5.05 at pH 7. Phylogenetic and multiple sequence alignment analysis revealed that XvIPR10 had high identity (45.96%) and was related to AoPRP (AJ132610) from *Asparagus officinalis*. The recombinant XvIPR10 protein was over-expressed in a prokaryotic expression system and the protein exhibited ribonucleolytic activity against yeast transfer RNA. Furthermore a