of this investigation was to assess the overall anthropogenic and environmental impacts on urban trees by measuring the tree vitality of *Acacia karroo* using chlorophyll fluorescence kinetics (JIP-test) and leaf water potential using a pressure chamber. A comparative study following an urbanization gradient approach in Potchefstroom is used. The association between tree vitality measurements in the form of Performance Index values (PI) and soil physical and chemical data, leaf water potential and other vegetation components was determined using RDA-ordinations. Additionally, a model (SATAM) was used to determine the monetary value of trees in urban environments. All this information will eventually contribute to develop an urban tree management program for Potchefstroom. It was evident from this study that urbanization has a negative impact on tree vitality but the water potential of trees was not necessarily negatively impacted upon. Although trees in urban environments do not always have high performance values they still play a major role in urban environments. According to the tree appraisal method (SATAM) some of these trees have a value of over R60,000.

doi:10.1016/j.sajb.2007.02.168

Dark chilling lowers the content and catabolism of ureides in soybean leaves: Long-term effects on nitrogen status and vegetative growth

D.J. Mellet, M. De Beer, A.J. Strauss, G.H.J. Krüger, P.D.R. Van Heerden
School of Environmental Sciences and Development, Section Botany, North-West University, Potchefstroom 2520, South Africa

Bacterial nitrogenase activity in the root nodules of certain legumes such as soybean leads to the synthesis of organic N-compounds known as ureides. Before utilisation in the leaves, ureides must first be converted to urea through a catabolic pathway that involves the enzyme allantoinase. Environmental stress factors, such as chilling stress, could potentially cause reductions in leaf ureide content and/or lower rates of ureide catabolism. Although these aspects may be very important in the inherent chilling sensitivity of warm-climate legumes such as soybean, no information about the effects of chilling stress on these processes exists. The aim of this study was to characterise allantoinase activity in soybean leaves and to determine the relationship with ureide content under normal and chilling temperatures. Plants of a chilling sensitive soybean genotype, PAN809, were cultivated under optimal conditions in a growth chamber. After four weeks of growth, leaves were harvested from plants at two-hour intervals throughout a 24-hour cycle. Large diurnal changes in allantoinase activity, and an inverse relationship between allantoinase activity and leaf ureide content, was observed. Allantoinase activity was generally at its lowest during the night but showed large increases already prior to the start of the light period. Maximum allantoinase activity occurred approximately four hours into the light period. These diurnal changes were most pronounced in young developing leaves. Simultaneous exposure of the roots and shoots of plants to dark chilling led to large reductions in both ureide content and allantoinase activity, while chilling of only the shoots reduced allantoinase activity but not ureide content. We provide novel evidence showing how dark chilling leads to severe N-limitation in shoots through a combined lowering of leaf ureide content and ureide catabolism. These perturbations manifested itself in the form of reduced shoot growth and the widespread development of chlorosis.

doi:10.1016/j.sajb.2007.02.169

Root physiology and anchorage efficiency of young *Eucalyptus* trees derived from micropropagation, cuttings and seedlings

M.E.O. Mokotedi, N.W. Pammenter, M.P. Watt
School of Life and Environmental Sciences, Howard College, University of KwaZulu-Natal, Durban 4001, South Africa

Micropropagation has improved rooting rates of numerous recalcitrant cold-tolerant hybrid clones of *Eucalyptus* species. However, *ex vitro* growth and physiology as well as root properties of those plants have received very little attention. Using a clone of *E. grandis*×*nitens*, we found no significant differences between micro- and macropropagated saplings and trees with respect to photosynthesis and leaf hydraulic characteristics. However, differences in root structure and anchorage efficiency were significant. At least 50% of the uprooted macropropagated trees produced a root system similar and equivalent in resistance to the tap roots of seed propagated *E. grandis* and *E. nitens*. However, none of the micropropagated trees produced equivalents of tap roots. Root abnormalities such as spiralling, kinked roots forming a 'ball-and-socket' at the root–shoot junction were common, and in addition, some micropropagated trees produced horizontal and vertical stems. Vegetatively propagated trees generally produced a shallower root system compared with seed propagated trees, which reduced uprooting resistance and led to trees being toppled by wind loading. The former produced fewer and thicker I-beam shaped roots, whereas the later produced T-beam shaped roots. The number of roots as well as root cross sectional area had a significant effect on the maximum force required to vertically extract roots. We found that for micropropagated trees, roots more efficient in anchorage developed after nearly two years of field-growth, which might be too late if saplings are to be planted in areas with strong winds. We conclude therefore, that the

quality and handling of micropropagated saplings before and during planting are important in the production of an efficient root system. Planting micropropagated saplings at a higher density than macropropagated trees might also improve anchorage by facilitating root ground cover.

doi:10.1016/j.sajb.2007.02.170

Regulation of photosynthetic activity by sucrose and hexose in leaves of sugarcane

A.J. McCormick [a,b], M.D. Cramer [c], F.C. Botha [a], D.A. Watt [a,b]
[a] *South African Sugarcane Research Institute, Private Bag X02, Mount Edgecombe 4300, South Africa*
[b] *School of Biological and Conservation Sciences, University of KwaZulu-Natal, Howard College, Durban 4041, South Africa*
[c] *Department of Botany, University of Cape Town, Private Bag, Rondebosch 7701, South Africa*

In crops other than sugarcane there is good evidence that the size and activity of carbon sinks influence source photosynthetic activity via regulation of photosynthesis-related enzymes, an effect that is partly mediated through coarse regulation of gene expression. The existence in sugarcane of a robust sugar-dependent relationship between leaf and sink tissues could represent a potentially fundamental limiting factor for sucrose accumulation in the stalk and consequently play a major role in overall sucrose yield. Previous work in our laboratories has demonstrated that increased culm sink demand through partial shading resulted in increased photosynthetic rates that correlated with a reduction in hexose levels in the leaves. In an extension of that study, we have examined source regulation in detached leaves (third fully-expanded) of pot grown *Saccharum* spp. hybrid cv. N19 (N19) with the aim of elucidating the mechanisms that determine carbon partitioning in sugarcane. Excised leaves preincubated in darkness for 3 h had increased photosynthetic rates on transfer back to light, relative to control plants maintained in the light. Tissue sucrose accumulation was reduced by darkness, but accumulated again upon transfer to the light. However, after the dark period, hexose levels remained significantly lower for the remainder of the incubation time; possibly indicating that photosynthesis was up-regulated by lack of hexose accumulation. When the excised leaves were fed a 1 mM sucrose solution via the transpiration stream, dark-treated leaves exhibited reduced photosynthetic rates, which were associated with increased sucrose and hexose concentrations within the leaf tissue. This down-regulation of photosynthesis by sugar accumulation was further explored by supplying the leaf transpiration stream with a variety of metabolites that have putative roles in mediating the source–sink relationship.

doi:10.1016/j.sajb.2007.02.171

Antimicrobial activity of medicinal plants against oral microorganisms

G.K. More [a], T.E. Tshikalange [a], N. Lall [a], J.J.M. Meyer [a], F.S. Botha [b], A.A. Hussein [c]
[a] *Department of Botany, University of Pretoria, Pretoria 0002, South Africa*
[b] *Centre of Stomatological Research, School of Dentistry, University of Pretoria, Pretoria 0002, South Africa*
[c] *Department of Chemistry of Medicinal Plants, National Research Center, El-Tahrir St., Dokki, Cairo, Egypt*

Ethanol extracts of nine plant species used traditionally in the treatment of oral diseases were screened *in vitro* for antimicrobial activity against oral pathogens namely *Actinobacillus actinomycetemcomitans*, *Actinomyces naeslundii*, *Actinomyces israelii*, *Candida albicans*, *Porphyromonus gingivalis*, *Privotella intermedi* and *Streptococcus mutans.* The antimicrobial activity was determined using the agar disk diffusion method. Out of nine plants, six showed good antimicrobial activity. The extract of the leaves of *Euclea natalensis* inhibited the growth of *C. albicans* at a concentration of 20 μg/μl and none of the extracts inhibited *A. actinomycetomcomitans*. The minimum inhibitory concentration, minimum bactericidal concentration and cytotoxicity were also determined. A pure triterpenoid was isolated from *E. natalensis* and we will report on its antimicrobial activity.

doi:10.1016/j.sajb.2007.02.172

Mutagenic and antimutagenic effects of *Sutherlandia frutescens*

S.S.B.N. Ntuli, W.C.A. Gelderblom, D.R. Katerere, B.I. Ndodo
Promec Unit, Medical Research Council, PO Box 19070, Tygerberg 7505, South Africa

Sutherlandia frutescens is a popular herbal product in South Africa which has reputed anti-cancer and anti-HIV properties. In spite of its widespread usage there is very little scientific evidence on its efficacy and potential toxicity. Dried ground whole plant material of *S. frutescens* was extracted by both sequential and non-sequential extractions using water and various organic solvents. The ethylacetate and 50% aqueous methanolic extracts were screened for mutagenic and antimutagenic activity using the *Salmonella*/microsome mutagenicity assay (double layer Ames test) against *Salmonella typhimurium* TA97a, TA98, TA100 and TA102 bacterial strains in the presence and absence of metabolic activation S9. The ethylacetate extract indicated antimutagenicity against all the bacterial strains tested. The 50% aqueous methanolic extract showed both antimutagenic and promutagenic activities. This is the first