The adaptive function and evolution of distyly has intrigued pollination biologists since Darwin's suggestion that reciprocal herkogamy evolved to promote intermorph cross-pollen transfer. The distylous, pollen colour dimorphic plant, *Pentanisia prunelloides*, was used as a model system to show how intermorph cross-pollen transfer is influenced by nectar (butterflies) and pollen (bees) collecting insects. The results show that individual bee visitation sequences, as well as pollen loads, are morph biased and result in low pollinator effectiveness when compared to butterflies. Darwin's cross-promotion hypothesis (reciprocal herkogamy promotes higher proficiency of intermorph cross-pollen transfer than intramorph cross-pollen transfer) and pollen fates (pollen removal failure, pollen transport loss, facilitated autogamy, autonomous autogamy, intramorph cross-pollen transfer and intermorph cross-pollen transfer) were investigated by combining emasculation and non-emasculation treatments, which revealed that the proficiency of intermorph cross-pollen transfer is 1.88 times higher than intramorph cross-pollen transfer, as well as about 1% of the pollen produced reaches the stigmas of the opposite morph. For both morphs, intramorph cross-pollen transfer was responsible for the largest contribution to illegitimate stigmatic pollen loads, while the geitonogamy and autonomous autogamy contributions were minimal. Negative frequency dependent selection has been hypothesized as an important selective force for the maintenance of distyly in natural populations. By manipulating the morph ratios and examining pollen import as well as export in experimental and field arrays, evidence for negative frequency dependent pollen transfer pattern was detected. Furthermore, it was shown that the theoretical conditions for the maintenance of sigma-height dimorphism as proposed by the Lloyd and Webb model were satisfied in this system.

doi:10.1016/j.sajb.2007.02.083

How savanna grasses decompose?

M.L. Masubelele [a], W.J. Bond [b], W.D. Stock [c]
[a] *Scientific Services, Kruger National Park, PO Box 318, Skukuza 1350, South Africa*
[b] *Department of Botany, University of Cape Town, Private Bag, Rondebosch 7701, South Africa*
[c] *Centre for Ecosystem Management, Edith Cowan University, 100 Joondalup Drive, Western Australia 6027, Australia*

Decomposition studies typically use litter bags placed on the soil. The fact that decomposition starts while plant litter is still standing in the field, experiencing breakdown by the sun, has seldom been considered. Here I report a comparative study of rates, and correlates, of decomposition of ten species of savanna grasses in the sun and on the soil. Rates of photodegradation of grass litter were significantly slower than microbial breakdown. The variables that best predicted decomposition in the sun were also different from those that determined decomposition on the soil. Initial photodegradation was predicted by polyphenolic content and tensile strength while initial microbial decomposition was governed by C/N ratio, polyphenolic content and tensile strength. These results have important implications for which grasses accumulate fuel, standing dead litter, in savannas.

doi:10.1016/j.sajb.2007.02.084

Photosynthesis and the regulatory role of sucrose and hexose in sugarcane leaves

A.J. McCormick [a,b], M.D. Cramer [c], 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, Ronderbosch 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 cold-girdled and detached leaves (second and 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. Cold-girdled leaves (at 5 °C) showed increased sucrose and hexose levels and a decline in photosynthetic rates over the duration of the 5 day treatment. 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 or pre-fed sucrose via the transpiration stream, dark-treated leaves exhibited reduced photosynthetic rates, which were associated with increased sucrose and hexose concentrations within the leaf tissue. The observed down-regulation of photosynthesis by sugar accumulation has provided a starting point for future identification of gene transcripts that have putative roles in mediating the source–sink relationship.

doi:10.1016/j.sajb.2007.02.085