with differential snow melt and longevity. These results will provide a very detailed assessment of the environment experienced by these alpine plants, and help identify implications under climate change scenarios.

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Plant species richness, soil properties and grazing effects in semi-arid grassland of South Africa

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Human activities, especially intensive agricultural production in grasslands, have resulted in a significant loss in the earth's biodiversity. In southern Africa, the greatest biodiversity loss has been in the grassland biome, mainly as a result of the cultivation of natural grassland and urban sprawl. Biodiversity is affected by precipitation regimes, availability of soil nutrients and grazing practices. Our study investigated the effect of soil nutrients and grazing intensity on biodiversity along a rainfall gradient in semi-arid grassland of South Africa. We conducted vegetation and soil surveys in high grazing (HG) and low grazing (LG) grasslands around Bethlehem and Bloemfontein in the Free State, and Kimberley in the Northern Province. Species richness increased from Kimberley to Bethlehem; this geographical gradient was positively associated with rainfall and correspondingly with soil nitrogen (N) and carbon (C), but negatively with soil pH. This could be due to more decomposable phytomass, and subsequently N together with C which is deposited on the soil surface in the higher rainfall area of Bethlehem. Soil pH presumably had a negative effect on species richness as a result of less intense leaching of the base cations in the lower rainfall areas of Bloemfontein and Kimberley. Comparisons between LG and HG sites revealed that Bethlehem had significantly higher species richness at LG than HG sites; soil pH was higher at the LG sites although the soils of sites at both grazing intensities are regarded as moderately acidic. Bloemfontein LG sites having slightly acidic soil had greater species richness than the HG sites having neutral soil. In Kimberley no significant difference was found between neutral soil with LG and slightly alkaline soil with HG. Our results indicate soil pH as the main variable determining species richness in the study area, and hence a possible indicator for monitoring biodiversity in semi-arid grassland.

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Towards improved nitrogen use efficiency in sugarcane by overexpression of alanine aminotransferase

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Although modern agriculture has become heavily dependent on the use of nitrogen fertilisers, most crops are unable to absorb and metabolise the applied nitrogen efficiently, resulting in fertiliser loss and consequent environmental pollution. Clearly, there is a need to improve the nitrogen use efficiency of agricultural crops. Towards this end, a potential approach is to generate transgenic plants that overexpress the enzyme alanine aminotransferase (AlaAT), which has been shown to increase nitrogen use efficiency in canola and rice. Such transgenic plants produced more plant biomass (and grain yield) using less nitrogen fertiliser than wild type plants. Transgenic plants have been generated at the South African Sugarcane Research Institute and evaluation is in progress to assess their nitrogen use efficiency. The analyses include biochemical assays to determine uptake of inorganic nitrogen (nitrate or ammonium), total nitrogen in the plants, AlaAT enzyme assays and phenotypic assessments to identify transgenic plants with improved use of nitrogen. The benefit of improved nitrogen use efficiency is that such plants would either produce higher yields at the same level of applied nitrogen, or similar yields at lower applied nitrogen when compared with wild type plants. Consequently, it is envisaged that if nitrogen use efficiency can be increased in sugarcane, then this would significantly reduce fertiliser costs and the input of nitrogen into the environment without impacting negatively on yield.

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Iris pseudacorus L.: An ornamental aquatic with invasive potential in South Africa

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The ornamental aquatic plant industry in South Africa and elsewhere in the world has grown substantially during the last decade and there is a renewed demand for several exotic species. *Iris pseudacorus*, a submerged plant used in the horticultural industry, classified as a category 1a invasive in the National Environmental Management: Biodiversity Act, 2004 draft alien and invasive species regulations. Certain countries have recognized the species as a problematic plant. Knowledge of the mode of propagation of invasive species and the efficiency thereof is vital in the management of biological invasions. In this study we investigated the vegetative propagation efficiency of *Iris pseudacorus*. The propagation efficiency of different maturity stages of stem cuttings (upper, middle and low) was investigated. Rhizome cuttings with four different lengths (1, 2, 4 and 8 cm) were studied to determine the ability of fragmented vegetative parts to develop new plants. Upper and middle stems showed the highest survival rates compared to lower parts of the stem cuttings. Rhizome fragments of 2-cm were capable of developing into a new plant. This implies that removal of even the smallest fragments is necessary to control this plant. Submerged plants can spread easily through fragmentation and manual removal will likely increase the rate of spread. Generally, manual removal is considered as effective for small infestations of *Iris pseudacorus*, however, this study indicates that repeated removal of plant parts is imperative for an ecologically sound management approach and effective eradication.

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Nitric oxide differentially modulates the expression of four cystatins from soybean

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