Mechanisms of growth and photosynthetic inhibition of a southern African geophyte (*Tritonia crocata*) by an invasive European annual grass (*Lolium multiflorum*)

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The rapid spread of European annual grasses in Mediterranean climate regions of South Africa listed among 25 global biodiversity hot spots is cause for concern, especially in terms of the wildflower diversity which forms the basis of a growing lucrative nature-based tourist industry in a region unique in terms of its rich floristic diversity and endemism. These alien grasses are known to impact on ecosystem structure by decreasing floral and faunal diversity through widespread and aggressive competition with native species. However, unknown are the physiological mechanisms underlying competitive interactions between alien invasive grasses and native taxa, and how these are modified by resource supply. These mechanisms were examined by comparing the photochemical performance, photosynthesis, growth and reproduction of a typical native geophyte *Tritonia crocata* (L.) Ker. Gawl. cultivated in monoculture and in mixture with an invasive European annual rye grass *Lolium multiflorum* Lam. in a replacement series design under 8 different combinations of water and nutrient supply in a passively ventilated greenhouse. Significantly reduced concentrations of photosynthetic pigments (chlorophyll *a* and total carotenoids), diminished photochemical efficiency (phenomenological energy fluxes per leaf cross sectional area for absorption, trapping and transport), decreased rates of photosynthetic gas and water exchange and abundance of the photosynthetic enzyme Rubisco, as well as diminished vegetative and reproductive biomass were observed in *T. crocata* grown in mixture with the invasive grass. These adverse effects were modified by level of water and nutrient supply, those of greatest magnitude apparent under conditions of high water and nutrient supply. The more effective competition for soil water resources by the invasive grass appeared the principle mechanism underlying the observed photosynthetic and growth inhibition in the native geophyte.

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Storage of *Saccharum* spp. germplasm under minimal growth conditions

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Micropropagation of *Saccharum* spp. germplasm is used routinely in our laboratories for rapid production of new cultivars. At times, due to greenhouse and field constraints, it is necessary to hold back material in culture. For this purpose, methods are being investigated to slow down growth and development at two culture stages, viz. before somatic embryo maturation and before plantlet acclimatization in the greenhouse. The protocol for plantlet regeneration via somatic embryogenesis comprised placing immature leaf segments as explants on an initiation medium (MS, 0.6 mg/l 2,4-D, 20 g/l sucrose, 0.5 g/l casein hydrolysate and 8 g/l agar) in the dark for six weeks, and then on the same medium without 2,4-D for four weeks under a photoperiod. Storage of immature somatic embryos was attempted three weeks after initiation by transferring the cultures to minimal growth conditions (1/2 MS, 5 or 20 g/l sucrose, 0.6 mg/l 2,4-D, at both 18 and 24 ± 2 °C) for 6, 12 and 18 weeks, after which they were placed on regeneration medium. Storage of immature embryos was successful for 12 weeks under all of the treatments tested, with the lower sucrose regime resulting in greater plantlet yields than the control at both 18 and 24 °C. Some of the storage treatments resulted in fewer albino plants than the control. For storage of whole plantlets prior to acclimatization, the effect of MS strength, gelling agent, ABA concentration, high osmoticum and temperature on plantlet survival was tested for eight months. The highest survival rates and shoot re-growth after

The probable use of *Pistia stratiotes* as a bioindicator of Cadmium and Zinc pollution in water

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The growth of *Pistia stratiotes* in an industrial effluent obtained from a battery factory was investigated over time. This was to access its suitability for use as a bioindicator of heavy metal pollution. An assay of the concentrated effluent showed that Cadmium (Cd) and Zinc (Zn) were found to be present at 0.415 mg/l and 0.80 mg/l respectively. The plants were grown in full and half strength concentrations of the effluent. By the third day, plants grown in full concentration of the effluent showed signs of stress and chlorotic by the seventh day. The plant parts analysed showed that the leaves and roots of the young plants took up high quantities of the heavy metals than the mature plants with the roots however took up more heavy metals than the leaves. *Pistia stratiotes* can be used as a bioindicator of Cd and Zn pollution streams as it responds quickly to their presence in water.

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