A case study of an alien vascular plant *(Agrostis stolonifera)* introduced on Marion Island

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Leaf anatomy, CO_2 assimilation rates, leaf N, chlorophyll, RuBP carboxylase and nitrate reductase were studied on the invasive alien grass Agrostis stolonifera *L. on Marion Island (sub-Antarctic). The results were compared with corresponding results from the indigenous* Agrostis magellanica *Lam. at the island.*

Blaaranatomie, CO_2-assimilasie, N-inhoud, chlorofil, RuBP-karboksilase en nitraatreduktase is by die uitheemse gras Agrostis stolonifera *L. op Marion-eiland (sub-Antarkties) ondersoek. Die resultate is met dié vir die inheemse* A. magellanica *Lam. van die eiland vergelyk.*

Agrostis stolonifera L. was first recorded at the meteorological station at Marion Island in 1965 and has since spread rapidly so that today it occurs on much of the northern and eastern coastal plains. Anatomical, biochemical and gas-exchange properties of the leaves of this species were investigated and the results compared with those from the indigenous *Agrostis magellanica* Lam. at the island.

Mesophyll cells of *A. magellanica* were larger but the number of cells per unit leaf area and the chloroplast to leaf surface area index were the same for the two species. Leaves of *A. magellanica* were more deeply ridged, thicker and more sclerophyllous than those of *A. stolonifera*.

On a leaf area basis there was little difference between the two *Agrostis* species in parameters which may be considered as indicators of the "biochemical" capacity for photosynthesis, e.g. leaf N content, chlorophyll concentration and RuBP carboxylase activity. Maxima for these parameters occurred in leaf 2 for both species; however, maximum CO_2, assimilation rates in *A. stolonifera* occurred in leaf 1 but for *A. magellanica* in leaf 2. The maximum rates (9 to 10 umol CO_2 m^{-2} s^{-1}) did not differ significantly between the two species and were similar to maximum values reported for Arctic and sub-Arctic tundra graminoids. At low photon flux densities *A. stolonifera* showed a greater response of CO_2 assimilation to photon flux density. *A. magellanica* exhibited temperature dependent photoinhibition.

The competitive ability of *A. stolonifera* on Marion Island may be related to its response to low photon flux densities or to its carbon allocation patterns (less sclerophyllous tissue means that a greater leaf area may be produced per unit carbon fixed). The lack of support tissue may limit it to sites partly sheltered from frequent gale-force winds.