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Physiological responses of a fynbos legume, Aspalathus linearis to drought stress

Daleen Lotter [a,d], Alexander J. Valentine [b,], Emma Archer Van Garderen [c], Mark Tadross [d,e]

[a] CSIR, Natural Resources and the Environment, P.O. Box 320, Stellenbosch 7602, South Africa
[b] Botany and Zoology Department, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa
[c] CSIR Natural Resources & the Environment, Bldg 1, cnr Carlow & Rustenburg Roads, Emmarentia 2193/School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, 1 Jan Smuts Avenue, Braamfontein 2000, South Africa
[d] Climate Systems Analysis Group, Department of Environmental and Geographical Science, University of Cape Town, Private Bag, Rondebosch 7701, South Africa
[e] United Nations Development Programme (UNDP–GEF), Energy and Environment Group, BDP 304 East 45th Street, 9th Floor, New York, NY 10017, USA

Abstract

Aspalathus linearis (rooibos) is a medicinally and economically useful shrub which is endemic to the Mediterranean west coast region of South Africa. Species distribution modelling indicates potentially severe consequences in range shift for rooibos tea under the changing climate conditions. However, they are based on several assumptions and simplifications which may compromise future predictions. In an effort to improve the accuracy of the species distribution model, results obtained from the modelling were used to further investigate the species' climatic limits through experimental manipulation of drought.Water limitation was associated with significant decreases in net photosynthesis, stomatal conductance, and transpiration in A. linearis. The inhibitory effects of drought on photosynthetic parameters had a concomitant effect on biomass accumulation and nutrient allocation. Hence, the projected increase in aridity for the rooibos production region is expected to reduce productivity of commercially cultivated tea. However, rooibos demonstrated certain adaptation mechanisms to adverse conditions by increasing water use efficiency, developing a higher level of sclerophylly and altering the allocation of plant reserves by increasing the flow of assimilates to the roots. The ability of the species to partially offset the negative effects of water deficit stress may enable seedlings to survive and persist, albeit with reduced biomass.