

The causes and effects of indigenous C₄ grass expansion into a hyper diverse fynbos shrubland

Abstract

The cool season rainfall at our study site should favour C₃ rather than C₄ grasses. There are however several locations where C₄ grasses have become dominant suggesting that rainfall seasonality is not a constraint on distribution. Here we explored the limitations on C₄ grass distribution in a fynbos shrubland.

Using $\delta^{13}\text{C}$ values of SOM we determined when these grasses had established. We also looked at the role of roads as conduits for establishment and asked what impact these grasses may have on fynbos species richness. We then conducted a field experiment designed to examine the extent to which soil moisture, nutrient availability and competition with fynbos for resources influences the establishment and growth of the grasses. Finally using aerial photography, we explored the role of changes in land use on distribution.

Our results showed that the establishment is recent, that roads may be acting as conduits and that with establishment there is a reduction in fynbos species richness and diversity. Disturbance and removing below-ground competition for resources, opens the system to establishment in wetter areas.

This study is the first to look at the potential for C₄ grasses expanding into cool season rainfall shrublands such as in Western Australia and South Africa. What is interesting about these results is that C₄ grasses can establish and dominate in a cool season rainfall regime. Rather than temperature of the growing season, it is competition for resources from fynbos that prevents these grasses from encroaching.