A Genecological Study of the Widespread Australian Native Grass *Austrodanthonia Caespitosa* (Gaudich.) H.P. Linder.

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The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

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Introduction The lack of commercial quantities of seed is preventing the use of native grasses in large-scale revegetation programmes. Sourcing wild-land non-local provenance seed from distant locations brings with it risks associated with maladaptation and potential genetic pollution. Understanding of intra-specific ecotypic variation and its adaptive consequences is required to both increase seed supply and retain adaptive characteristics in native plant revegetation programmes. A recently commenced genecological study on the widespread Australian native grass, *Austrodanthonia caespitose,* aims to examine quantitative traits in a common garden study and genetic structure (using DNA analysis) of 35 populations collected from a large geographic range. Examination of the adaptive significance of these traits using reciprocal transplant experiments will aid in the development of provenance guidelines for Australian native grasses. In this paper we report the initial findings for one of many characteristics being measured in a common garden study, namely plant transpiration efficiency.

Materials and methods Leaf, stem and inflorescence samples were harvested from a subset of the main plant collection. This subset included ten populations represented by 8 individuals (4 pairs) covering a range of bio-geographical characteristics. Ground and dried plant samples were analysed for $\partial^{13}C$ according to standard methods. A higher value of $\partial^{13}C$ indicates higher discrimination and therefore less carbon fixed per unit of water lost (low water-use efficiency).

Results No significant difference in $\partial^{13}C$ among sites was detected ($F_{(9, 63)} = 1.451$, $P > 0.18$). Calculation of the variance components showed that most of the variation was between plant pairs within a site (1.62, $P<0.001$), indicating genetic differences were occurring over small distances, perhaps <1 m. Exposure to solar radiation from a northerly aspect had a significant effect on $\partial^{13}C$ values (Table 1) which became increasingly more negative with decreasing sunlight. Whilst the relationship between altitude and $\partial^{13}C$ was significant, it was also weak. Here, $\partial^{13}C$ increased with increasing altitude but this may have been confounded by soil type as higher altitude sites were associated with shallower soils than those at lower altitudes. The relationship with altitude was strongest for those micro-sites that were heavily shaded; in these situations the close proximity to shrubs and trees would provide competition for soil moisture with the *Austrodanthonia caespitosa* plant.

Table 1 ANVOA for stepwise regression for response variable $\partial^{13}C$. $R^2 = 0.24$

Term	d.f.	Sums of Squares	Mean Square	F-value	P
Horizon (North)	1	2.98	2.98	6.47	0.01
Altitude	1	1.94	1.94	4.22	0.04
Logging/clearing	1	1.81	1.81	3.93	0.05 ns
Horizon (South)	1	1.46	1.46	3.16	0.07 ns
Exchangeable Aluminium	1	1.63	1.63	3.55	0.07 ns
Residual	67	30.89	0.46		

All $\partial^{13}C$ values were within the range of -25 to -29 reported previously for C_3 plants. It was expected that $\partial^{13}C$ would be highest (less negative) in the drier environments compared to wetter ones but the opposite was found. This suggests that larger scale landscape characteristics may be less important than micro-site characteristics in driving genetic differentiation at least for this trait.

Conclusions These preliminary results suggest that there is more within-site than between-site variation in $\partial^{13}C$ reflecting little ecotypic variation within this species. Distance appeared to be a poor indicator of variation, rather variation was more pronounced at a much finer scale. In the case of $\partial^{13}C$, differences in micro-site characteristics and altitude appear to have the greatest influence on $\partial^{13}C$ suggesting that it is perhaps more important to match restoration site conditions with those of the seed collection site. These results suggest that a broad provenance range for *A. caespitosa* and that seed could be sourced widely with little apparent consequence for performance in plant transpiration efficiency. However, this is not the only variable that should be considered in delineating a provenance boundary.