Are leaf traits stable enough to rank native grasses in contrasting growth conditions?

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Introduction The growing interest in classifying species in response groups relating to variations in environmental factors has triggered the search for functional traits that express differences in ecological behaviour among plant species (Lavorel & Garnier, 2002). Specific leaf area (SLA) and leaf dry matter content (LDMC) reflect a fundamental trade-off in plant functioning between a fast growth rate (high SLA, low LDMC species) and nutrient conservation (low SLA, high LDMC species). This study aimed to analyse the stability of ranking native grasses by SLA and LDMC values under different plant growing conditions.

Materials and methods Twelve wild grass species, *Anthoxanthum odoratum* (Ao), A*grostis capillaris* (Ac), *Arrhenatherum elatius* (Ae), A*venula marginata* (Am), *Brachypodium pinnatum* (Bp), *Briza media* (Bm), *Dactylis glomerata* (Dg), *Danthonia decumbens* (Dd*), Holcus lanatus* (Hl), *Lolium perenne* (Lp), *Festuca rubra* (Fr), and *Molinia cœrulea* (Mc), harvested in natural Pyrenean meadows, were cultivated in a growth chamber with a complete nutrient solution (GC treatment: 260µ E/m^2 per s , 25-18°C day-night temperature) and in heavily fertilised, irrigated plots at Toulouse (T). LDMC and SLA were measured in the two treatments following the standard protocol described by Garnier *et al*., (2001). Mean of 3 replicates of 3 plants in GC or 12 plants in T were compared to a database of traits measured in field conditions (F) in the Central Pyrenees. As Dd was not cultivated in T, correlations were calculated for 11 or 12 pairs of species.

Results Pearson's correlations and Spearman's rank correlations between GC values and F values or T values are generally higher for LDMC than for SLA (Table 1). Growth chamber and field LDMC correlated fairly well for all the grasses excepted Bm. This species showed lower field LDMC than expected (Figure 1).

Table 1 Correlation between LDMC and SLA measured in contrasted environments [#]

Treatments	Correlation coefficients	Traits	
		LDMC	SLA
GC - T	r Pearson	0.913 ***	0.658 *
	r Spearman	0.884 ***	0.747 **
GC - F	r Pearson	0.828 ***	0.794 **
	r Spearman	0.886 ***	0.725 **
T - F	r Pearson	0.874 ***	0.753 **
	r Spearman	0.736 **	0.825 **

[#] *** P < 0.001; ** P< 0.01; * P < 0.05

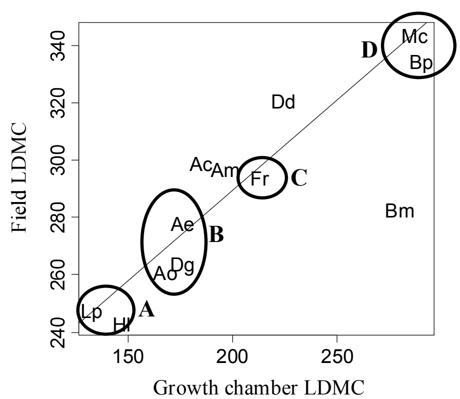

Figure 1 Relation between field and growth chamber LDMC of grasses (n = 11, Bm excluded; Pearson's r = 0.945 ***, Spearman's r = 0.943 ***). A, B, C and D are functional types of grasses (Ansquer *et al*., 2004)

Conclusions In spite of variation in growth factors (large fertility gradient between F and T or GC and lower photon fluxes in GC than in F and T), the LDMC was robust enough to rank grass species. Species ranking, based on correlation of agronomic characteristics and functional traits (Ansquer *et al*., 2004), agree with the functional grass typology, as used to assess the utilisation value of natural grasslands according to their dominant grasses.

References

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