

Site effects on the composition of multi-species grass/legume mixtures during sward establishment

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Introduction Under the auspices of COST Action 852, a multi-site experiment investigated issues of community structure, function and their interrelationships in multi-species grass/legume mixtures (Collins *et al.*, 2004; Sebastià *et al.*, 2004). We describe the effects of 2 contrasting sites on forage yield and species composition during sward establishment.

Materials and methods Identical experiments were established at 2 sites in Wales, site 1 (AB) at Aberystwyth (30m ASL) and site 2 (BM) at Bronydd Mawr (400m ASL). The experiment used 4 species. Legume (L) and grass (G) functional groups were subdivided further into fast growing, competitive species (subscript '1'), and relatively slow growing, persistent species (subscript '2'). The species used were perennial ryegrass cv. Fennema (G₁); cocksfoot cv. Cambria (G₂); red clover cv. Merviot (L₁), and white clover cv. Alice (L₂). Mixtures were constructed using a range of species proportions based on monocultures sown at 2 densities. High density (HD) monoculture plots were sown at rates of 40, 30, 15 and 5 kg/ha for G₁, G₂, L₁ and L₂ respectively; low density (LD) monocultures were sown at 60% of these rates. This paper describes the development of mixtures sown with equal proportions of the 4 species (i.e. each sown at 25% of its monoculture rate). The response was derived from the mean of yields in the HD and LD plots. The experiment was sown in site AB in 2002 and in site BM in 2003. Results from the first 2 harvests of the following year (2003 for AB and 2004 for BM) were analysed separately. The contributions of individual species to total sward yield were analysed using ANOVA.

Results and Discussion There were no differences between the 2 sites in total sward yield in either harvest (Table 1). However, the yields of individual species differed significantly from each other at both sites in both harvests. Averaged over sites, perennial ryegrass (G₁) was the highest yielding and cocksfoot (G₂) the lowest yielding species in the mixtures in harvest 1. In harvest 2, however, whilst cocksfoot remained the lowest yielding species overall, red clover (L₁) greatly increased its yield to become the highest yielding mixture component. There were significant species x site interactions at both harvests, brought about by the contrasting performance of red clover at the 2 sites. Thus, in the lowland AB site, red clover was consistently high yielding and by harvest 2 had become the dominant component of the mixture. In the upland BM site, red clover was low yielding in harvest 1 and, although its relative performance had improved by harvest 2, it did not become dominant. The mixture in the BM site in harvest 2 was relatively evenly balanced between the 4 species. The results give an indication of the strong influence of environment on the processes occurring during the establishment phase of sward development in multi-species mixtures.

Table 1 Individual species yield and total sward yield (kg/ha) of multi-species mixtures from harvests 1 and 2 at 2 sites in Wales

	Site	G ₁	G ₂	L ₁	L ₂	Total Yield
Harvest 1	AB	961	70	995	227	2253
	BM	1204	422	118	165	1909
Harvest 2	AB	426	95	3898	544	4963
	BM	858	468	668	734	2728

Sig. level and *lsd* for Harvest 1: Species (P=0.006) 190.7; Site (ns); Species x Site (P=0.045) 621.9
Total Yield: Site (ns)

Sig. level and *lsd* for Harvest 2: Species (P<0.001) 469.5; Site (P=0.005) 332.0; Species x Site (P<0.001) 664.0
Total Yield: Site (ns)

References

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