Shading effect on production and protein concentration of *Dactylis glomerata* and *Agrostis tenuis*

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Introduction Silvopastoral systems make compatible livestock and timber production and provide important advantages from economic and ecological points of view (Sibbald, 1996). Around one million ha of new afforested areas promoted by the EU Common Agricultural Policy have been established in the last decade, that can be used as potential silvopastoral system areas. Pasture production is usually reduced in dense stands as trees grow up due to the light interception by the tree crown, but the radiation reaching the soil will depend on the tree type and this will affect herbaceous species composition and development. The aim of this work was to evaluate the shading effect (0 and 50 % of light interception) on pasture production and composition of monocultures of cocksfoot (*Dactylis glomerata* L. var. Artabro) and bent grass (*Agrostis tenuis* Sibth. cv Highland) in simulated conditions.

Materials and methods The experiment was conducted in Lugo (NW Spain) in a sandy soil. The experimental design was split-plot with three replicates. Shading was the main plot and herbaceous species the subplots. Monocultures of cocksfoot and bent grass were initially established in autumn 1996 in each sub-plot of 1 square meter with seed rates of 30 kg/ha and 8 kg/ha, respectively. Treatments consisted of two shading intensities (0 and 50% light interception) simulated with a black plastic mesh located at 0.5 m above ground and imposed from the time of sowing. Pasture production was estimated from sampling two sub-samples of 0.3x0.3 m prior to harvesting each sub-plot. Five harvests were taken in 1997 at a height of 0.05 m. Protein concentration was determined after microkjheldal digestion (Castro *et al*, 1990). Analysis of variance was used for statistical analyses and LSD for separation of means.

Results The year 1997 had an unusually rainy summer. Pasture production (Table 1) was similar in shaded and unshaded plots, with the exception of the middle spring cut which gave higher yields in unshaded conditions, when light was the limiting factor, and after summer (October) when shading allowed better growth when water supply was the main ecologic constraint for pasture production. Protein content was similar between treatments with the exception of post-summer harvest, when protein concentration was higher under shaded conditions and in the autumn harvest for bent grass when the reverse was found.

Table 1 Pasture production (t/ha) in 1997 (Unsh: unshaded, and Sh: shaded)

	Cocksfoot			Bent grass		
	Sh	Unsh	Sig	Sh	Unsh	Sig
April	3.56	3.30		3.72	3.20	
June	5.16	8.17	*	5.75	6.09	
July	4.05	3.57		4.26	3.83	
October	3.19	1.73	*	2.25	1.29	*
November	1.94	1.32		1.66	1.09	

Table 2 Protein concentration (%) in 1997 (Unsh: unshaded, and Sh: shaded)

	Cocksfoot			Bent grass		
	Sh	Unsh	Sig	Sh	Unsh	Sig
April	10.49	10.27		18.65	19.22	
June	10.35	10.44		14.94	12.52	
July	12.57	15.16		14.77	12.33	
October	19.11	15.68	*	14.38	16.92	
November	23.56	22.38		8.33	13.48	*

Conclusions In our conditions, shading positively affects pasture production in the summer and allows extension of the grazing season in areas with summer drought, but negatively affects pasture production when moisture conditions are adequate and light input can reduce pasture production. Quality of cocksfoot was higher late in the season when grown with shade, as indicated by increased content of protein.

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