Some characteristics of summer-growing (C_4) perennial grass patches that occur in improved pasture.

Annabel Bowcher and Jim Virgona

NSW Agriculture, Agricultural Research Institute, Wagga Wagga, NSW, 2650

The appearance of discrete areas dominated by perennial, summer-growing (C_4) grasses within a paddock is a phenomenon which has had little documentation. These "patches" have defined boundaries but there is relatively little known about their spatial dynamics (Cousens and Mortimer, 1995). The stability and competitiveness of these isolated patches is an area of research which could contribute to a better understanding of factors that regulate botanical composition in pastures. Our paper compares patches dominated by three C_4 perennial grass species with patches dominated by either annuals or phalaris.

Methods

Thirty-eight discrete patches were selected in a grazed 18 year old phalaris (Sirosa) paddock at Cootamundra (average annual rainfall = 625 mm) in southern NSW. The patches consisted of 13 annual (mainly black grass, *Eragrostis cilianensis*, and Paterson's curse, *Echium plantagenium*), 20 C_4 perennial (consisting of 8 couch, *Cynodon dactylon*, 8 paspalum, *Paspalum dilatatum* and 4 setaria, *Setaria glauca*) and 5 phalaris (*Phalaris aquatica*) dominated areas. The frequency of each of the above species and sub clover (*Trifolium subterraneum*) was measured on 5 May 1995 and 28 March 1996 using a 1 m^2 100 cell mesh quad (Lodge and Gleeson, 1984) located with fixed markers. Ten soil cores were taken from around each patch for soil analysis including pH (in $CaCl_2$), exchangeable cations and phosphorus content (Olsen).

Results and Discussion

The density of patches can be numerically described by the frequency of the C_4 perennial grasses found within them (Table 1). Indeed patches where phalaris was equally dominant could not be found. It should be noted that the C_4 dominated patches were *not* found in gullies or other areas characterised by high soil moisture content. The initial frequency counts in the patches showed that the presence of C_4 perennial grasses reduced the frequency of black grass compared with patches dominated by annuals (Table 1) with phalaris dominated patches being intermediate. The paspalum patches also had lower frequency of Paterson's curse compared with all other patch types. The occurrence of sub clover remained relatively consistent with between 98-100% frequency in all patch types. Soil chemical analysis showed no relationships between patch type and soil pH, exchangeable cations and Olsen-P.

Table 1. Frequency of perennial grasses (at two times), black grass and Paterson's curse in discrete patches in a degraded phalaris stand.

Patch type	Major perennial %		Black grass %	Paterson's curse %
	1995	1996	1995	1995
Annual	5	12	59[a]	65[a]
Couch	98	49**	6[b]	53[ab]
Paspalum	84	19***	4[b]	30[b]
Phalaris	46	55	33[ab]	52[ab]
Setaria	93	40*	5[b]	41[ab]

*, **, *** represent significant declines in frequency ('95 to '96) at P<0.05, 0.01, 0.001, respectively.

Means in columns followed by a common letter are not significantly different between the patches.

The second frequency measurement, taken before the autumn break and after a summer of higher than average rainfall, showed a large decline in the frequency of C_4 perennials in the patches that they previously dominated. This contrasts with the phalaris patches where a slight but nonsignificant rise was recorded (Table 1). The result is surprising given the favourable seasonal conditions for the growth of C_4 perennial plants over the '95/'96 summer. One possible explanation is that higher than average spring rainfall in 1995 led to high levels of standing dry matter (3000 kg/ha) under which the C_4 species rotted. The results show that the patches of C_4 grasses found in this old phalaris affected the occurrence of annual components. Patches dominated by C_4 grasses were not stable through time and declined markedly from '95 to '96. In contrast, the frequency of phalaris in patches where it was the dominant perennial was moderate but maintained between the years.

References

Cousens, R. and Mortimer, M. (1995) The spatial dynamics of weed populations. *In* "Dynamic of weed populations" Pp 217-218. Cambridge University Press, Great Britain.

Lodge, G.M and Gleeson, A.C. (1984). A comparison of methods of estimating lucerne population for monitoring persistence. *Australian Journal of Experimental Agriculture and Animal Husbandry* 24: 174-177.