Population dynamics of trifolium subterraneum,, medicago murex and trifolium balansae grown in monocultures and mixtures

BS. Dear and N. Coombes

NSW Agriculture, Agricultural ResearchStation
PMB, Pine Gully Road Wagga Wagga NSW 2650

Summary.. Seed yield seed set and seefdling regeneration of three annual legumes, subterranean clover, *WTrifolium suberaneam.,murex medic M*edicago *,fftogret-_,* and hadantsa clover, T. baimurar„ wore maemtirEted akkata gartima ramecnaiktrues, hiOntaroy eamiimaancs, and mm conabiaratiora with ammanil nicegrass., *Idiom reiggiimartL thor?usieat elf* syegrats,s; arracrntied tietail? bedew yields b

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Introduction

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compar persist in es dominated snibreirmareann clover Two such new. species MC WARS& dower and imam medic both *whin are now* grown iut sondneastern Australia

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Methods

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Once established, the plots were grazed at a high stocking rate for short periods (3 to 4 days) at intervals of 8 to 10 weeks to avoid selective grazing.

Herbage yields were assessed by taking 15 readings per plot with a calibrated pasture capacitance probe (5).

Seed yields in the murex and subterranean clover plots were measured in December by excavating strips of soil 2 m long x 10 cm wide x 2 cm deep. Seed was then separated from the soil by sieving and then thrashing burrs and pods.

Balansa seed was harvested in late November by cutting and removing herbage and flower heads in two 0.09 rn^2 quadrats per plot

Seedling density was measured in the second year by counting seedlings in two 0.09 m^2 quadrats per plot

Results

Herbage yield

Including a grass in the pasture mixture increased herbage yields by 33% in both September and November in the year of sowing. The choice of the legume species had no effect on total herbage yield_ Mean herbage yield m September for grass-free plots and ryegrass plots was 5979 kg/ ha and 7945 kg/ha respectively.

Seed yields

In grass-fed swards, subterranean clover seed set was reduced by 53 and 32% when grown in combination with either murex or balansa. When grown in grassy swards, both legumes again reduced subterranean clover seed set by 52 and 34%, the percentage reduction being almost identical to that observed in grass-free swards (Table 1).

Table1. Seed yield of subterranean clover, murex medic and balansa clover when grown in monocultures and binary mixtures with and without ryegrass.

	Mixture	Species seed yield (kg/ha)		
		Subterranean clover	Murex medic	Balansa clover
-Grass	Subterranean clover	758	304	81
	Murex medic	358	573	59
	Balansa clover	514	287	181
+Grass	Subterranean clover	403	157	39
	Murex medic	194	392	27
	Balansa clover	267	237	81
	l.s.d. (P=0.05)	107	73	46

Murex seed yield was depressed by 48% when grown in the presence of balansa or subterranean clover when grown in the absence of a grass. When a grass was present the competitive effect of subterranean clover on murex medic was greater than balansa clover.

Balansa clover seed set was depressed by approximately 60% when grown with subterranean clover and murex medic in both grassy and grass-free swards.

The absence of grasses in subterranean clover, murex medic and balansa clover monocultures increased seed yields of these legumes by 89, 46 and 126% respectively.

Seedling regeneration

Regeneration of subterranean clover in the second year was lower when grown with murexmedic (Table 2), the presence of ryegrass further reducing clover seedling numbers. Balansa clover only reduced subterranean clover regeneration when grown in a mixture with grass. Despite the reduction, subterranean clover seedling numbers were still high (>2200 plants/m2).

Table 2. Seedling density of subterranean clover, murex and balansa clover in the second year when grown in monocultures and binary mixtures with and without ryegrass.

	Mixture	Seedling regeneration (plants/m^2)		
		Subterranean clover	Murex medic	Balansa clover
-Grass	Subterranean clover	4998	266	727
	Murex medic	3483	1189	1318
	Balansa clover	4185	874	5473
+Grass	Subterranean clover	3891	142	311
	Murex medic	2201	961	852
	Balansa clover	2539	522	1912
	l.s.d. (P=0.05)	1292	378	1139

Murex medic seedling numbers showed the same responses to the presence of other legumes as subterranean clover, however, plant numbers were much lower in all treatments (142-1189 plants/m2).

Seedling regeneration in balansa clover plots was reduced whenever either of the other two legumes was present, the effect being greater when ryegrass was present.

The inclusion of a grass in the sward did not affect the percentages of each of the species in the regenerating swards (Table 3). Whenever subterranean clover was part of the mix it dominated the swards in terms of plant density. Both murex medic and balansa clover density increased when not competing against subterranean clover.

Table 3.Presence in the sward of each of the three legumes in the second year expressed as a percentage of total legume seedlings.

Species mix	No ryegrass			Plus ryegrass		
	Balansa clover	Subterranean clover	Murex medic	Balansa clover	Subterranean clover	Murex medic
Subterranean clover: murex medic	-	93	7	-	94	6
Murex medic:balansa clover	60	-	40	62	-	38
Balansa clover:subterannean clover	15	85	-	11	89	-

Discussion

The experiment demonstrated that the presence of ryegrass in legume swards will depress seed yield of the legumes although seed set was still sufficient to allow the legumes to regenerate. In mixed legume grassy swards, the seed yield of the balansa clover was the most sensitive, declining to 15% of the pure sward. This compares with murex medic and subterranean clover which declined to 27% and 26% respectively.

In balansa clover swards even relatively low seed yields of 27 kg/ha were able to produce plant densities of 311 plants/m^2 in the following year, perhaps due to the very small seed size of this clover. The regeneration results did suggest, however, that balansa clover, grown under the crash grazing system imposed, may be more sensitive to competition than subterranean clover or murex medic.

Murex medic regeneration in the second year was clearly inferior to subterranean clover. This was most likely due to its higher level of hard seed (3) rather than reduced seed set the previous year *as* when murex medic and subterranean clover were grown in a mixture, murex medic was able to set similar quantities of seed as subterranean clover. This finding differs with other work (4) which suggested that murex medic seed set was more sensitive to competition than subterranean clover. Murex medic was the only legume whose seedling regeneration was relatively unaffected by the presence of grass in the sward. While murex medic regeneration was poor compared to subterranean clover, its higher level of hard seed may be an advantage where false breaks are common or where hard seed levels are broken down by frequent cropping.

The experiment suggested that maintenance of balansa clover in mixed swards may require special management. Balansa clover plant numbers in the second year were much lower in plots which contained subterranean clover or murex medic and was also depressed in plots with ryegrass. The greater sensitivity of balansa clover to competition is shown by the large variation in seedling numbers which ranged from 311 to 5,473 plants/m^2 depending on the species mix. Experience suggests that balansa clover regenerates more thickly where pastures are grazed heavily, particularly over summer, leaving very little residue.

The system of crash grazing imposed is likely to have influenced the results and increased the competitive effect of the grasses. Further studies under set stocking are required to adequately assess the impact of extended grazing on the persistence of the legumes. One side-effect observed but not measured was an obvious increase in the density of broad-leaved weeds in grass free plots. This required the use of herbicides. Therefore, while legume density was lower in grassy plots, the grass legume mixture is likely to be a more stable combination. Another advantage of grasses is that while they depressed seed yields, they increased total herbage yields by 33% and the positive effect of this on carrying capacity and ability to conserve fodder would be expected to more than compensate for the loss in seed yield and clover density in the sward.

Acknowledgment

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