Seed preferences of *Pheidole* ants for pasture grasses and legumes at 3 sites in southern New South Wales

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Abstract

The seed-harvesting activity of ants is likely to reduce establishment success of pasture species that are incorporated in mixed pasture/crop rotations in the wheat belt of southern Australia. Seed baits of 26 commercial cultivars of perennial and annual grasses and legumes were laid out at 3 sites near Canberra, ACT. The sites differed in plant species composition and ground cover, and represented closed native pasture, sown perennial grass-dominated pasture and more-open annual grass-dominated pasture. *Pheidole* sp. was the commonest ant observed harvesting seeds during the 24-hour observation period, and average seed harvesting percentage was significantly greater in the more open habitat of annual grassland than at the other two sites. Among perennial grasses and annual legumes, the percentage seed harvested was negatively correlated with seed weight. *Pheidole* sp., which are successful colonisers of transition habitats between closed and open grassland, are likely to have significant effects during the establishment of pasture phases in mixed cropping/pasture rotations.

Key words

Ant seed harvesting, pasture species, pasture establishment, *Pheidole* ants.

Introduction

The projected incorporation of a range of pasture species into crop/pasture rotations is advocated as a means of achieving greater sustainability of agricultural systems in eastern and western Australian cropping zones (Dear *et al.* 2003). A neglected aspect of these assessments is a consideration of the effects of these practices on animal species that interact with plant life cycles. Of particular importance in Australia is the seed-harvesting activity of ants, which are the major agents of seed dispersal in most plant communities (Anderson 1991), and whose activity can conflict with seeding operations in agriculture, forestry and conservation.

An experiment was conducted near Canberra, ACT, to monitor the seed-harvesting activity of ants on a range of perennial and annual grasses and legumes at 3 sites representing, native, sown perennial, and remnant annual pasture communities.

Methods

Seeds of commercially available cultivars of 6 perennial grasses (phalaris, cocksfoot, tall fescue, perennial ryegrass, tall wheatgrass and weeping grass), an annual grass (annual ryegrass), 3 annual legumes (subterranean clover, barrel medic and cluster clover), and 11 perennial legumes (lucerne, white clover, red clover, Persian clover, balansa clover, strawberry clover, pink serradella, birdsfoot trefoil, greater lotus, cicer milkvetch and biserrula) were obtained from seed merchants. Three sites on Ginninderra Experiment Station (35° 12' S, 149° 4' E; 600 m a.s.l.) were chosen to represent native pasture (Site 1; dominated by kangaroo grass and wallaby grass), sown perennial grass pasture (Site 2; dominated by phalaris and subclover) and lower basal cover annual pasture (Site 3; dominated by vulpia and capeweed). At each site, 30 markers were placed in the ground in a grid pattern of 3 rows, 0.5 m apart, with 10 markers of 10 cm spacings within the rows. There were 3 replicate grids at each site. Within each replicate at each site, a "bait" of 5 seeds of each cultivar was randomly assigned to a marker. The number of harvested seeds was recorded after a 24 h period over 30-31st March 2000. The data were analysed as a randomised complete block design, with differences between cultivars and sites considered significant at $P<0.05$.

Results and discussion

At all 3 sites *Pheidole* sp. were the commonest ant present and the only species observed harvesting seed. The average percentage seed harvested was 65.8 % at Site 3 (annual grassland), which was significantly greater ($P < 0.001$) than at Site 2 (the sown perennial

pasture; 43.6%) and Site 1 (native grassland; 37.8%). This difference reflects the greater intensity of seed harvesting activity of ant species such as *Pheidole* that readily colonise more open grassland communities.

Within the 3 groups of pasture species, cultivars were differentially harvested by *Pheidole* ants (Table 1). Phalaris was more readily harvested than the other grasses. Among annual legumes, cluster clover, Persian clovers and Balansa clovers were more harvested than Barrel medics and sub-clovers. Lucerne and white clover seeds were the most readily harvested among the perennial legumes. Intuitively, seed size would seem to be the most obvious correlate with ease of harvest. Although large negative correlations were present between seed size and percent seeds harvested amoung the grasses (r = - 0.51) and annual legumes (r = - 0.87), the correlation was positive among the perennial legumes (r = 0.62), possibly because of ant preference for more commonly encountered white clover and lucerne seeds.

Conclusions

The site comparisons in this study indicated that it is likely that ant seed harvesting will have a significant effect on the establishment success of grass and legume species in pasture phases of crop/pasture rotations. Although it is likely that the degree of this effect will be closely associated with the seed size of perennial grasses and annual legumes sown, ant preferences for particular perennial legumes are not as predictable.

References

Anderson AN (1991) Seed harvesting by ants in Australia. In 'Ant-plant interactions'. (Eds. CR Huxley, DF Cutler) pp. 493-503. (Oxford University Press: UK)

Dear BS, Moore GA, Hughes SJ (2003) Adaptation and potential contribution of temperate perennial legumes to the southern Australian wheatbelt: a review. *Australian Journal of Experimental Agriculture* **43**, 1-18.

Table 1. The average percentage of seed harvested from seed baits of common grass and legume cultivars over 3 sites at Ginninderra Experiment Station, near Canberra, ACT.

Species	Cultivar	Seed harvested %
Grasses		
Phalaris	Holdfast	82.8
Annual ryegrass	Tetila	73.8
Microlaena		68.4
Tall fescue	Quantum	66.6
Perennial rye	Roper	61.2
Cocksfoot	Kara	60.6
Tall wheatgrass	Tyrell	37.2
Annual legumes		
Cluster clover		80.2
Persian clover	Kyambro	74.4
Persian clover	Maral	73.4
Balansa clover	Bolta	70.6
Balansa clover	Paradana	67.2
Balansa clover	Frontier	66.6
Pink serradella	Cadiz	60.6
Barrel medic	Sephi	36.2
Barrel medic	Paragio	28.8
Subclover	Larisa	13.8
Subclover	Gosse	11.2
Perennial legumes		
Lucerne	Siriver	51.6
White clover	Haifa	47.8
Red clover	Redquin	39.4
Cicer milkvetch	Monarch	37.2
Strawberry clover	Palestine	35.0
Birdsfoot trefoil	Granger	31.6
Greater lotus	Maku	27.2
Biserrula	Casbah	23.4
l.s.d.(P=0.05)		5.4