Effect of seed size on lupin establishment and yield

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Good quality seed is a prerequisite for successful grain legume production. There is both circumstantial and experimental evidence for effects of seed source on lupin emergence, growth and yield (J.S. Gladstones, pers. comm.). Positive correlations between seed size and seed performance for several species (1), and between seed phosphorus concentration and growth rate (2) have been reported. Results from four experiments which examined the effect of seed size on establishment and yield are reported.

Methods

A sample of L. angustifolius cv. Danja was separated into three size classes by sieving, and seed samples compared at five plant densities in field experiments at two sites in the northern wheatbelt of W.A. Seed lots differing in mean seed size from three separate sources were also compared. At a third site, the effects of seed size (bulk sample, small, large) and plant density on yield of cv. Danja and Gungurru were examined. At a central wheatbelt, the effects of seed size, (separated from the same sample), sowing depth and plant density on cv.Danja were examined.

Results and discussion

In two trials, small seed had only a small effect on plant density (same target plant density, but gave lower seed yield than large seed (Table 1). The yield difference was more marked at lower plant densities; that is, the smaller seed had a steeper response curve. For the trial which compared small and large seed lots with the bulk 'parent' sample, there were no significant effects of any treatment on plant establishment or seed yield. Sowing small seed (133mg) at 10cm depth reduced the plant density to 65% of the control (5cm) while deep sowing of large seed (191mg), reduced plant density by only 13% (results averaged over 4 seeding rates). Deep sowing reduced yield by 33% and 26% for small and large seed, respectively. At the same plant density, seed yield was always lower for the small seed and fitted response curves indicated that at 40 plants.m^{-2}, the yield difference was 223 kg/ha. Overall, results confirmed those obtained from a single trial in 1987 (R.French, unpub.data), and strongly suggest that significant yield advantages will come from use of high quality lupin seed. Further work will attempt to determine which seed quality attributes (size, source, nutrient content, etc.) are responsible for differential growth and yield of lupins grown from different seed lots.

Table 1. Effect of lupin seed source and size on plant establishment and seed yield. Means of five sowing rate treatments.

Seed source	NRS	NRS	NRS	CRS	Binnu	BRS	Std.	
Size class	Small	Medium	Large	Small	Medium	Large	Error	
Seed size (mg)	101	134	176	141	161	176		
East Chapman								
Plant density (pl.m^{-2})	24.0	27.7	31.6	26.5	28.1	30.8	2.5	*
Seed yield (kg/ha)	996	1268	1545	1392	1513	1699	72	***
Geraldton								
Plant density (pl.m^{-2})	21.9	22.9	26.0	21.9	24.7	24.7	2.2	ns
Seed yield (kg/ha)	1927	2236	2493	1970	2350	2490	116	***

NRS = Newdegate Research Station CRS = Chapman R.S. BRS = Badgingarra R.S.

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