Lupin yield response to plant density in the Western Australian wheatbelt

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Planting 90 kg/ha of 80% viable lupin seed to achieve 45 plants/m^2 in wheatbelt areas is a long-standing Department of Agriculture recommendation (1). Many farmers consider such crops too thick for low rainfall areas. Because the recommendation was based on trials conducted with old varieties and in many cases, in high rainfall areas, an extensive re-assessment of lupin yield-density relationships was undertaken.

Methods

Danja lupins were sown at 30, 50, 70, 100, 150 and 200 kg/ha at 10 sites in the Western Australian wheatbelt in 1987 and at one site in 1988. Crop establishment was measured six weeks after sowing and machine harvest yields at maturity. Asymptotic response curves were fitted to the yield-density relationships (2). Optimum densities were chosen at the point where one unit of extra seed sown returns two units of extra seed yield. Yield potential was defined as the seed yield predicted at infinite plant density.

Results and discussion

Maximum observed yields ranged from 0.66 to 2.80 t/ha. In no case did seed yield decline significantly with increasing plant density, so extrapolation to infinite density was valid. Yield potential ranged from 0.63 to 3.28 t/ha and optimum plant density ranged from 17.3 to 100.0 plants/m2. The mean optimum density was 56.3 plants/m2. Optimum density was positively related to yield potential. For a yield potential of 1.5 t/ha, a realistic situation for the wheatbelt, the optimum plant density was 45.4 plants/m^2. Using the percentage establishment of viable seeds observed in these experiments and assuming an average seed size for Danja lupins of 150 mg (3) and 90% germination, this was equivalent to a sowing rate of 99.3 kg seed/ha. Thus the Department of Agriculture's lupin sowing rate recommendations are appropriate to the wheatbelt. This does not, however, rule out the possibility that lower densities may be better in some special circumstances, such as on poorer soils, but these circumstances would seem unusual.

1. Nelson, P., Smart, W.L. and Walton, G.H. (1933). W.A.D.A. Farmnote No. 4/83.

2. Bleasdale, J.K.A. (1967). J. Hortic. Sci. 42:51-58.

3. Gladstones, J.S. (1986). J. Aust. Inst. Agric. Sci. 52:182-183.