Plant density decline of dryland lucerne during establishment

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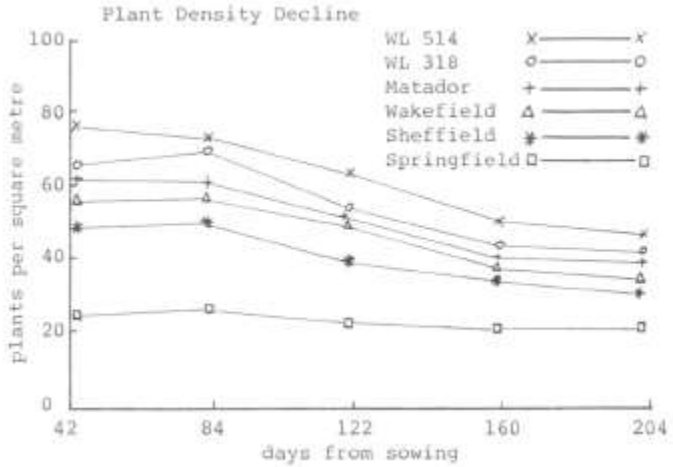
Plant density at establishment is important for future stand productivity of lucerne (1). There is, however, little known of the decline in plant density between emergence and establishment. This experiment was designed to monitor the decline in seedling density of six aphid-resistant lucerne cultivars during the first six months after emergence.

Methods

Six replicates of six lucerne varieties were sown at 3 kg ha^{1} under a barley cover crop sown at 30 kg ha ^{1} in June 1981 at Tintinara in the Upper South East of South Australia. Lucerne varieties were WL 318 (dormancy rating 4), Sheffield (6), Wakefield (7), Springfield (8), Matador (8) and WL 514 (8). At five-weekly intervals plants in the same six 1 m^2 areas per plot were counted.



Results and Discussion

The number of emerged seedlings differed for each variety (figure) owing to variation in seed weight, germination percentage and hard seed content. On average 38% of viable seed either failed to germinate or the seedlings did not survive until the first count. The increase in plant density on day 84 by four varieties was due to their high hard seed content (23% for WL 318).

Over the six-month period from seeding (day 0), the higher the initial density (at day 42) the higher was the rate of decline. Hence differences in plant density between varieties diminished with time. In addition, plots with low initial populations tended to lose a smaller proportion of plants than those with high initial populations.
$Y = 0.93x - 0.0047x^2 - 2.16$ ($P < 0.001$; $100r^2 = 89.7$)
where Y = plants m^2 at day 204; x = plants m^2 at day 42.

The figure suggests that if the same rates of density decline continue, then all varieties would approach a common final density. However, the initial decline in plant numbers was due mainly to water stress. With this stress being interrupted by winter rain, differences between varieties should persist.

Dormancy rating had no bearing on emergence, rate of decline or establishment density. Crown size, response to grazing and dormancy rating are of little significance in the establishment phase but are likely

to be determining factors in long-term persistence. Plant densities will be monitored for a further two years.

1. FitzGerald, A.D., Simmons, K.V. and Southwood, O.R., 1980. NSW Department of Agriculture Division of Plant Industry Bulletin.