

PARENTAL DOMINANCE OR TOLERANCE IN LUCERNE

M. C. Campbell and P. S. Cocks

Plant Sciences, University of Western Australia, Perth, WA

ABSTRACT

Lucerne (*Medicago sativa*) was sown at increasing distances from isolated adult plants along 4 radials 0.5 m long, to evaluate possible influences of the parent plant on seed germination and seedling survival. Time of sowing was also considered with radials 3 & 4 being sown in May and radials 1 & 2 being sown four weeks later. Two cultivars were used in the 1995 experiment; Hunterfield, a winter active cultivar and P545, a winter dormant cultivar. The results indicate that seeds as close as 2.5 cm to established plants could germinate, survive and become established. Observations suggested that the winter activity of the plant had a marked effect on seedling recruitment as did time of sowing.

KEYWORDS

Lucerne, allelopathy, competition, germination, seedling survival, recruitment

INTRODUCTION

Because it rarely regenerates naturally in Australian pastures, the productivity of lucerne depends on the survival of originally established plants, (Clements, 1988, Gramshaw et al., 1988). One reason may be that lucerne seedlings do not compete well with weeds and other pasture species (Evans, 1995 and Sutton, 1924). This implies that a poorly established or degenerating lucerne pasture will not rejuvenate either by allowing natural regeneration from seed produced in the pasture or by oversowing with new seed. There are those who believe that lucerne pastures do not regenerate naturally because of the auto-allelopathic influences of the established plants on the seed bank or on seedlings (Tesar, 1986, 1993, Tsuzuki & Kawagoe, 1984). If this is so then lucerne seeds sown close to adult plants will not germinate, or if they germinate then they will not survive or their growth will be retarded. Others believe that the only effects of an established lucerne plant on newly recruited seedlings are those involving competition for light and water. This experiment investigates these issues.

METHOD

The experiment was established in May, 1995 on an old lucerne variety trial at Kojonup, in the south-west of WA, latitude 33.50° S, longitude 117.09° E with an annual rainfall of 542 mm. The trial was sown in 1992 and the plants were well established. Three plants each of a winter dormant and a winter active cultivar were used; P545 and Hunterfield, respectively. All vegetation and seed were removed from around the selected adult plants for a distance of 1 m, thus disturbing the soil. Seed was harvested from the plants and sown at a depth of 0.5 cm, at distances increasing by increments of 2.5 cm along four radials. Total seeds sown along each radial was 20, there were 4 radials and thus 80 seeds for each plant. After sowing the seeds, their positions were marked using pink drinking straws and circular mesh pasture cages 1.3 m in diameter by 1.2 m high were placed round each adult plant and its associated seedlings. The seeds were initially sown in two radials on 16th May 1995. Three weeks later, the weeds were sprayed out of radials 1 & 2 and these radials were sown to lucerne on 13th June 1995. This enabled a comparison of the effect of time of sowing on the recruitment of the seedlings.

RESULTS

The germination and survival of the seeds indicated that there were differences in the germination between the two cultivars, possibly

due to their winter activity (Table 1). The results, summarized in the graph, also showed that seeds germinated as well close to an adult plant as they did further away; 6 out of a possible 24 seeds sown at position 1 germinated and 3 survived for 3 months. Table 2 shows that early sowing also improves germination and subsequent seedling survival

DISCUSSION

The results show clearly that lucerne sown in close proximity to adult plants will germinate and survive. This opens up the possibility of seedling recruitment, a process that would significantly increase the life of established stands. There is only one published record of seedling recruitment in Australia (Campbell, 1974) although it was observed in adjacent stands to those used in this experiment. This experiment shows that seeds can germinate close to an established lucerne plant, and that given a head start can survive reasonable competition from weeds. Many conditions could have affected the germination and survival of the seedlings; the seed sown was not scarified which contributes to a reduced and/or staggered germination throughout the season. Also, the remoteness of the Kojonup site meant that insects and weeds adversely affected the seedlings, although the later germinating weeds did not appear to affect their survival. The success of Hunterfield compared with P545, suggests that high winter activity is important in seedling survival. Future work should focus on grazing management to encourage seed production and the survival of new seedlings.

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Table 1

Total number of seedlings surviving per plot from seed sown in radials in cleared ground around an adult plant, as recorded on the dates shown.

Cultivar/Rep.	Winter Activity	13/6/95	18/7/95	10/8/95	12/9/95	
Hunterfield	Winter Active	1	25	24	22	25
		2	2	9	4	7
		2	23	16	20	16
P545	Winter Dormant	1	18	3	8	6
		2	7	6	11	1
		3	16	2	12	8

Table 2

Comparison of the average number of seedlings surviving from seed sown at different times around adult plants of differing winter activities

Cultivar	Date Sown	13/6/95	18/7/95	10/8/95	12/9/95
Hunterfield	16/5/95	7.33	5.83	4.17	5.67
	13/6/95	0.67	2.3	3.5	2.3
P545	16/5/95	6.83	0.67	2.67	1.83
	13/6/95	0	1.2	2.5	0.8

Graph shows percentage of seedlings surviving at the different positions along the radials in August and November 1995.

