

overcome either by a pre-planting application or by delaying sowing until rain provides sufficient moisture.

CHICKPEAS (*Cicer arietinum*)

Chickpeas show promise as an alternative to wheat in the drier sections of the wheatbelt but are susceptible to competition from most weed species. Preliminary results indicate that both trifluralin and simazine, along with several other herbicides, tri-allate, prometryne and terbutryne, are selective in chickpeas.

Of these herbicides only simazine provides control of grasses and a wide range of broad-leaf weeds. It is therefore likely to be the most useful herbicide. However, under the conditions likely to prevail in this section of the wheatbelt, and following poor results in lupins under dry conditions, simazine may prove unreliable. Under these conditions, incorporation of trifluralin or tri-allate for grass control, followed by post-emergence applications of terbutryne for broad-leaf weed control, if necessary, may prove more reliable.

THE RESPONSE OF LUPINS TO POST-EMERGENCE APPLICATION OF CARBETAMIDE

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Lupins (*Lupinus angustifolius* and *L. albus*) are sensitive to competition from annual weeds, particularly annual ryegrass (*Lolium rigidum*) and wild oat (*Avena* spp.). Pre-planting control of these weeds by the herbicides di-allate and trifluralin, and pre-emergent control by simazine is not always satisfactory in periods of low rainfall. Carbetamide, which can be applied either pre-emergence or post-emergence, provides a satisfactory means of post-emergence grass control in lupins. It can be used in a primary weed control situation or as a means of correcting previously applied but unsatisfactory methods of control. Potential problems in the latter situation, especially the response of lupins of different age groups to carbetamide, are being investigated at Wagga.

In one experiment carbetamide at 1.5 and 3.0 kg a.i. ha⁻¹ was applied to Uniharvest lupins heavily infested with annual

ryegrass, some wild oats and a mixture of capeweed, wireweed, fumitory and storksbill 2, 4, 6, 9 and 12 weeks after sowing. Trifluralin 0.56 kg a.i. and simazine 2.0 kg a.i. ha⁻¹ were included for comparison.

All herbicides reduced the grass population to negligible proportions. The response to carbetamide was slow; grass control was only 75 per cent effective 8 weeks after application although, by harvest, better than 98 per cent control was obtained at both dose rates. Carbetamide also retarded crop growth rate for a time and delayed flowering. But, whereas the crop recovered completely at the 1.5-kg dose rate, only partial recovery was obtained at the 3.0-kg rate.

Flowering date was related to time and rate of application. There was a maximum delay of 3 weeks with the 3.0-kg dose rate applied 12 weeks after sowing. Despite these setbacks an extended rainfall season compensated for the delay in flowering and the 3-kg dose rate applied 6, 9 and 12 weeks after sowing gave the highest yields (2400, 2100 and 2200 kg ha⁻¹ respectively).

In another experiment carbetamide was applied to lupins unsuccessfully treated with simazine at sowing. The herbicide was applied to the cv. Unicrop at dose rates of 1.5 and 3.0 kg a.i. ha⁻¹ 13 weeks after sowing. The heavy ryegrass population was reduced by 95 per cent at the 3.0-kg rate and 75 per cent at the 1.5-kg rate. As before, crop growth recovered completely at the lower dose rate.

Average temperatures after the last spray application in the first experiment were 0.5 to 1.0°C lower than those experienced in the second experiment. The relatively poor performance of the 1.5-kg dose rate in the latter case, may thus be an expression of the reduction in carbetamide effectiveness as temperatures rise. If so, it suggests that dose rates should be increased as time of application is delayed. At the same time the high yields obtained at the 3.0-kg dose rate indicate little danger to *L. angustifolius* cultivars with the late application of carbetamide. In both experiments, however, prolonged heavy rains after spray application provided the necessary time and growth conditions for recovery. Early onset of dry spring conditions, associated with the delay in flowering due to late herbicide application, could easily limit pod set and reduce yield. That maximum yield occurred when carbetamide was applied 6 weeks after sowing suggests this time as a potential optimum.

In these and previous lupin trials at Wagga (Cuthbertson, in press) annual weeds were not completely controlled, even when broad-spectrum herbicides like simazine, propazine and