A SCREENING TECHNIQUE FOR EVALUATION OF BRUSHWEED HERBICIDES

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Summary

A screening technique for evaluation of brushweed herbicides employing gorse (*Ulex europaeus*), broom (*Cytisus scoparius*) and tree lupin (*Lupinus arboreus*) is described. Preliminary data, on initial brown-off of leaves and stems, on persistence in woody tissue, and of formulation effects has been obtained and is sufficient to enable reasonable prediction of likely field performance of candidate brush herbicides. Some data of the activity on gorse of Dowco 233, a new pyridyloxy herbicide is presented. (Dowco 233 now triclopyr.)

INTRODUCTION

Brushweeds continue to be one of the greatest problems impeding the further development of New Zealand hill country for pastoral agriculture and for forestry. Because of difficulty of access, variability of sites and the sheer bulk of plant material to be treated, field trial work is nearly always costly, time consuming and extravagant of often limited quantities of experimental formulations. No less costly is the assessment work in brushweed trials, which as Moffat (1965), Leonard (1965) and Upritchard (1966) rightly concluded, must extend to 20 months or more.

The development of a screening technique was seen to be of importance for achievement of economies in a total brushweed programme. The activity of candidate compounds or mixtures could be evaluated relative to accepted field standard herbicides, the influence on activity by formulation type examined and possible mode of action tentatively identified. In addition such a technique should enable determination, within a comparatively short period, of the likely potential of new herbicides to control regrowth and give a reasonable correlation of screening test results with field performance. This research note outlines a screening technique which attempts to meet these criteria.

METHODS AND MATERIALS

Tree lupin (*Lupinus arboreus*) and broom (*Cytisus scoparius*) were established from seed, while gorse (*Ulex europaeus*) was established from field collected volunteer seedlings. Young plants were established in 15 cm diameter 'planter bags', grown outdoors, and conditioned by frequent pruning back of terminal and lateral growth to promote rapid development of woody tissue. Tree lupins were suitable for pot tests in approximately three months from sowing, while broom required about six months, and gorse required at least 18 to 24 months to produce strong woody tissue. In all cases plants selected for herbicide tests were 15 to 20 cm high and had at least 5 cm of new growth since pruning. Herbicides were applied in the equivalent of 500 to 1000 litres/ha spray volumes to 4 to 8 replications of single plants per treatment using a laboratory hand sprayer developed from a De Vilbiss No. 15 atomiser. Heights of individual plants were recorded at treatment

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and at monthly intervals up to four months post-treatment and at the end of the assessment period. Following treatment, plants were maintained outside in cold frames or in the open under uniform growing conditions.

Dowco 233 is an experimental growth regulator herbicide identified as 3,5,6-trichloro-2-pyridyloxyacetic acid, whose proposed common name is trichlopyr.

RESULTS AND DISCUSSION

Fig. 1 illustrates typical mean gorse responses as assessed from height measurements over a period of up to 31 weeks post-treatment. Rapid brown-off of foliage and stems has been achieved with the most effective treatments Dowco 233 amine, 2,4,5-T ester, and picloram/2,4,5-T ester.

Brown-off normally became complete within 12 weeks of treatment. Thereafter regrowth occurred quite rapidly; i.e. at a similar rate to the untreated plants as indicated by the similar gradients in Fig. 1. The expected inferior activity of the water soluble amine salt of 2,4,5-T over the emulsifiable concentrate ester formulation is evident, as is the improved regrowth control with picloram/2,4,5-T ester over 2,4,5-T

TABLE 1: COMPARISON OF GORSE CONTROL IN FIELD AND SCREENING EXPERIMENTS

Treatment	g/100 litres (kg/ha)	Rate litres (kg/ha)	Field Trial — Taranaki				Screen	
			28 weeks % brownoff	12 months % Stemkill	12 months % Regrowth Control	12 weeks % dieback	30 weeks % Regrowth Control	
2,4,5-T ester	180	(2)	90	80	88	89	74	
Dowco 233 amine	180	(2)	95	80	95	100	92	
picloram K salt	25 + 100	(0.25 + 1)	95	100	100	100	100	
2,4,5-T ester	25 + 100	(0.25 + 1)						
picloram K salt	25 + 100	(0.25 + 1)	87	60	93	100	100	
Dowco 233 amine	—	—	0	0	0	55% growth increase	86% growth increase	
Untreated	—	—						

* dosages in parenthesis are the equivalents used in screening.

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ester alone. Dowco 233 amine induced complete brown-off and was intermediate between picloram/2,4,5-T ester and 2,4,5-T ester in achievement of end kill inferred from rates of regrowth following maximum brown-off.

Table 1 compares results obtained in a field trial with comparative dosages of the same herbicides in a pot screen. In both trials treatments were applied under maximum soft growth conditions and for each trial regrowth was the mean percentage based on visual assessments of two independent observers. Acceptable agreement between the screening test and field trial has been obtained except in the picloram/Dowco 233 field treatment where brown-off of leaves and stems was less complete than expected, and increasing regrowth could be anticipated beyond 12 months post-treatment.

Screening tests with tree lupins and broom have the advantages of requiring short establishment times, and enabling more rapid assessment of brown-off than for gorse. However, they do not enable quite as reliable assessment of regrowth control as has been achieved with gorse in its more woody plant form.

CONCLUSIONS

The screening technique for assessment of brushweed herbicides has proved to be an acceptable method of predicting likely dosages and field performance of candidate brush herbicides, formulation effects, and of herbicide mixtures. Some prediction of control of potential regrowth has been possible within the comparatively short (six month) assessment period. The technique has already enabled a simplification in design of field trials for evaluation of new brush herbicides. Dowco 233 has shown sufficient activity in pot tests and in an initial field trial to warrant wider evaluation on New Zealand brushweeds.

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VEGETABLES

CHAIRMAN'S SUMMARY

M. J. WRAIGHT

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The three papers in this session report herbicide trial work on vegetables — three quite different lines of work on three completely different crops. It should be appreciated when reading these papers that a lot of work has gone on in these fields in the past. For this reason it should be noted that the three authors in this session are reporting work that is trying to find rather more subtle or finer differences than we have been used to previously.

Herbicide research is important in these crops. They are high value crops but are lucrative only when near perfect weed control is achieved.

Stevenson presents results from two trials — one on wax beans, one on green beans (with different sowing times, soil types and cropping history) and gives details of weed control achieved and yields of beans for processing. Success or otherwise of the quite large range of herbicide treatments can be seen as a compromise between degree of weed control, crop damage and final crop yield.

Wilson's paper describes a trial which combined different commercially used herbicide programmes with different sowing depths in the onion crop, to test the interaction of these two separate factors in weed control, crop establishment and final yields. This work does help in understanding the roles of sowing depth and herbicide programme, and should have use when conditions such as soil moisture, weed spectrum, time of sowing etc differ from those normally encountered.

Cox has given us an ideal example of the degree of sophistication that is entering the field of herbicide work on vegetable crops. In looking at the effects of low rates of simazine on seedling asparagus, with and without irrigation he has looked not at weed control achieved or at crop survival but rather at root and foliage weights of the seedlings and at simazine residues.

With all three of these papers a thought occurs as to whether one or two trials are sufficient when one is looking for such fine differences in yields, or weed control, or crop tolerance. Field conditions such as climate, soil type, past cropping regimes, potential seed populations, etc can all vary by more than the subtle differences that are being looked for in trial results. In such cases we probably need a greater number of repeat trials or even collection of further evidence from scientifically carried out surveys of commercial practice to complete the full picture.