CONTROL OF WEEDS IN EDIBLE CHICORY

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SUMMARY

Ten herbicide treatments were evaluated for control of annual weeds and for crop tolerance in edible chicory (*Cichorium intybus* var. *foliosum*). All treatments combined with trifluralin lowered root yields but not significantly so ($P > 0.05$). Asulam and metamitron caused some initial retardation in seedling growth. From the point of view of both weed control and crop tolerance, propyzamide plus nitrofen and chlorpropham plus nitrofen were the most promising treatments. However, no herbicide proved capable of maintaining weed free conditions to crop harvest without supplementary handweeding. There were no significant treatment effects on root numbers.

INTRODUCTION

As a biennial member of the Asteraceae originating in Europe and naturalised in America and elsewhere, edible chicory, also known as succory, is a recent introduction to New Zealand vegetable markets where it is referred to as 'witloof'.

In this country 'witloof' is marketed in the form of chicons, which are the etiolated terminal buds emerging from chicory roots under forcing conditions. These chicons may be used fresh or as a cooked vegetable. Chicory roots also supply an extract for the beverage industry, and in Europe the whole plant biomass finds use as a supplementary winter stock fodder. In addition a possible sugar content of up to 20% makes this crop a potential candidate for energy purposes (Chubey and Dorrell 1977).

When sown from seed chicory plants initially make slow progress and because of their sensitivity to competing weeds may be badly checked unless weed free conditions are achieved after germination.

In the traditional growing areas in Europe the selection of herbicides used has given variable results. Out of 17 treatments tested by Neururer (1978) none gave a satisfactory kill of weeds without damage to chicory roots. Other authors however, recommend a variety of materials as being suitable (Daniau and Beraud 1976, Temmerman and Hofmans 1978). In the absence of literature relating to the culture of chicory under New Zealand conditions the choice of treatments mentioned in this paper was derived partly from the above reports but mainly from experience gained from a previous season's pilot trial.

MATERIALS AND METHODS

Pelleted chicory seed (cv. Reine bon) was sown on 20.11.81 at the rate of 400,000 seeds/ha in rows 35 cm apart in an area of Horotiu sandy loam soil with an organic carbon content of 9.2%. Plot size was 1.8 x 7.6 m with treatments arranged in a randomised block design of four replications. Herbicides were applied by a propane gas spray unit delivering 360 litres/ha at 210 kPa.

Trifluralin was pre-plant soil incorporated (PPSI) on 20.11.81, chlorpropham and propyzamide applied pre-emergence on 24.11.81 and nitrofen, asulam, metamitron and chlorpropham post-emergence on 15.12.81. The crop at this time was in the two true-leaf stage. Hand weeding of the plots was initiated on 11.1.82 in the hand weeded controls, and in all chemical treatments except 3, 7 and 8, in which weed infestation was so great that weeding was considered to be too labour intensive. Weeds at this time varied in size from seedlings to 10 cm high.

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Harvesting of the chicory was carried out on 14.4.82 by lifting roots from three rows in each plot. Assessment of herbicide effectiveness in the various treatments was made by visual estimates of weeds present prior to hand weeding, recording the time taken to hand weed those treatments considered worthwhile and by counting and weighing roots at harvest.

RESULTS AND DISCUSSION

Weed control

The weed population in the trial area consisted of black nightshade (*Solanum nigrum*), wild portulaca (*Portulaca oleracea*), redroot (*Amaranthus powellii*), willow weed (*Polygonum persicaria*), summer grass (*Digitaria sanguinalis*), smooth witch grass (*Panicum dichotomiflorum*) and crowfoot grass (*Eleusine indica*).

Observations made prior to hand weeding showed that the degree of weed infestation in chlorpropham pre-emergence, chlorpropham post-emergence and nitrofen post-emergence all applied as single treatments was so great as to preclude them from further attention. Asulam combined with trifluralin gave a good general kill of weeds but failed on wild portulaca. Metamitron combined with trifluralin provided the best control with an average 94% kill. Nitrofen combined with trifluralin allowed some grasses to re-infest the treatment but still gave adequate control. Propyzamide plus nitrofen and chlorpropham plus nitrofen gave almost equally good control of weeds apart from a few grasses. Propyzamide as a single treatment was not very effective on broad-leaf weeds.

Crop tolerance

The target number of approximately 200,000 plants/ha was achieved with no losses through bolting or damage from sclerotinia fungus. Statistical analysis of root numbers

TABLE 1: Crop yield data and details of herbicide applications for weed control in chicory.

Herbicide	Rate (kg/ha)	Application method	% weeds 11.1.82	Time to weed plot (min.)	Root number (000/ha)	Fresh root yields (t/ha)
control			100	-	-	-
trifluralin	1.0	PPSI	80	-	166 a	21 b
nitrofen	2.0	Post em	95	-	-	-
trifluralin + asulam	1.0 2.0	PPSI Post em	30	26	197 a	25 ab
trifluralin + metamitron	1.0 5.0	PPSI Post em	6	11	186 a	28 ab
trifluralin + nitrofen	1.0 2.0	PPSI Post em	15	11	195 a	28 ab
chlorpropham	4.5	Pre em	40	-	-	-
chlorpropham	4.5	Post em	60	-	-	-
chlorpropham + nitrofen	4.5 2.0	Pre em Post em	10	20	165 a	33 a
propyzamide	3.0	Pre em	40	26	172 a	31 a
propyzamide + nitrofen	3.0 2.0	Pre em Post em	8	14	204 a	32 a
hand weeded			100	42	202 a	25 ab
cv%					16	19

— No harvest made or weeding times taken.

showed that there were no significant differences between treatments (Table 1). Although only trifluralin as a single treatment resulted in a significant yield reduction compared with the best treatments, all trifluralin treatments reduced the yields to below the trial average. Chicory seedling growth was initially checked by asulam and metamitron but appeared to make a satisfactory recovery. Best root yields were obtained from propyzamide plus nitrofen, chlorpropham plus nitrofen and propyzamide as a single treatment.

The results of this work show that there are suitable chemicals capable of giving adequate control of weeds during the establishment phase of chicory. None of the chemicals gave complete crop protection throughout the life of the trial and even the best herbicides broke down within 2 months of application. This means that under New Zealand conditions at least one mid season hand weeding is essential for maintaining weed free conditions.

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