WEED CONTROL AND USE OF HERBICIDES IN GARLIC

A. RAHMAN, T.K. JAMES and J. MORTIMER

Ruakura Soil and Plant Research Station, MAF, Private Bag, Hamilton

SUMMARY

Several herbicides and their combinations were tested for weed control in garlic over three growing seasons in the Waikato. The best overall weed control without damage to the garlic crop was achieved by using either oxadiazon or linuron as a pre-emergence spray and alachlor or chloridazon/chlorbufam as a follow up spray 8-10 weeks later. Prometryn also gave good results with oxadiazon but was not as effective when combined with other pre-emergence treatments. A few other herbicide combinations also appeared promising. Simazine was consistently damaging to the crop. Early crops planted in June or early July are more likely to give better yields and it is also easier to achieve good weed control in them than the late plantings.

INTRODUCTION

Good weed control in garlic is important from planting through to maturity if maximum yields and efficiency at harvest are to be obtained. As the crop offers little ground cover, effective weed control is dependent on the use of selective herbicides. As with onions, a wide range of herbicides is available for chemical weed control in garlic. Many of these have been tested in some parts of New Zealand and recommendations have been provided for Canterbury and Pukekohe conditions (Brandenburg 1978; Oliver and Wilson 1981).

The Waikato region has a relatively short history of growing garlic commercially. In 1980 ten growers had planted only 7 ha, which increased to over 100 ha in 1982 when Waikato became the second largest producer of export garlic.

Earlier work with many cropping herbicides has shown that some of the herbicides which performed well in the Pukekohe trials may not be as satisfactory in the Waikato region because of the different weed spectrum and soil types (Wilson *et al* 1983). Field trials were therefore conducted to find the best herbicide programmes for the garlic crop under Waikato conditions. The choice of the herbicide programme in relation to the time of planting was also investigated.

MATERIALS AND METHODS

Four field trials were conducted between 1982 and 1985 on the Horotiu sandy loam soil near Hamilton. The site for Trials 1 and 2 had 9.9% organic C and a pH of 5.7. The respective figures for the site of Trials 3 and 4 were 10.8 and 5.9. The cloves of garlic (var. Californian white) were planted in rows 30 cm apart with 20 cm between cloves. Beds were 1.5 m wide and 6 m long with 4 rows per bed. Trials 1, 2 and 3 were planted in mid June to early July and Trial 4 was planted in mid August. The treatments were arranged in a randomised block design with four replications.

The herbicide treatments were applied overall in a spray volume of 300 litres/ha at a pressure of 210 kPa with a hand held precision sprayer. Trifluralin was applied before planting and incorporated to a depth of approximately 5 cm. All the pre-emergence herbicides were applied 3-7 days after planting and the post-emergence herbicides 9-12 weeks after planting.

Weeds emerging before the application of the post-emergence herbicides were assessed and then treated with ioxynil at 0.5 kg ai/ha.

The crop was harvested in mid to late January (late February for Trial 4). The bulbs were lifted with the tops still attached and dried in the open air for about 3 weeks.

Proc. 38th N.Z. Weed and Pest Control Conf.

They were then topped (leaving about 5 cm of stalk), the roots were trimmed and the weight of bulbs was recorded.

Visual weed control assessments and/or weed dry matter weights were recorded before applying the post-emergence treatments and again one month before harvest. Scoring was on a 0-10 scale with 10 being complete weed control. Data on dry matter of weeds were collected by harvesting duplicate 0.1 m² samples, one from each end of the plot.

RESULTS AND DISCUSSION

The main weed species present in these trials were twin cress (*Coronopus didymus*), chickweed (*Stellaria media*), narrow-leaved plantain (*Plantago lanceolata*), shepherd's purse (*Capsella bursa-pastoris*), dandelion (*Taraxacum officinale*), white clover (*Trifolium repens*) and annual poa (*Poa annua*). Later in the season (from October onwards) summer grass (*Digitaria sanguinalis*), smooth witchgrass (*Panicum dichotomiflorum*), redroot (*Amaranthus powellii*), willow weed (*Polygonum persicaria*), black nightshade (*Solanum nigrum*) and wild portulaca (*Portulaca oleracea*) were also recorded in most plots.

Weed control

In Trial 1 many of the treatments failed to provide adequate season-long weed control or to give acceptable bulb yields, and data from this trial are therefore not presented in the table. The failed treatments included single treatments of aziprotryne (giving 11 weeks of weed control), linuron (12 weeks) and oxadiazon (13 weeks); combinations of chlorthal-dimethyl with methabenzthiazuron (11 weeks), prometryn (13 weeks) or ioxynil (14 weeks) and the mixture of CIPC with pendimethalin (17

TABLE 1: Effect of herbicide treatments on weeds in garlic.

Treatment	Rate* (kg ai/ha)	Trial 2		Trial 3		Trial 4	
		DM (kg/ha)		DM (kg/ha)		DM (kg/ha)	weed**
		27.8.83	15.12.83	24.8.84	18.12.84	17.10.84	18.12.84
hand weeded	—	0	0	0	0	0	0
linuron + prometryn	1.0 + 0.5	3	186	16	347	62	5.0
linuron + alachlor	1.0 + 2.0	3	80	21	139	30	5.3
linuron + chloridazon/ chlorbufam	1.0 + 2.0	1	32	14	196	60	5.0
aziprotryne + prometryn	2.3 + 0.5	165	58	20	210	80	4.3
aziprotryne + alachlor	2.3 + 2.0	168	112	—	—	—	—
aziprotryne + chloridazon/ chlorbufam	2.3 + 2.0	138	224	—	—	—	—
oxadiazon + prometryn	1.5 + 0.5	33	8	45	102	20	6.5
oxadiazon + alachlor	1.5 + 2.0	48	9	54	16	10	7.0
oxadiazon + chloridazon/ chlorbufam	1.5 + 2.0	94	29	—	—	—	—
trifluralin + prometryn	1.0 + 0.5	138	110	39	262	116	6.0
trifluralin + alachlor	1.0 + 2.0	89	214	—	—	—	—
methabenzthiazuron + prometryn	2.0 + 0.5	—	—	19	269	96	5.0
simazine	2.0	0	356	64	55	0	4.1
SED		64	44	23	45	43	
CV%		73	60	58	38	49	

* In Trial 2 prometryn was applied at 1.0 kg ai/ha for all treatments

** 0 = very weedy; 10 = no weeds present

— Treatment not included

weeks). None of these treatments were included in the subsequent trials (Trials 2, 3, 4) which basically tested four pre-emergence treatments viz., linuron, aziprotryne, oxadiazon and trifluralin, each being followed by prometryn, chloridazon/chlorbufam or alachlor as the post-emergence treatment. Simazine was the only treatment tested as a single chemical in these trials.

Data on dry matter of weeds harvested just before application of the post-emergence herbicides in August (October for Trial 4) showed that linuron and simazine had given the best weed control up to that stage closely followed by oxadiazon (Table 1). The only weed present in the oxadiazon plots was chickweed whereas the linuron plots contained narrow-leaved plantain and clover. However, by December oxadiazon combinations had the lowest amount of weeds followed by the linuron mixtures. When used with oxadiazon all three post-emergence herbicides gave excellent weed control but when applied after linuron or aziprotryne the results were somewhat variable. In Trials 3 and 4 however, the reduced rate of prometryn resulted in significantly less control of weeds. The combinations with aziprotryne and trifluralin were not as effective overall as those with linuron or oxadiazon. Methabenzthiazuron, which gave very good results under Pukekohe conditions (Oliver and Wilson 1981) provided satisfactory weed control in the two trials tested.

Bulb production

The use of alachlor after either linuron or oxadiazon consistently gave bulb yields similar to, or better than, the hand weeded plots. At the lower rate, prometryn in combination with oxadiazon also gave good bulb weights. The combinations of trifluralin with alachlor, and oxadiazon with chloridazon/chlorbufam also resulted in good yields when used in Trial 2. Trifluralin however, has the disadvantage of requiring incorporation into the soil.

The garlic bulb yields presented in Table 2 show that yields from the simazine treatment were significantly lower than the hand weeded plots in all the three trials. This was due to a combination of the late weed competition (Table 1) and the lack of tolerance of the garlic to this herbicide. The damage, which was much more pronounced in the late planting (Trial 4), varied from bleaching of the young leaves to mortality of

TABLE 2: Effect of herbicide treatments on the garlic bulb yield (t/ha).

Treatment	Rate* (kg ai/ha)	Trial 2 17.1.84	Trial 3 15.1.85	Trial 4 15.2.85
hand weeded	—	5.80	6.01	5.08
linuron + prometryn	1.0 + 0.5	5.23	4.75	4.80
linuron + alachlor	1.0 + 2.0	6.12	6.32	5.39
linuron + chloridazon/ chlorbufam	1.0 + 2.0	5.72	5.33	5.00
aziprotryne + prometryn	2.3 + 0.5	5.07	5.09	4.36
aziprotryne + alachlor	2.3 + 2.0	5.61	—	—
aziprotryne + chloridazon/ chlorbufam	2.3 + 2.0	5.39	—	—
oxadiazon + prometryn	1.5 + 0.5	4.94	6.43	5.45
oxadiazon + alachlor	1.5 + 2.0	6.25	6.80	5.85
oxadiazon + chloridazon/ chlorbufam	1.5 + 2.0	6.00	—	—
trifluralin + prometryn	1.0 + 0.5	5.13	4.93	4.63
trifluralin + alachlor	1.0 + 2.0	5.97	—	—
methabenzthiazuron + prometryn	2.0 + 0.5	—	4.85	4.81
simazine	2.0	4.01	5.10	1.85
SED		0.42	0.33	0.39
CV%		10.8	8.6	11.4

* In Trial 2 prometryn was applied at 1.0 kg ai/ha for all treatments

— Treatment not included

some young plants. Oliver and Wilson (1981) also noted significant yield reductions from simazine in trials at Pukekohe. The only other treatment causing damage in these trials was prometryn when used at the higher rate of 1 kg ai/ha in Trials 1 and 2. This caused burning of some mature leaves, although it was a few weeks after treatment before this effect was apparent.

A comparison of bulb yields between early and late plantings (Trials 3 and 4) showed that on average the yields were considerably higher when the crop was planted early. Also the average bulb size was larger, the general crop vigour better and there was less late-season weed growth in the early planting than in the crop planted in August.

The results from all four trials showed that the best weed control without damage to the garlic crop could be achieved in the Waikato region by using either oxadiazon or linuron as a pre-emergence treatment and either alachlor or chloridazon/chlorbufam as a follow up spray 8-10 weeks later. Both oxadiazon and linuron have given good results in other trials in New Zealand (Brandenburg 1978; Oliver and Wilson 1981). Prometryn also appeared an effective post-emergence treatment but requires further testing for adequate crop safety. If weeds have appeared before application of the follow up treatment, ioxynil can be used to control them first. In general herbicide treatments were more effective in the early-planted crop (June/July) and this crop also produced higher yields than the late plantings.

REFERENCES

- Brandenburg, W., 1978. Weed control in leeks and garlic under Canterbury conditions. *AgLink HPP 37/5*, Information Services, MAF, Wellington.
- Oliver, R.M. and Wilson, G.J., 1981. Garlic: Weed Control, In Research Digest. *N.Z. Commercial Grower 36*: 14.
- Wilson, G.J., Rahman, A. and Scheffer, J.J.C., 1983. Persistence of some soil-applied herbicides for kiwifruit. *Proc. 36th N.Z. Weed and Pest Conf.*: 104-106.

Chemical Appendix

alachlor (Lasso)	aziprotryne (Brasoran)
chloridazon/chlorbufam (Alicep)	chlorpropham (Winstone's CIPC)
chlorthal-dimethyl (Dacthal)	ioxynil (Totril)
linuron (Linuron 50)	methabenzthiazuron (Tribunil)
oxadiazon (Ronstar)	pendimethalin (Stomp)
prometryn (Gesagard)	simazine (Simazol 4A)
trifluralin (Treflan)	