ONION SOWING DEPTH AND HERBICIDES

G. J. WILSON

Horticultural Research Station, MAF, Pukekohe

Summary

Four commercial herbicide programmes for early weed control in onion crops were compared in combination with three sowing depths of 10, 20 and 40 mm. Using pelleted seed of the cv. 'Pukekohe Longkeeper' sowing at 40 mm caused significant reductions in early plant vigour, establishment and yield compared with sowings at 20 mm and 10 mm. When a mixture of propachlor and chlorpropham (4.5 + 1.0 kg/ha) was applied pre-emergence crop reduction due to deep sowing was less severe than with the other herbicide treatments and yield differences were not significant.

INTRODUCTION

Successful commercial onion production in New Zealand depends on obtaining efficient weed control with herbicides. Good weed control in the early period of crop establishment and growth is critical (Cox 1968; Crowder 1968). The choice of alternative programmes for the Pukekohe district was outlined by Wilson (1971). Using pelleted seed sown at 13 and 25 mm Crowder (1968) found that these depths did not influence susceptibility of the onions to the residual herbicides, chlorpropham, propachlor and the chlorbufam/pyrazon mixture.

Commercial sowings at Pukekohe have indicated however that sowing depth may influence crop establishment and yields. This field experiment was designed to test the possible interaction of onion sowing depth with four early residual herbicide programmes.

EXPERIMENTAL METHODS

Three sowing depths of 10, 20 and 40 mm were compared in combination with the following early herbicide programmes:

(a) propachlor	6.0 kg/ha	pre-em
(b) propachlor + chlorpropham	4.5 + 1.0 kg/ha	pre-em
(c) pyrazon/chlorbufam	3.0 kg/ha	pre-em
(d) pyrazon/chlorbufam	3.0 kg/ha	post-em (onion flag)

A non-ionic wetting agent (1.4 litres/ha) was added to treatment (d) to provide contact herbicide action.

The 12 treatments were replicated four times using plots 7.0 x 1.5 m. Pelleted seed of cv. Pukekohe Longkeeper was sown at a spacing of 3.2 cm with a Stanhay precision drill. There were five rows per plot with 20 cm between rows. The soil type was Patumahoe clay loam and representative of onion production areas in the Pukekohe district. Hand weeded control plots were not included in the comparison as some form of early residual herbicide treatment is essential in commercial practice.

The trial was drilled on 16 August 1974 and pre-emergence residual herbicides applied five days later. The post-emergence pyrazon/chlorbufam treatment was applied when 98% of the young onion plants had reached the flag stage.

Proc. 28th N.Z. Weed and Pest Control Conf.

A rain of 18 mm fell the evening following the pre-emergence herbicide application. Twelve days after sowing but before onion emergence all treatments were sprayed with diquat/paraquat at 0.5 kg/ha. In mid-October ioxynil at 0.5 kg/ha was sprayed over the complete trial. Crop establishment was recorded two months after sowing by plant counts over 6 m of the middle row in each plot. Yields were recorded at crop maturity on 10 March and all sound bulbs above 4 cm in diameter classified as first grade.

RESULTS

(1) Weed Control

Best weed control was obtained with the pre-emergence pyrazon/chlorbufam treatment which remained virtually weed free for eight weeks. Pyrazon/chlorbufam as a post-emergence flag stage spray gave good weed control with the shallow sowing, where earlier crop development allowed spraying eight days before the deeper sowings. Weed counts taken in mid-October demonstrated the effectiveness of the pre-emergence pyrazon/chlorbufam of programme (c).

Programme	(a)	(b)	(c)	(d)
Total weeds/m ²	296	328	51	196

A weed count taken in programme (d) four weeks earlier before treatment application recorded 437 weeds/m². The main species on the trial site were seedling white clover (*Trifolium repens*), twincress (*Coronopus didymus*), black nightshade (*Solanum nigrum* complex), willow weed (*Polygonum persicaria*), redroot (*Amaranthus* sp.), wireweed (*Polygonum aviculare*), annual poa (*Poa annua*) and cornbind (*Polygonum sp. convolvulus*).

Weed control with propachlor alone was similar to the mixture of propachlor plus chlorpropham. More of the three *Polygonum* species, black nightshade and annual poa survived where propachlor alone was used. On the other hand more twincress and seedling white clover survived where propachlor at a reduced rate was mixed with chlorpropham.

(2) Plant Establishment Counts

Shallow sowing gave the quickest and most even emergence. Table 1 shows that plant establishment was reduced as a result of sowing at 40 mm, but that there were negligible differences between the 10 mm and 20 mm depths. Deep sowing caused a significant stand reduction except where the propachlor plus chlorpropham mixture was used. Pyrazon/chlorbufam applied pre-emergence resulted in a greater overall stand reduction than the other treatments (Table 1).

(3) Crop Yields

There were no significant yield differences between the 10 and 20 mm sowing depths, while sowing at 40 mm caused a major yield reduction. However where propachlor plus chlorpropham was applied the yield reduction due to sowing depth was not significant.

DISCUSSION

Good onion establishment was achieved in the shallow sowings and 87% of the seeds sown established in the propachlor treatment. Establishment in this site was favoured by good seedbed preparation and continually moist soil for the six-week period after drilling (230 mm of rain on 29 days).

Shallow sowing may not be satisfactory under drier seedbed conditions.

Vegetables

TABLE 1: ONION CROP ESTABLISHMENT AND YIELD

<i>Treatment</i>	<i>Rate kg/ha</i>	<i>Sowing depth mm</i>	<i>Onion establishment, plants/m²</i>	<i>Yield tonnes/ha</i>	
				<i>First grade</i>	<i>Total yield</i>
propachlor	6	10	91.3 a	55.9 ab	58.6 a
pre-em		20	82.8 ab	52.4 ab	54.7 ab
		40	52.2 cd	44.8 c	46.2 c
propachlor	4.5	10	79.2 ab	54.0 ab	56.1 ab
+ chlorpropham	1.0	20	80.4 ab	55.7 ab	57.8 ab
pre-em		40	70.4 b	49.2 bc	50.9 bc
pyrazon/	3	10	66.7 bc	54.8 ab	56.2 ab
chlorbufam		20	70.4 b	59.2 a	61.2 a
pre-em		40	48.1 d	43.0 c	44.6 c
pyrazon/	3	10	82.1 ab	55.1 ab	57.1 ab
chlorbufam		20	78.8 ab	56.6 ab	58.9 a
post-em (flag)		40	52.9 cd	43.8 c	45.6 c
CV %			15.4	8.7	8.4
MAIN EFFECTS					
propachlor			75.4 a	51.0 a	53.2 a
propachlor + chlorpropham			76.7 a	52.9 a	55.0 a
pyrazon/chlorbufam pre-em			61.7 b	52.3 a	54.0 a
pyrazon/chlorbufam post-em			71.3 a	51.8 a	53.9 a
10 mm depth			79.8 a	54.9 a	57.0 a
20 mm depth			78.1 a	55.9 a	58.2 a
40 mm depth			55.9 b	45.2 b	46.8 b

Although the best early weed control was achieved with the pyrazon/chlorbufam treatment this programme was the only one to depress crop establishment. Local district experience has shown that there is considerable risk of damage with this application especially on lighter soils. The programmes of propachlor, and propachlor plus chlorpropham were rated as less efficient but most weeds were eliminated by the ioxynil spray in mid-October. Wireweed did remain as a serious problem where propachlor alone had been used.

This experiment verified the local popularity of a post-emergence pyrazon/chlorbufam treatment applied at the onion flag stage. It provided good early weed control without serious risk to the crop. There was an advantage from combining shallow sowing with this treatment because the earlier crop emergence and more even vigour allowed spraying eight days ahead of the deeper sowings. At this time young weeds and particularly twincrest were more readily killed where contact action depends on inclusion of a wetting agent.

ACKNOWLEDGEMENTS

I thank J. J. C. Scheffer and R. M. Oliver for technical assistance and the Biometrics section at Levin for analyses.

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