A NEW UREA HERBICIDE FOR USE IN PEA CROPS

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Summary

A series of trials with the new selective herbicide, methabenzthiazuron, has shown that this herbicide applied at the rate of 1.40 lb a.i./acre will give adequate weed control in pea crops. The trials have shown that overall weed control and phytotoxicity are equivalent, if not slightly better than with conventional treatments for the majority of varieties; the crop tolerance of methabenzthiazuron at excess rates is high; and application time should be preferably at emergence plus one week.

INTRODUCTION

IN his assessment of present methods of weed control in peas, Allen (1964) reported that the range of materials available enabled growers to produce pea crops with yields little affected by weed competition. He also commented that most users expressed some degree of dissatisfaction with present techniques because of the poisonous, unpleasant nature of dinoseb, the incomplete range of individual materials, the added cost and inconvenience of mixtures, or the limited conditions for success against a number of weeds. Since 1964 some new chemicals have found a place for weed control in peas but disadvantages such as poor crop tolerance and poor weed control under some climatic conditions have been found.

In 1967, several chemicals were screened for their selective control in peas (Wallace, 1968) and of these methabenzthiazuron and buturon showed considerable promise. Further detailed assessments were warranted on these materials, especially methabenzthiazuron, and consequently the following trials were initiated.

EXPERIMENTAL

In all trials, the treatments were applied with a hand-pushed rig on which was mounted a 6 ft 6 in. boom. This rig has a calculated accuracy of application to an error of $\pm 0.475\%$. Each herbicide was applied in 32 gal of water per acre; rates are in active ingredient per acre.

Application for all trials was made under conditions of minimum drift in order to obtain optimum coverage. With all trials except H2031, all treatments were applied at the same time.

Plot size in all but two trials was 0.0063 acres and five replications were used. Exceptions to this were H2031 (plot size 0.0030 acres, replication $\times 4$) and H2039 (plot size 0.0024 acres, replication $\times 4$).

RESULTS

All the trials were conducted on crops situated on the Heretaunga and Argyll plans in Hawke's Bay. Soil types ranged from alluvial silts and clays to peats.

Treatment (lb)		Overall Weed Control	Phyto- toxicity	Weeds/ sq. ft	Plant Population	Total Plant Weight	No. of Pods	Pod Weight
TRIAL H2003								
methabenzthiazuron	(1967)	1.05	...	36.2 NS	0.0	6.5 NS	33.8 NS	48.2 NS
methabenzthiazuron	(1967)	1.40	...	37.2 NS	0.0	6.5 NS	35.2 NS	47.0 NS
methabenzthiazuron	(1967)	1.75	...	38.2 NS	0.0	5.8 NS	32.4 NS	44.6 NS
methabenzthiazuron	(1968)	1.40	...	38.0 NS	0.0	8.1 NS	25.8 NS	37.6 NS
prometryne 0.62	...	...	...	38.2 NS	0.2	6.8 NS	32.2 NS	42.4 NS
dinoseb 0.59/MCPB	1.00	...	...	38.0 NS	1.0	10.0 NS	31.6 NS	42.4 NS
CV	...	4.9%	...	48.1%	20.3%	24.6%	—	26.8%
TRIAL H2037								
methabenzthiazuron	(1968)	1.05	...	12.4 bBB	2.8 bA	79.4 bB	—	—
methabenzthiazuron	(1968)	1.40	...	14.0 bcAB	3.4 aA	74.4 bB	—	—
methabenzthiazuron	(1968)	1.75	...	15.8 acAB	4.8 aA	46.8 bB	—	—
prometryne 0.62	...	...	...	16.8 aA	5.2 aA	33.6 bB	—	—
dinoseb 0.59/MCPB	1.00	...	...	6.8 cC	2.2 bB	182.4 aA	—	—
CV	...	15.9%	39.4%	52.4%	—	—	—	—
TRIAL H2029								
methabenzthiazuron	(1967)	1.05	...	23.4 aA	0.1	6.4 NS	24.0 aA	25.8 NS
methabenzthiazuron	(1967)	1.40	...	25.8 abA	0.2	4.8 NS	22.6 aA	35.2 NS
methabenzthiazuron	(1967)	1.75	...	27.6 aA	0.3	6.2 NS	20.0 aA	35.2 NS
methabenzthiazuron	(1968)	1.40	...	25.4 abA	0.2	6.0 NS	24.6 aA	32.8 NS
prometryne 0.62	...	...	...	21.8 bA	0.2	7.8 NS	24.8 aA	30.8 NS
dinoseb 0.59/MCPB	1.00	...	...	19.4 bB	0.1	8.6 NS	18.4 bA	30.6 NS
CV	...	14.6%	—	55.8%	20.4%	35.1%	27.5%	30.7%
TRIAL H2004								
methabenzthiazuron	(1967)	1.05	...	26.2 aA	3.4 bA	2.9	16.2 NS	20.8 NS
methabenzthiazuron	(1967)	1.40	...	29.6 aA	4.8 aA	0.2	22.8 NS	27.2 NS
methabenzthiazuron	(1967)	1.75	...	29.6 aA	5.4 aA	0.1	23.0 NS	24.0 NS
buturon 2.00	...	...	...	13.6 bB	2.6 bB	11.2	18.4 NS	25.6 NS
prometryne 0.62	...	...	...	26.2 aA	3.2 bA	2.2	18.4 NS	27.2 NS
dinoseb 0.59/MCPB	1.00	...	...	28.4 aA	4.2 abA	4.4	17.8 NS	20.8 NS
CV	...	12.3%	35.8%	—	—	—	33.8%	41.2%

*Figures are averages only — not analysed.

TABLE 2: APPLICATION TIMING OF METHABENZTHIAZURON

Treatment (lb)	Time of Application	Overall Weed Control	Phyto-toxicity	Plant Population	Total Plant Weight	Pod Weight
TRIAL H2031						
Methabenzthiazuron (1968)	1.40 ...	*	*	13.5 NS	26.0 NS	12.0 NS
methabenzthiazuron (1968)	Emergence	8.6	0.7	13.0 NS	20.0 NS	10.0 NS
methabenzthiazuron (1968)	Emergence + 1 wk	9.1	0.7	12.5 NS	26.0 NS	14.0 NS
methabenzthiazuron (1968)	Emergence + 2 wk	9.1	0.5	10.5 NS	18.0 NS	9.0 NS
methabenzthiazuron (1968)	Emergence + 3 wk	8.2	0.6	14.7 NS	26.0 NS	14.0 NS
methabenzthiazuron (1968)	Emergence + 4 wk	7.0	0.5	28.8%	28.1%	50.8%
CV	...	—	—			

*Figures are averages only — not analysed

COMPARATIVE WEED CONTROL

Results are given in Table 1. Trial H2003 showed no significant differences between treatments, the crop responding similarly to all treatments. The phytotoxicity figures, although not analysed, indicated that dinoseb/MCPB treatment gave more crop damage than other treatments. This was apparent with visual assessment.

A trial on a peat soil (H2037) gave inferior results from all treatments. Although this was the case, prometryne gave a significant increase in weed control over other treatments.

The dinoseb/MCPB mixture in trial H2029 gave significantly lower weed control and reduced the plant population. It also appears that methabenzthiazuron 1.75 reduced the number of pods significantly but the reason for this is obscure.

The final trial in this series (H2004) showed that buturon gave a significant lowering of the weed control as compared with other treatments. Little significant difference was recorded between treatments for phytotoxicity and no differences for yield.

THE APPLICATION TIMING FACTOR

Results are given in Table 2. This trial (H2031) was laid down to determine the optimum time of application for methabenzthiazuron 1.40 lb. The results indicate that there is no significant difference as regards yield from any of the treatment times. However, unanalysed results of weed control and phytotoxicity indicate that emergence plus two weeks for application will give the most efficient weed control.

THE VARIETY FACTOR

Results are given in Table 3. Trial H2039 was laid down to determine the relative susceptibility of 41 varieties or strains to both the formulation of methabenzthiazuron and to the standard dinoseb/MCPB treatment. For ease of presentation, these varieties have been divided into two classes and in both cases there is a marked significant increase in phytotoxicity over other treatments from the application of dinoseb/MCPB. This significant difference followed for all but three varieties — Onward, English Wonder and Maple. These three varieties gave phytotoxicity responses with all applications of methabenzthiazuron almost equivalent to dinoseb/MCPB. The significant increase in phytotoxicity from dinoseb/MCPB does not appear to have been carried through to the yield results.

THE TOLERANCE FACTOR

Results for trial H2005 are given in Table 4 and indicate that both formulations of methabenzthiazuron are well tolerated by the variety Emblem up to 3.50 lb. This is 2.5 times the recommended rate of application. Emblem was selected as the best variety owing to its low comparative tolerance of selective herbicides.

RELATIVE YIELD — FIELD RESULTS

Results are given in Table 5. Obtaining yield results from fully replicated small plot trials is not entirely satisfactory for green peas owing

TABLE 3: EFFECTS OF HERBICIDES ON VARIOUS PEA VARIETIES

Treatment (lb)		Phytotoxicity	Plant Population	Total Plant Weight	Pod Weight
TRIAL H2039 (PROCESS AND MARKET VARIETIES)					
methabenzthiazuron	(1967) 1.40	...	97.75 NS	681.10 NS	142.17 NS
methabenzthiazuron	(1967) 2.10	...	96.50 NS	713.05 NS	147.20 NS
methabenzthiazuron	(1968) 0.70	...	89.25 NS	534.07 NS	112.97 NS
methabenzthiazuron	(1968) 1.40	...	104.75 NS	685.67 NS	156.32 NS
methabenzthiazuron	(1968) 2.10	...	74.50 NS	563.97 NS	110.97 NS
Bayer 5837	1.40	...	101.75 NS	752.75 NS	159.05 NS
dinoseb	0.59/MCPB	1.00	92.25 NS	694.27 NS	155.52 NS
CV	...	...	23.4%	27.6%	28.7%
TRIAL 2039 (FIELD VARIETIES)					
methabenzthiazuron	(1967) 1.40	...	79.75 NS	521.72 NS	81.80 NS
methabenzthiazuron	(1967) 2.10	...	74.00 NS	600.15 NS	82.50 NS
methabenzthiazuron	(1968) 0.70	...	69.25 NS	447.67 NS	59.50 NS
methabenzthiazuron	(1968) 1.40	...	78.75 NS	593.22 NS	88.77 NS
methabenzthiazuron	(1968) 2.10	...	63.00 NS	433.37 NS	71.05 NS
Bayer 5837	1.40	...	66.75 NS	544.42 NS	94.82 NS
dinoseb	0.59/MCPB	1.00	68.75 NS	548.97 NS	84.17 NS
CV	...	...	15.9%	28.3%	24.8%

TABLE 4: TOLERANCE OF VARIETY EMBLEM TO METHABENZTHIAZURON, TRIAL H2005

Rate/Ac	Methabenzthiazuron (1967)		Methabenzthiazuron (1968)	
	Overall Weed Control	Phytotoxicity	Overall Weed Control	Phytotoxicity
7.00	8.6	4.3	8.6	5.3
6.30	9.0	4.0	8.6	5.0
5.60	9.0	2.6	8.6	3.6
4.90	9.0	2.0	9.0	3.6
4.20	9.3	2.3	10.0	3.6
3.50	9.6	2.0	10.0	3.3
2.80	10.0	1.6	10.0	2.6
2.10	10.0	1.3	10.0	2.0
1.40	10.0	1.0	9.6	2.3
0.70	9.6	0.6	9.0	1.3
0.35	9.0	0.6	8.6	1.0
0.07	6.6	0.0	6.6	0.6
			18.5	20.5

TABLE 5: RELATIVE YIELD OF GREEN PEAS

Treatment (lb)		Yield (lb/acre)	Average Tenderometer Reading		Gross Return (\$/acre)
TRIAL H2006	methabenzthiazuron (1968)	1.40	...	...	79-07
	dinoseb 0.44/MCPB	0.50	...	...	79-29
	...	...	...	...	...
TRIAL H2007	methabenzthiazuron (1968)	1.40	...	...	90-13
	dinoseb 0.59/MCPB	1.00	...	...	93-19
	...	...	...	...	...
TRIAL H2009	methabenzthiazuron (1968)	1.40	...	...	112-52
	dinoseb 0.59/MCPB	1.00	...	...	102-37
	...	...	...	...	...

to changing maturity. These three trials were laid down to compare the field effects of methabenzthiazuron and dinoseb/MCPB. In all cases the yield (\$) was equivalent from both treatments. However, owing to the organization of these trials, the methabenzthiazuron plots were harvested at a lower tenderometer reading. Had they been harvested at the same tenderometer reading as the dinoseb/MCPB plots, greater differences in favour of methabenzthiazuron could have been expected.

DISCUSSION

The results of this series of trials show that methabenzthiazuron at the recommended rate of 1.40 lb a.i./acre is equivalent, if not sometimes better, in its weed control ability than other treatments and does not increase the phytotoxicity to process green pea crops. This, however, is not the case on peat soils where it is apparent that difficulties will be further experienced in seeking a suitable herbicide.

The time of application of methabenzthiazuron to green pea crops does not appear to be critical. The results do indicate that emergence plus two weeks is probably the best time. Any application before this growth stage is giving insufficient control, owing to a total reliance on the long-term effects of the chemical. After this stage the crop is providing too much canopy for adequate coverage of the weeds.

Of the 41 varieties and strains screened for phytotoxicity with application of methabenzthiazuron, only three gave an expression of damage beyond the permitted tolerance level. Far less damage was experienced on all other varieties than with dinoseb/MCPB. Although this damage difference was not expressed in the yield results, it was apparent in both the variety screening trial and the field trials that the crop matured approximately 1 to 2 days earlier than when treated with dinoseb/MCPB. The different rates of maturity do not pose any problem and in fact can be of assistance to the processor during poor weather conditions at harvest.

Green peas appear to tolerate up to 2.5 times the recommended rate of methabenzthiazuron. The variety selected for the trial was the most susceptible of the process varieties. Other process varieties could be expected to tolerate rates well in excess of this. Although it is not desirable to over-spray, this does give an operator some flexibility when spraying out corners and allows inaccuracies in overlapping.

Overall, this series of trials has shown that methabenzthiazuron at 1.40 lb will give successful selective weed control with little if any crop damage in Hawke's Bay pea crops.

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