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AGRONOMY BRANCH REPORT

ALTERNATIVES TO DDT FOR THE CONTROL OF *HELIOTHIS FUNCTIGERA* WALLENGR., IN LUCERNE CROPS

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SUMMARY

A trial conducted at Meningie West in January, 1973, showed that endosulfan at 0.21 kg ai/ha is an effective treatment for controlling *heliothis* larvae in forage lucerne. It compared favourably with DDT and results of the trial indicate that even lower rates may be effective in lucerne seed crops where larvae are usually treated at much earlier stages.

INTRODUCTION

The larvae of the native moth *Heliothis punctigera* is adopted to feeding on a wide range of host plants. In lucerne its preference for buds, flowers and pods make it an important pest of seed crops. DDT has been used to control *heliothis* but with concern over the residual properties of this insecticide it is necessary to seek alternative insecticides to control this pest. Following trials by the manufacturers and farmer experience, trichlorphon was recommended for *heliothis* control in forage lucerne. It has not, however, performed well in peas and, before trichlorphon can be recommended for seed lucerne, its effectiveness should be confirmed. Endosulfan has showed promise in trials in field peas as another alternative to DDT for *heliothis* control. It has not been tested in lucerne. Also, to be an economic alternative to DDT, low rates must be used.

AIMS

(a) To comfirm the effectiveness of trichlorphon at 0.47 kg ai/ha against *heliosis* larvae in lucerne forage.

(b) To determine the effectiveness of endosulfan at three rates: 0.42, 0.35, 0.21 kg ai/ha.

(c) To compare the effectiveness of the above treatments with DDT.

METHODS

(a) Treatments

No.	Insecticide	kg ai/ha	Product	Formulation	litres/ha
1.	Trichlorphon	0.47	"Dipterex"	57%	0.825
2.	Endosulfan	0.42	"Thiodan"	35%	1.2
3.	Endosulfan	0.35	"Thiodan"	35%	1.0
4.	Endosulfan	0.21	"Thiodan"	35%	0.6
5.	DDT	0.70	DDT	25%	2.8
6.	Nil	-	-	-	-

(b) Site and Design

The trial was conducted at Meningie West on the property of Mr. L.C. Olsen. A randomised block design was used with 5 replicates of 6 plots. Each plot was divided into 5 sections for stratified random sampling of heliothis larvae. Plot size was 25 m x 4 m.

(c) Application

Insecticide treatments were applied on 9 January, 1973 by 4 m boomspray delivering 100 l/ha.

(d) Sampling

Larvae were sampled with a sweepnet 38 cm in diameter mounted on a 1 m handle. An arc of about 160° was made in each sweep. Larvae captured and counted and released immediately. Five random sweeps within each section of a plot consituted a sample. The pre-spray assessment was made on 9 January, 1973, and the post-spray assessment on 11 January, 1973.

(e) Statistical analysis

Analysis on the pre-spray assessment was done on untransformed values. Regression of post-spray counts on pre-spray counts showed a high correlation and an adjustment of post-spray counts was made. This resulted in negative values and in the analysis of co-variance the adjusted post-spray values were transformed to square root $x + 5$. For estimates of survival after spray and percentage control calculated according to Abbott (1925), the estimated grand mean was used as a measure of the pre-spray population and the adjusted means as measures of the soil-spray populations.

RESULTS

Detailed results of the two assessments are at Appendix 1. Analysis showed there was no significant difference between treatment plots in the pre-spray assessment. The estimated grand mean of the pre-spray population was 37.26 larvae per sample. There were significant differences at $p = 0.001$ in post-spray assessments. Table 1 shows the post-spray means and estimates of survival and percentage control.

Table 1 Mean larval numbers, percentage survival and percentage control in treatments after spray 11/1/73

Treatment and Rate			Larvae after spray		
No.	Insecticide	kg ai/ha	Mean No. per sample	Percentage Survival	Percentage Control
1.	Trichlorphon	0.47	4.57 (3.09)*	12.3	71.6
2.	Endosulfan	0.42	-0.02 (2.23)	-0.5	101.1
3.	Endosulfan	0.35	1.32 (2.51)	3.5	91.8
4.	Endosulfan	0.21	1.65 (2.58)	4.4	89.8
5.	DDT	0.70	0.98 (2.45)	2.6	93.9
6.	Nil	-	16.09 (4.59)	43.2	0

L.S.D. $p = 0.20$ (0.28)
$p = 0.10$ (0.37)
$p = 0.05$ (0.45)

*Means of tranformed data where x = number of larvae per sample.

DISCUSSION

Trichlorphon at 0.47 kg ai/ha resulted in 72% control of larvae. In forage lucerne this degree of control would be adequate. In seed lucerne a higher degree of control would be required. Endosulfan at all three rates tried were not significantly different giving 90% and more control. DDT at 0.70 kg ai/ha gave a similar degree of control. As the rate of DDT used in seed lucerne is much lower than the rate tested, it is likely the lower rates of endosulfan can also be used in *heliothis* control in seed lucerne. At the lowest rate of endosulfan tested, i.e. 0.21 kg ai/ha control was still better than trichlorphon at 0.47 kg ai/ha.

CONCLUSION

Trichlorphon at 0.47 kg ai/ha is confirmed as effective against *heliothis* in forage lucerne. However, it would not give adequate control in seed lucerne.

Endosulfan at all three tested rates gives effective control of *heliothis* in forage lucerne. In seed lucerne where larvae are sprayed at even earlier stages, it is likely that lower rates would be effective.

RECOMMENDATIONS

Endosulfan at 0.21 kg ai/ha should be recommended for *heliothis* control in forage lucerne in place of trichlorphon as it is cheaper and more effective.

Endosulfan should be tested at 0.21 kg ai/ha and lower rates, say 0.14 and 0.07 kg ai/ha in seed lucerne and compared to DDT at 0.15 or 0.25 kg ai/ha.

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REFERENCES

Abbott, W.S. (1925) A method of computing the effectiveness of an insecticide. J. Econ. Ent. 18 : 265-267.

Appendix 1

(a) Pre-spray larval assessments in each treatment - 9 January, 1973

Treatment and Rate			Larval numbers																							
No.	Insecticide	kg ai/ha	Replicate 1					Replicate 2					Replicate 3					Replicate 4					Replicate 5				
			Section					Section					Section					Section					Section				
			1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1.	Trichlorphon	0.47	36	36	40	30	40	46	38	40	40	58	33	42	68	65	58	31	32	61	19	29	45	41	27	33	42
2.	Endosulfan	0.42	52	35	34	29	20	48	51	54	28	32	50	78	44	40	54	55	37	38	40	46	24	31	33	33	30
3.	Endosulfan	0.35	21	28	36	35	34	45	33	42	33	14	37	47	28	39	45	53	32	57	16	30	31	33	40	31	24
4.	Endosulfan	0.21	44	20	30	27	36	43	40	49	32	34	43	48	46	37	32	60	37	61	51	31	16	19	21	33	28
5.	DDT	0.70	43	24	34	34	39	35	48	32	36	25	33	45	27	46	28	29	37	51	28	44	23	22	31	30	33
6.	Nil	-	40	27	37	25	17	47	28	58	46	21	31	43	56	74	70	48	25	44	36	30	26	12	16	26	21

(b) Post-spray larval assessment in each treatment - 11 January, 1973

Treatment and Rate			Larval Numbers																							
No.	Insecticide	kg ai/ha	Replicate 1					Replicate 2					Replicate 3					Replicate 4					Replicate 5				
			Section					Section					Section					Section					Section				
			1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1.	Trichlorphon	0.47	13	7	7	6	4	7	6	2	5	4	4	4	5	7	11	1	3	1	0	4	9	4	7	4	5
2.	Endosulfan	0.42	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	2	0	1	1	3	1	0	0	0	0
3.	Endosulfan	0.35	4	6	4	0	1	1	0	0	0	0	0	2	1	1	2	0	1	1	0	2	0	0	2	1	0
4.	Endosulfan	0.21	7	7	6	3	3	1	0	0	1	1	2	1	0	1	6	0	0	0	1	0	1	2	1	2	1
5.	DDT	0.70	15	2	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	1	0
6.	Nil	-	12	6	11	14	14	27	25	29	15	17	7	13	16	13	47	17	8	24	9	11	22	14	21	19	16