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CABBAGE PEST CONTROL INVESTIGATIONS

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SUMMARY

The materials diazinon 0.05% and 0.1%, tetrachlorvinphos 0.1% and methidathion 0.05% used fortnightly gave satisfactory control of cabbage moth *Plutella xylostella* (L.), cabbage white butterfly *Pieris rapae* (L.), cabbage centre grub *Hellula hydralis* Guen., and cabbage cluster caterpillar *Crocidolomia binotalis* Zell. in three screening trials in south-eastern Queensland.

I. INTRODUCTION

Previous investigations (Champ 1960 and 1962) established 0·04% endrin as an alternative to BHC-DDT dust for control of cabbage moth (*Plutella xylostella* (L)), cabbage white butterfy (*Pieris rapae* (L.)) and cabbage centre grub (*Hellula hydralis* Guen.). Diazinon 0·1% also showed promise for control of these pests. Trials reported in this paper were carried out during 1968-69 to test diazinon and various other materials as alternatives to DDT and endrin for control of lepidopterous cabbage pests in south-eastern Queensland.

II. MATERIALS

aminocarb	21·7	% w/v emulsifiable concentrate
carbaryl	80	% w/w wettable powder
DDT	50	% w/w dispersible powder
diazinon	80	% w/v emulsifiable concentrate
endosulphan	35	% w/v emulsifiable concentrate
endrin	20	% w/v emulsifiable concentrate
fenthion	55	% w/v emulsifiable concentrate
maldison	103	% w/v emulsifiable concentrate
mevinphos	100	% w/v emulsifiable concentrate
methidathion	40	% w/w wettable powder
	40	% w/v emulsifiable concentrate
naled	96	% w/v emulsifiable concentrate
promecarb	50	% w/w wettable powder
rotenone	Derris dust containing 0·75% rotenone, 1·25% other extractives from derris	
tetrachlorvinphos	24	% w/v emulsifiable concentrate
trichlorphon	62·5	% w/v emulsifiable concentrate

III METHODS

Three trials were conducted at the Maroochy Horticultural Research Station during 1968-69.

Trial layout was an 8 x 4 randomized block; trial 2 a 12 x 4 block; and trial 3 a 13 x 4 block.

The unit plot comprised 2 x 5 plant rows 60 cm apart totalling 10 plants, with plants 45 cm apart in a row. Adjoining plots were separated by two guard plants and guard plants were left at either end of each row. The distance between parallel plots was 90 cm. Cabbages used were the sugarloaf variety.

Pest infestations were allowed to develop before any treatments were applied. Four at weekly intervals were made in trial 1, the first spray being applied 6 weeks after planting out. In trial 2, six weekly sprays were applied, the first after 4 weeks; and in trial 3, four fortnightly sprays were applied, the first after 2 weeks. Sprays were applied with a Rega knapsack, a wetting agent being used with each treatment. Complete plant coverage was attempted, particularly in initial applications.

Cabbage white butterfly and cabbage moth were active in all trial areas. Cabbage centre grub and the cabbage cluster caterpillar attacked the plants in trial 2.

Population data relative to each pest were obtained 1 day before and 6 days after the first spray in each trial, and additionally at 13 days after the first spray in trial 3. Numbers of larvae plus pupae of each species were recorded and the numbers of eggs of cabbage cluster caterpillar and cabbage white butterfly were counted at pre-treatment in trials 2 and 3 respectively.

In the 13-day count in trial 3, first instar larvae are presented separately from later instars plus pupae.

Corn earworm *Heliothis armigera* (Hubner) was present in light numbers late in trial 3.

Counting began in trials 1 and 2 on the first erect leaf of the first cabbage in the 10-plant plot. On the second cabbage, the leaf following the first erect leaf in a clockwise direction was then examined. Similarly, the third leaf on the third cabbage was examined and so on to the tenth leaf of the tenth cabbage, making a total of 10 leaves examined per plot. The plot sample thus represented leaves from the heart to the exterior of the cabbage.

In trial 3, each of the 10 cabbages was examined in entirety. Insecticide application rates are presented with the tabulations of results.

IV. RESULTS AND DISCUSSION

The results of trials 1 to 3 are presented in tables 1 to 3.

Excepting DDT, naled and endosulphan used fortnightly in trial 3, all materials in the three trials gave satisfactory control of cabbage white butterfly. Though naled and endosulphan gave a satisfactory knockdown, the 14-day spray interval was too long and cabbages were infested at harvest.

Diazinon used at 0·05% and 0·1%, tetrachlorvinphos at 0·1% and methidathion at 0·05% were satisfactory against cabbage moth. Results obtained with 0·025% diazinon, 0·1% trichlorphon, 0·05% tetrachlorvinphos, 0·05% mevinphos, 0·1% DDT plus 0·04% endrin, and 0·1% naled indicate satisfactory control for 7 days but not for 14 days. Diazinon at 0·1% was the only material to prevent reinfestation for a fortnight.

TABLE 1

TRIAL 1—PEST POPULATIONS AND DAMAGE RATINGS AT HARVEST

Treatment	Pest Populations				Mean Damage Rating per Cabbage	
	At Pre-treatment 22 Oct 68 Mean Larvae + Pupae per 10 Leaf Sample per Plot		At 7 Days Post-treatment Mean Larvae + Pupae per 10 Leaf Sample Per Plot			
	P. xylostella	*P. rapae*	*P. xylostella*	*P. rapae*	*Trans* Mean*	*Equiv* Mean
trichlorphon 0·1%	25·5	0·7	0·2	0	1·376	1·39
maldison 0·1%	31·2	1·0	1·5	0	1·586	2·01
diazinon 0·1%	25·8	1·5	0	0	1·332	1·27
DDT 0·1% + endrin 0·04% ..	34·5	0·7	2·2	0	1·519	1·81
mevinphos 0·05%	51·0	1·0	0·7	0	1·403	1·47
carbaryl 0·1%	33·5	0·2	2·7	0	1·616	2·11
derris dust 0·75% rotenone ..	39·5	1·5	25·0	0	1·793	2·71
No treatment	38·2	1·0	48·0	3·8	2·225	4·45
Necessary differences for 5% significance 1%	Not analysed				0·186 0·253	

Transformation * $\sqrt{x} + 0{\cdot}5$

Trichlorphon, diazinon and tetrachlorvinphos each used at 0·1% and mevinphos at 0·05% gave satisfactory control of cabbage centre grub. Other trial 2 materials gave less satisfactory kills, though by harvest only fenthion had failed to bring the infestation under control.

All of the materials used in trial 2 against cabbage cluster caterpillar gave a satisfactory knockdown but the larvae were present in harvested cabbages from the mevinphos, methidathion, fenthion and promecarb treatments.

In trial 3, corn ear worm was present in light numbers in harvested cabbages of the naled, 0·05% tetrachlorvinphos, 0·025% and 0·05% diazinon and methidathion treatments.

The materials carbaryl, fenthion and amincarb produced phytotoxic symptoms. In some heads, carbaryl induced a yellow chlorosis between veins with browning of older leaves. Fenthion and aminocarb produced a brown network on the leaves.

V. CONCLUSION

On a fortnightly basis, 0·05% and 0·1% diazinon, 0·1% tetrachlorvinphos and 0·05% methidathion gave the most satisfactory control of the range of lepidopterous cabbage pests.

Diazinon at 0·1%, however, was the only material to prevent some reinfestation towards the end of the schedule by the most persistent pest—the cabbage moth. Under heavy pressure, the schedule of the other materials would require shortening to guarantee clean heads at harvest.

Additional protection would also be required against a heavy infestation of corn ear worm.

Endrin at 0·04% failed to give the level of control of cabbage moth reported earlier (Champ 1962) and 0·1% DDT was ineffective against both cabbage moth and cabbage white butterfly.

TABLE 2

TRIAL 2—PEST POPULATIONS AND DAMAGE RATINGS AT HARVEST

Treatment	Pest populations								Mean Damage Rating per Cabbage	
	At Pre-treatment (10 Dec 68) Mean Larvae + Pupae per 10 Leaf Sample per Plot				At 7 Days Post-treatment Mean Larvae + Pupae per 10 Leaf Sample per Plot					
	P. xylostella	*P. rapae*	*H. hydralis*	*C. binotalis* (+ eggs)	*P. xylostella*	*P. rapae*	*H. hydralis*	*C. binotalis*	Trans mean*	Equiv mean
trichlorphon 0·1%	10·0	8·5	3·5	5·0	0·7	0	0·2	0	1·367	1·37
trichlorphon 0·05%	10·5	12·2	3·2	1·0	3·0	0	2·5	0	1·510	1·78
promecarb 0·1%	9·2	14·2	3·5	1·5	2·0	0	4·2	0	1·592	2·04
tetrachlorvinphos 0·1% ..	5·5	7·8	4·0	0·5	1·0	0·5	0·5	0	1·430	1·54
diazinon 0·1%	9·5	9·5	6·8	2·2	0	0	0·5	0	1·358	1·35
diazinon 0·05%	15·5	12·0	3·0	6·7	0	0	2·7	0	1·376	1·39
aminocarb 0·1%	12·8	14·2	5·0	1·0	5·0	0·2	1·0	0	1·672	2·30
fenthion 0·05%	5·2	13·5	3·5	6·8	4·0	0·2	3·0	0	1·675	2·31
DDT 0·1% + endrin 0·04% ..	15·0	9·0	2·5	1·2	2·2	0·2	1·2	0	1·545	1·89
methidathion 0·05%	15·8	13·2	3·8	2·0	0	0	1·7	0	1·475	1·68
mevinphos 0·05%	25·7	12·2	14·2	4·0	0·5	0·2	0	0	1·612	2·10
No treatment	16·5	15·5	6·8	6·8	28·8	12·2	8·0	3·0	2·440	5·46
Necessary differences for significance 5%	not analysed								0·09	
1%									0·12	

Transformation * $\sqrt{x + 0{\cdot}5}$

TABLE 3

TRIAL 3—PEST POPULATION AND DAMAGE RATINGS AT HARVEST

Treatment	Pest populations													Mean Damage Ratings per Cabbage	
	Plutella xyostella						*Pieris rapae*								
	At Pre-treatment (11 Sep. 69)		At 6 days post-treatment		At 13 Days post-treatment		At Pre-treatment (11 Sep. 69)				At 6 Days post-treatment	At 13 Days post-treatment			
	Mean Larvae + Pupae per Plot				Mean First Instar Larvae Plot	Mean Later Instar Larvae† Pupae Plot	Mean Eggs/Plot		Mean Larvae + Pupae/Plot		Mean Larvae + Pupae/Plot	Mean First Instar Larvae /Plot	Mean Later Instar Larvae /Plot		
	Trans Mean*	Equiv Mean	Trans Mean†	Equiv Mean			Trans Mean*	Equiv Mean	Trans Mean*	Equiv Mean				Trans Mean*	Equiv Mean
trichlorphon 0·1%	7·99	63·87	2·08	3·82	>75	5·75	5·47	29·92	3·31	10·94	0	0	0·50	1·600	2·06
naled 0·1%	8·65	74·81	0·93	0·36	>25	6·25	6·68	44·56	3·28	10·74	0	0	0·50	1·813	2·79
tetrachlorvinphos 0·1% ..	8·61	74·19	1·49	1·73	6·25	1·75	6·89	47·44	3·61	13·04	0	0	0	1·471	1·66
tetrachlorvinphos 0·05% ..	8·30	64·82	1·56	1·95	5·50	1·25	6·39	40·80	3·30	10·91	0	0	0·25	1·605	2·08
DDT 0·1%	7·55	56·95	5·62	31·12	>75	14·50	6·27	39·35	3·43	11·74	2·75	0·25	1·75	1·944	3·28
diazinon 0·025%	8·19	67·09	0·93	0·36	>25	0·25	6·28	39·43	3·02	9·11	0·50	0	0	1·524	1·82
diazinon 0·05%	8·05	64·82	0·84	0·20	3·25	1·00	5·98	35·81	3·24	10·47	0·50	0	0	1·414	1·50
diazinon 0·1%	8·10	65·65	0·84	0·20	0	0	5·67	32·14	3·15	9·92	0·25	0	0	1·269	1·11
DDT 0·1% + endrin 0·04%	8·04	64·63	2·31	4·82	>25	5·75	6·96	48·49	4·02	16·15	0·25	0	0	1·567	1·96
endrin 0·04%	8·29	68·66	4·31	18·11	>50	9·50	6·88	47·29	3·17	10·07	0·75	0·50	0	1·616	2·11
methidathion 0·05% ..	7·41	54·87	1·77	2·64	0·50	1·00	5·90	34·86	3·26	10·62	0·50	0	0	1·490	1·72
endosulfan 0·075% ..	7·77	60·31	3·49	11·67	>25	2·50	6·84	46·74	2·88	8·31	1·00	0	0·50	1·739	2·53
No treatment	7·84	61·41	11·73	137·21	>75	>50	7·45	55·45	3·21	10·30	29·25	>25	13·75	2·216	4·41
Necessary differences for significance 5%	N.S.		1·43		N.A.	N.A.	N.S.		N.S.		N.A.	N.A.	N.A.	0·084	
1%			1·92											0·112	

Transformations *$\sqrt{x}$, †$\sqrt{x}$ + 0·5 N.A. not analysed N.S. no significant differences

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