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PROTECTION OF STORED POTATO TUBERS AGAINST
PHTHORIMAEA OPERCULELLA (ZELL.)

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SUMMARY

Malathion, diazinon and fenclorphos were tested as protectants against larvae of a DDT-lindane resistant strain of *Phthorimaea operculella*. Only malathion gave results which warranted further testing.

DDT resistance has been reported from *Phthorimaea operculella* (Zell.) in Queensland and it was suggested that the resistance had its origin in treatment of potato tubers (*Solanum tuberosum* L.) in storage with a DDT dust (Champ and Shepherd 1965). This form of protection was recommended first in 1947, but because of the resistance is invalidated now as a general recommendation. Concurrent with investigations on the DDT resistance, preliminary screening of replacement materials was carried out.

Candidate protectants were compared using 1-kg batches of potato tubers, variety Sebago, held in "cake" tins, 20 cm in diameter and 9 cm high, with cloth gauze lids. Tubers were fumigated with methyl bromide before use (4 hr, 2 lb/1000 cu ft).

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Protectants were applied to tubers by shaking each batch in a tin containing excess dust, after which all surplus dust was dislodged from tubers before transfer to the test containers. All tests were carried out at 25°C.

One hundred newly hatched first instar *P. operculella* larvae, from a laboratory-cultured DDT–endrin resistant field-collected strain from Millaroo, North Queensland, were added to each test batch and survival recorded as number of adults produced. All batches were held to allow development of a subsequent generation, and after this check those batches in which treatments had broken down were discarded.

Batches in which treatments maintained control were (60 days after treatment) exposed to reinfestation from 10 male and 10 female newly emerged similarly resistant adults bred from field-collected larvae from Glasshouse Mountains, southern Queensland. Again results were assessed on the total numbers of adults produced and treatments which did not maintain control were discarded.

Those batches which still maintained control 130 days after treatment were further exposed to reinfestation from 5 male and 5 female newly emerged adults bred from another sample of larvae collected at Glasshouse Mountains. Results were assessed as before.

Materials used were DDT as a standard (May 1959), diazinon, malathion and fenclorphos. DDT, diazinon and fenclorphos were formulated with pyrophyllite from technical grade active material and malathion as premium grade with wheat flour.

A summary of the suppression of reinfestation by the various protectants is given in Table 1.

DDT and fenclorphos did not give satisfactory control at dust concentrations of 2 and 5% respectively. Diazinon gave control at a concentration of 2% until 130 days after treatment, when control broke down. Malathion gave control at concentrations of 2% and higher. Subsequent observations, not recorded here, indicated that the 2% malathion treatment gave control for 200 days after treatment before breakdown, whereas the 5% treatment still remained satisfactory. Malathion was the only material which warrants further evaluation in the field.

Nirula (1962) reported malathion as giving good results for protection of stored potato tubers from *P. operculella* at concentrations from 0.01 to 0.05%. These concentrations would not be effective for long-term storage under Queensland conditions.

TABLE 1

SURVIVAL OF FIRST INSTAR LARVAE AND REPRODUCTION OF ADULTS OF *Phthorimaea operculella* IN POTATO TUBERS TREATED WITH INSECTICIDE

Days from Treatment	1				60				130				
	Mean No. of Larvae Added per Batch	Total Live Adults from Daily Counts		First Generation Progeny		Mean No. of Adults Added per Batch		Total Live Adults from Daily Counts		Mean No. of Adults Added per Batch		Total Live Adults from Daily Counts	
		♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Control*	100	29	35	180	195	10	10	111	111	5	5	104	140
DDT 2%	100	0	0			10	10	18	26	Discarded			
Diazinon 0.1%	100	5	7	62	73	Discarded							
Diazinon 0.2%	100	11	8	84	76	10	10	219	235	Discarded			
Diazinon 0.5%	100	0.6	0	0	0	10	10	152	163	Discarded			
Diazinon 1%	100	0	0	0	0	10	10	11	17	Discarded			
Diazinon 2%	100	0	0	0	0	10	10	0	0	5	5	89	105
Fenclorphos 2%	100	0	0	0	0	10	10	100	135	Discarded			
Fenclorphos 3%	100	0	0	0	0	10	10	156	191	Discarded			
Fenclorphos 5%	100	0	0	0	0	10	10	17	34	Discarded			
Malathion 0.1%	100	0	0.3	0	0	10	10	79	99	Discarded			
Malathion 0.5%	100	0.3	0.3	0	0	10	10	11	11	Discarded			
Malathion 1%	100	0	0	0	0	8	10	1	5	5	5	8	14
Malathion 2%	100	0	0	0	0	9	10	0	0	5	5	0	0
Malathion 5%	100	0	0	0	0	8	10	0.6	0	5	5	0	0.3

* A new batch of untreated tubers was used as controls for adult tests

REFERENCES

- CHAMP, B. R., and SHEPHERD, R. C. H. (1965).—Insecticide resistance in *Phthorimaea operculella* (Zell.) with particular reference to DDT. *Qd J. Agric. Anim. Sci.* 22:69-81.
- MAY, A. W. S. (1959).—DDT for the protection of stored potatoes. *Qd J. Agric. Sci.* 16:329-53.
- NIRULA, K. K. (1960).—Control of potato tuber moth. *Indian Pot. J.* 2:47-51.

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