

SHORT COMMUNICATION

Evaluation of Four Organophosphorus Insecticides for Control of *Phthorimaea operculella* ZELLER on Stored Seed Potato Tubers

Makoto GOTO and Hiroshi AKIYAMA
Domestic Section, Kobe Plant Protection Station

DDT has been used as a dust for the control of potato tuber moth, *Phthorimaea operculella* ZELLER on stored seed potatoes. Due to the overall prohibition of the use of DDT in 1970, however, an urgent need arose for the search of a sufficiently effective substitute for this chemical. Four organophosphorus insecticides, Baycid (Dimethyl-4-(methylthio)-3-methylphenylthiophosphate), Sumithion® (Dimethyl(3-methyl-4-nitrophenyl)thiophosphate), Malathion (Dimethyl-dicarbethoxyethyl-dithiophosphate) and Dipterex® (Dimethyl-2,2,2-trichloro-1-hydroxyethyl-phosphonate) were therefore selected and their effects were evaluated.

Materials and Methods

The names and concentrations of insecticides used are shown in Table 1. Newly emerged adults of potato tuber moth that have been reared at Kobe Plant Protection Station since 1963 were kept in glass jars for 24 hours to allow them to oviposit. Eggs laid on wool cloth were used for the experiments within 24 hours after oviposition. The potato variety used was *Irish Cobler* produced in Hokkaido. Potato tubers were washed clean and disinfected in a 0.05% Osban® solution for ten minutes. The weight of each tuber was approximately 150 g. Two experiments were carried out in a dark room maintained at 25°C.

Experiment 1 Batches of potato tubers were shaken with insecticidal dusts in a vinyl bag. The dosages per 1 kg of tubers are also shown in Table 1. Treated tubers were stored in a dark room at 20°C until used. Every 30 days after treatment, these tubers were infested with eggs of potato tuber moth as follows; three tubers were put into each plastic jar (18 cm diam. × 10 cm high) which contained sand up to 3 cm deep. Wool cloth with 50 eggs was placed on each tuber. The jars were then capped with gauze. For the first two weeks all jars were kept in a room at 25°C, 70% R.H. and from then at 25°C, 50% R.H. for moth emergence. Unhatched eggs were counted on the tenth day after infestation. Adult emergence was recorded every day from the start to the end of the emergence period. All treatments were replicated three times. This experiment was conducted from 13 October, 1970 to 15 March, 1971.

Experiment 2 This experiment was conducted after the same methods as in the experiment 1 except the following. A total of 50 eggs of potato tuber moth was inoculated onto potato tubers. On the tenth day after infestation, when they reached the second instar, tubers were dusted

Table 1. Insecticides applied in experiments for the control of potato tuber moth and dosages per 1 kg potato tubers.

Insecticides	%(w/w)	Dosage/1 kg potato tubers	
		Exp. 1	Exp. 2
DDT	5	3.1 ^g	5.3 ^g
Baycid	2	2.9	4.7
Sumithion	2	2.9	5.5
Malathion	1.5	2.9	4.9
Dipterex	4	3.0	5.5

with the insecticides dosages of which per 1 kg of tubers are shown in Table 1.

Results and Discussion

Experiment 1 As is shown in Fig. 1, the average hatch on potato tubers dusted with DDT, Sumithion, and Dipterex was almost the same as that in the control throughout the experiment, whereas in Malathion treatment, 38.3% of eggs hatched and in case of Baycid 77.4% of eggs did so just after dusting. Baycid did not show residual effect after 30 days from dusting but Malathion continued effective for 120 days though the power gradually decreased.

The average percentage survival is shown in Fig. 2. In the control 37.5% to 55.8% of 150 eggs developed to adult moths but DDT, Malathion and Sumithion controlled potato tuber moth perfectly and no adults emerged throughout the experiment. Baycid suppressed the moth development perfectly till 90 days but after 120 days 1.6% of 150 eggs reached the adult stage. Dipterex did not fully control the moth emergence throughout the experiment.

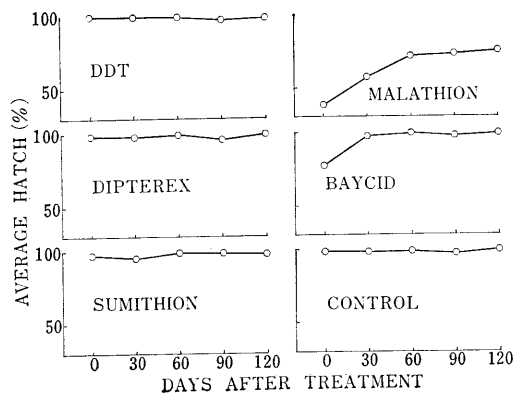


Fig. 1. Average hatches of eggs of potato tuber moth on dusted potato tubers.

Experiment 2 The average percentage survival is shown in Fig. 3. From controls 20.7% of 150 eggs developed to adult moths. When treated with DDT, 0.4% of 150 eggs reached the adult stage. With Baycid, Malathion, Sumithion and Dipterex, 0.2%, 0.2%, 1.3% and 5.8% of 150 eggs developed to adult moths respectively. In treatments with DDT, Baycid and Malathion, all moths were killed within 24 hours after emergence.

The results obtained from the two experiments above lead to the conclusion that only Malathion (1.5%) gave the same effective control as DDT among the four insecticides tested. Baycid (2%) was effective for 90 days. Though the effect on the control of larvae in tubers was less than that of DDT, Sumithion did prevent first-instar larvae from infesting potato tubers. Dipterex was apparently inferior to DDT.

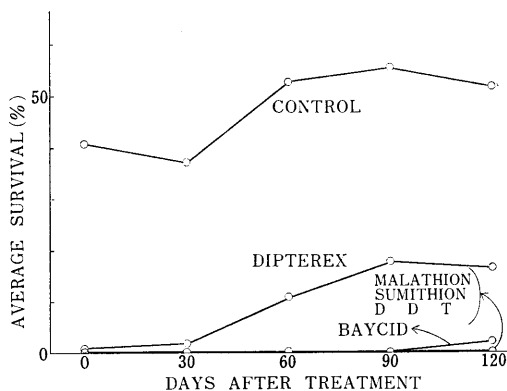


Fig. 2. Effects of insecticides on survival of potato tuber moth.

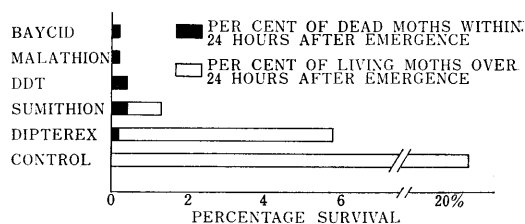


Fig. 3. Average emergence and mortality of potato tuber moth treated as second instar larvae.

Acknowledgement

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