

PERFORMANCE AND EFFICACY OF SOME PESTICIDES ON THE LARVAE OF POTATO TUBER MOTH.

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INTRODUCTION

Potato, *Solanum tuberosum* L., is an of international crop for consumers (Daoud *et al.*, 1991). In Egypt, it is considered as a major energy – rich crop and it is consumed for its high food contents and it is also required for exportation, representing one of the most important sources of national income. Recently, because of the increasing importance of cultivating potato during the last years, research has been concentrated on studying the major pests attacking this favorite crop. Mariy *et al.* (1999) reported that, *Phthorimaea operculella* (Zeller), attacked potato plants just after the first appearance of seedlings until harvesting and storing dates. These insect species affect directly or indirectly plant growth and and crop yield. laboratory studies were carried to evaluate the effect of four different materials: two insect growth regulators and two chemical insecticides (Match and Salabeed), on the fourth instar larvae of the potato tuber moth *P. operculella*.

MATERIAL AND METHODS

laboratory studies were carried out to evaluate the effects of four different materials against 4th instar larvae of *Phthorimaea operculella* . For experimental purpose, larvae of *P. operculella* were collected from several fields cultivated with potato plants in Qalubia Governorate. Rearing of the pest was carried out according to the technique described by Hemeida (1976).

The following materials were tested against 4th instar larvae of *P. operculella*:

- 1- Cascade (10% D.C), an insect growth regulator. A volume of 2 ml. of Cascade was diluted in water to obtain a constant total volume of 200 ml., to give the stock solution of 1000 p.p.m. Five concentrations of 20, 40, 80, 160 and 320 p.p.m., were prepared by diluting with water 2, 4, 8, 16 and 32 ml. of the

previous stock solution (1000 p.p.m.), respectively, to obtain a total constant volume of 100 ml.

- 2- Consult (10% E.C), an insect growth regulator. A volume of 2 ml. of Consult was diluted in water to obtain a constant total volume of 200 ml., to give the stock solution of 1000 p.p.m. Five concentrations of 20, 40, 80, 160 and 320 p.p.m. were prepared by diluting with water the following volumes; 2, 4, 8, 16 and 32 ml. of the previous stock solution (1000 p.p.m.), respectively, to obtain a total constant volume of 100 ml.
- 3- Match (30% E.C), a chemical insecticide. A volume of 2 ml. of Match was diluted in water to obtain a volume of 200 ml., to give the stock solution of 3000 p.p.m. Five concentrations of 0.3, 0.6, 1.2, 2.4 and 4.8 p.p.m., were prepared by diluting with water 0.01, 0.02, 0.04, 0.08 and 0.16 ml. of the previous stock solution (3000 p.p.m.), respectively, to obtain a total constant volume of 100 ml.
- 4- Salabeed (30% E.C), a chemical insecticide. A volume of 2 ml. of Salabeed was diluted in water to obtain a volume of 200 ml., to give the stock solution of 3000 p.p.m. Five concentrations of 1.5, 9.0, 16.5, 23.5 and 31.5 p.p.m., were prepared by diluting with water 0.05, 0.30, 0.55, 0.78 and 1.05 ml. of the previous stock solution (3000 p.p.m.), respectively, to obtain a total constant volume of 100 ml.

To study the insecticidal effects of the different treatments, 4th instar larvae of *P. operculella* were used (the 4th instar is more serious for potato tubers in storage). Pieces of potatoes each of about 0.5 cm. long, were dipped for one minute in each concentration of the four tested compounds and then were left for about one hour to dry. For each concentration, three replicates each of 5 fourth instar larvae of *P. operculella* were placed in a 15x 7.5 cup, and were allowed to feed on the treated food for 24 hours in case of all the tested compounds, comparing with the same numbers of untreated control. Mortality percentages among *P. operculella* larvae were daily recorded. Survived larvae after treatments were transferred to other cups containing untreated food until pupation and adult emergence. Tests of the untreated control were conducted using the same source of food, but dipped only in water. The experiments were carried under laboratory conditions of 25 ± 2 C° and 65 ± 5 % R.H.

Obtained data concerning the effects of the four tested materials were corrected, according to the formula given by Abbott (1925). The effectiveness of different treatments were expressed in terms of LC50 and LT50 values at 95 fiducially limit. If mortality percentages ranged between 16 to 84%, the values of

LC50 or LT 50 were estimated. Statistical analysis of obtained data were based on the probit analysis, according to statistical method of Litchfield and Willcoxon (1949).

RESULTS AND DISUSSION

After 2 days of Cascade treatments, mortality percentages among 4th instar larvae of *P. operculella* ranged from 28.57% to 85.72%, by using the concentrations ranging from 20 to 320 p.p.m., respectively (Table, 1). So, mortality percentages increased by increasing the tested concentrations of Cascade. These results are similar to those of El-Khawas *et al.* (2003), who tested Cascade against 3rd instar larvae of *Ostrinia nubilalis* Hb. As shown in Table (2) and Fig. (1), the LC₅₀ value after 48 hours from treatment was 56 p.p.m. The LT50 value (Table, 3 and Fig., 3), indicated a negative correlation between the applied concentrations of Cascade and LT50 values. This value was 64 hours at concentration of 40 p.p.m. The same results was shown by El-Khawas *et al.* (2003) by testing Cascade against larvae of *O.nubilalis* and also by Mansour (2001), who studied the effect of Mimic on *Spodoptera littoralis* (Boisd.) larvae.

After 24 hours from Consult treatments, , the LC₅₀ value was 53 p.p.m. (Table, 2 and Fig., 1). Laval mortality percentages of *P. operculella* after treatment with Consult were positively correlated with increasing the concentration of this I.G.R. Ebaid (2001) found that, the LC₅₀ value on *Sesamia cretica* L.larvae was 72 p.p.m., 24 hours after treatment with Consult. El-Khawas (2001) reported the same positive correlations between the concentration of Consult and the larval mortality of *Agrotis ipsilon* (Hufn.) (the LC₅₀ value was 35 p.p.m. after 72 hours). A negative relationship was detected between the applied concentration of Consult and the LT₅₀ values (Table, 3 and Fig., 1). This value was 50 hours by using the concentration of 40 p.p.m.. These results are agreement with those of Mansour (2001) on *S. littoralis* larvae, treated with Mimic; Ebaid (2001) on *S. cretica* fed on fresh succulent rolled leaves of maize plants dipped in different concentrations of Consult and El-Khawas (2001), by testing Consult on *A. ipsilon* larvae.

By comparing the effects of Cascade and Consult, at the different applied concentrations (20, 40, 80, 160, and 320 p.p.m.), it was found that, the treatments with Consult was more effective than Cascade (Table, 1).

Tests involving treatments with Match are listed in Table (1), where mortality percentages ranged from 20.00 to 86.67% (at LC₅₀ value), at concentrations ranged from 0.3 to 4.8 p.p.m., respectively. The LC₅₀ value obtained

was 1.2 p.p.m., after 24 hours of treatment (Table, 2 and Fig., 2). The LT_{50} values were 64 and 30 hours, at concentrations of 0.6 and 1.2 p.p.m., respectively (Table, 3 and Fig.,3).

TABLE (I)

Corrected mortality percentages for fourth instar larvae of *P. operculella*, fed on potato pieces treated with different concentrations of Cascade, Consult, Match and Salabeed.

Treatments	Concentrations p.p.m.	% cumulative mortality after days of treatments				
		1	2	3	4	5
Insect growth regulator (Cascade)	0.0	0.00	6.67	13.33	13.33	13.33
	20.0	20.00	28.57	30.77	38.47	46.15
	40.0	33.33	42.86	53.85	61.54	69.23
	80.0	53.33	57.14	61.54	69.23	76.92
	160.0	66.67	71.42	76.92	84.62	92.30
	320.0	80.00	85.72	92.30	100.00	
Insect Growth regulator (Consult)	0.0	0.00	6.67	13.33	13.33	13.33
	20.0	26.67	35.71	38.47	46.15	53.85
	40.0	40.00	49.99	61.54	69.23	76.92
	80.0	60.00	64.29	69.23	76.92	92.30
	160.0	73.33	78.57	84.62	92.30	100.00
	320.0	86.67	92.85	100.00		
Chemical insecticide (Match)	0.0	0.00	6.67	13.33	13.33	
	0.3	20.00	28.57	35.71	38.47	
	0.6	30.00	42.86	53.85	61.54	
	1.2	46.67	64.29	76.92	84.62	
	2.4	66.67	78.57	84.62	92.30	
	4.8	86.67	92.85	100.00		
Chemical insecticide (Salabeed)	0.0	0.00	6.67	13.33		
	1.5	33.33	42.86	46.15		
	9.0	46.67	49.99	53.85		
	16.5	73.33	78.57	84.62		
	23.5	86.67	92.85	100.00		
	31.5	93.33	100.00			

Mortality percentages, after 24 hours of treatment with Salabeed, ranged from 33.33 to 93.33%, at concentrations ranged from 1.5 to 31.5 p.p.m., respectively (Table, 1). Therefore, increasing the insecticide concentration was followed by an increase in mortality percentages. Zidan *et al.* (1998) found the same results, when 4th instar larvae of *A. ipislon* were exposed to Cyanophos, Fenvalerate, Prempet and Pyriproxyfen. Also, El-Khawas (2001) recorded the same findings for Marchal against *A. ipislon*. While, El-Khawas *et al.* (2003) reported the same observation for Dursban against 3rd instar larvae of *O. nubilalis*. The LC_{50} value obtained was 9.1 p.p.m. after 24 hours from treatment (Table, 2 and Fig., 1). In addition, the LT_{50} value was 48 hours at concentration of 9.0 p.p.m. (Table, 3 and Fig., 3).

In general, as shown in Table (1), all tested materials had different effects on 4th instar larvae of *P. operculella*, in comparison with the untreated control.

TABLE (II)

Comparative toxicity of fourth instar larvae of *P. operculella* fed on treated potato with Cascade, Consult, Match and Salabeed.

Treatments	Days after treatments	LC ₅₀ (p.p.m.)	Slope	Confidence limits at Po. 0.05	
				LC ₅₀	Slope
Cascade	2	56	6.00	26.67 : 117.00	1.62 : 22.20
Consult	1	53	4.89	27.18 : 103.35	1.58 : 15.44
Match	1	1.2	3.92	0.71 : 2.04	1.70 : 9.02
Salabeed	1	9.1	2.36	6.50 : 12.74	1.79 : 3.12

TABLE (III)

Comparative mortality time for Cascade, Consult, Match and Salabeed on fourth instar larvae of *P. operculella*.

Treatments	Concentrations p.p.m	LT'50 (hours)	Slope	Confidence limits at Po. 0.05	
				LT50	Slope
Cascade	40.0	64	3.54	37.65:108.80	1.01:12.39
Consult	40.0	50	3.49	30.30:82.50	1.20:10.12
Match	0.6	64	3.96	32.00:128.00	0.66:23.76
	1.2	30	3.09	16.82:55.50	0.80:10.82
Salabeed	9.0	48	2.87	22.86:100.80	0.26:31.57

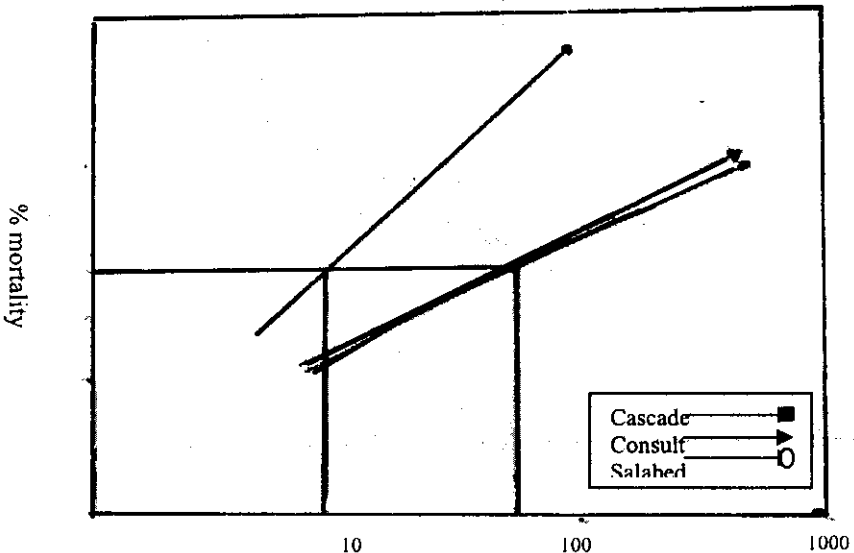


Fig. (1) : Log concentration probit - lines showing response of 4th instar larvae of *P. operculella* to different treatments with Cascade, Consult and Salabeed (computed after 48 hours mortality data for Cascade and 24 hours mortality data, for Consult and Salabeed).

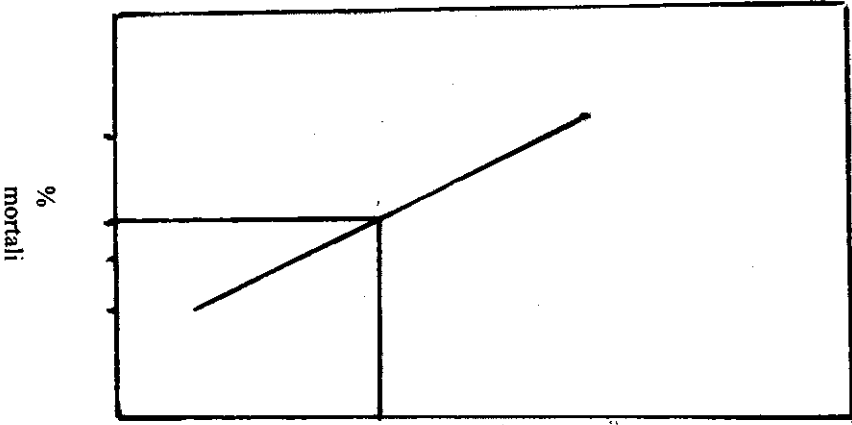


Fig. (2): Log concentration probit – lines showing response of 4th instar larvae of *P. operculella* to treatment with Match (computed after 24 hours mortality data).

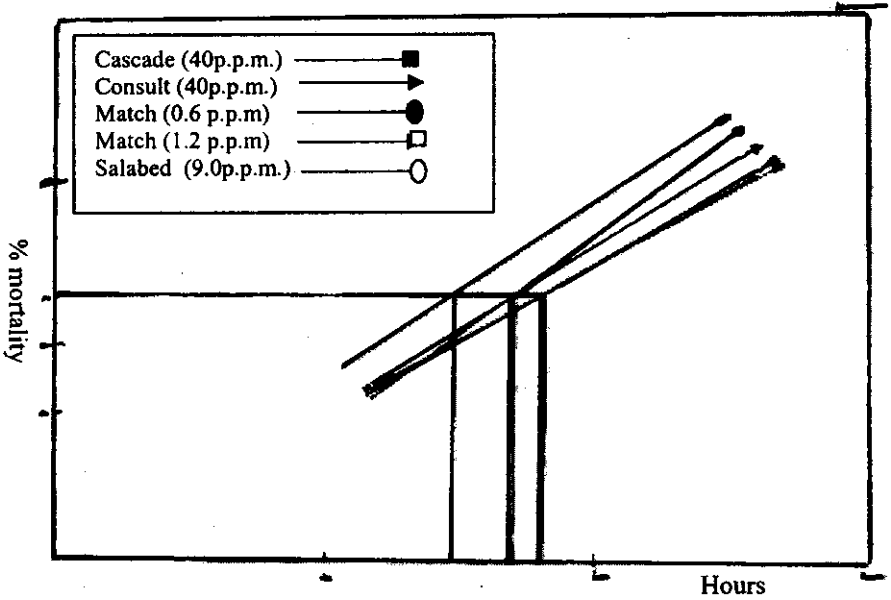


Fig. (3) : Probit regression mortality time – lines showing response of 4th instar larvae of *P. operculella* fed on potato pieces treated with different concentrations of Cascade, Consult, Match and Salabed

SUMMARY

Laboratory studies were conducted to evaluate the toxicity of different insecticides including; Cascade, Consult, Match and Salabeed, on 4th instar larvae of the potato tuber moth *Phthorimaea operculella*. The LC₅₀ values obtained were; 56.0, 53.0, 1.2 and 9.0 p.p.m., after 2, 1, 1 and 1 days of treatments with the previous materials, respectively. Obtained data indicated that, as the concentration of all applied materials increased, the mortality percentages increased. In addition, the LT50 values recorded were (64), (50), (64 & 30) and (48) hours, with the concentrations of (40.0), (40.0), (0.6 & 1.2) and (9.0) p.p.m. of Casade, Consult, Match and Salabeed, respectively. Therefore, using insect growth regulators such as, Cascade and Consult, may be recommended when planning I.P.M. programs against *P. operculella*, to protect the beneficial natural enemies and all surrounding environment.

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