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EFFECTIVENESS OF SOME PLANT POWDERS AND BIOINSECTICIDES AGAINST *Phthorimaea operculella* (ZELLER.) (LEPIDOPTERA : GELECHIIDAE) ON SOME POTATO CULTIVARS

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ABSTRACT

Experiment was carried out in laboratory at Vegetable Research Pests Department, Plant Protection, Research Institute, to evaluate the effect of seeds of Black pepper (*Piper nigrum*), Clovers flower (*Syzygium arematicum*) and Santonica flower (*Matricaria chamomillia*) against *Phthorimaea operculella* larvae at three concentrations,(7.5; 15.0; 30.0 gm.) on three potato tuber cultivars (Roseate; Herms and Mondial cultivars) compared with the bioinsecticide protecto (10 % W.P.).

The results demonstrated that the cloves flower powder was the most effective against larvae of *P. operculella*, followed by santonica flower powder and black pepper seed powder, while protecto was the most effective compound which caused larval mortality of 90.7; 93.3 and 93.5 %, after two weeks on three potato tuber cultivars Roseate; Herms and Mondial, respectively. Also the data indicated that larval mortality of the potato tuber moth with the three powders was increased by increasing the concentrations . However the tested materials showed a significant effect in increasing the mortality rate of larvae of the tested insects on the three potato cultivars.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is an important vegetable crop in Egypt, which is seriously infested by potato tuber moth, *Phthorimaea operculella* (Zell.) (Lepidoptera : Gelechiidae) especially, in the field and in stores (Abd El-Salam *et al.,* 1972), Khalil *et al.* (1987), Ahmed (1991), Dawood (1999) and Abd El-Wahab (2003). Infested potato tubers become completely unmarketable. Chemical control of this potato tuber moth is a costly input that contaminated the environment, increase resistance to insecticides and can also cause health hazards for humans.

Much research has been conducted on the effectiveness of plant products against insect stored potato (Gomaa, 2002). Promising results were obtained by several investigators (Su, 1985 & Shemais and Al-Moajel 2000; Fatoh 2003).using plant extracts, dust and oils as pest control agents against stored product pests.

MATERIALS AND METHODS

Insect culture:.

The stock culture of *P. operculella* was reared on potato tubers (Roseate; Herms and Mondial cultivars) in cages, the front and back walls of the cage were protected and covered with fine wire gauze, and the top of each cage was a plate glass.

Infested potato tubers were placed in the breeding cages and after the emergence of moths; fresh tubers were placed for oviposition. The moths were fed on molasses supplied as small droplets on the inner surface of other boxes to be left for pupation. When pupation was completed, the cocoons were carefully collected, to be used for starting the experimental cultures.

Materials used:

Powders of black pepper seeds (*Piper nigrum*) Fam.: Piperaceae; cloves flower (*Syzygium aromaticum*) Fam.: Mytaceae; and santonica flower (*Matricaria chamomillia*) Fam. : Compositae were bought from the local market.

Bioinsecticide, Protecto (10% W.P) is a commercial product (*Bacillus thuringensis* Var. Kurstaki Berliner potency: 3200 IU/mg), concentration of 3. 5 gm, and registered by the Insect Pathology Unit (IPU) at Plant Protection Research Institute (PPRI), Agriculture Research Center, Ministry of Agriculture and Land Reclamation, Cairo, Egypt.

Experiment:.

These plant materials were ground well in an electric mill. The sieved powder was used in the experiments. Potato tubers were covered with three concentrations (30, 15, 7.5 gm) of the plant powder to study its effect on *P. operculella*. Untreated potato tubers were used as control in each treatment.

Each treatment was replicated three times. Each replicate was 10 kg. Three replicates were used in each concentration for each cultivar.

Statistical analysis:

The mortality was corrected using Abbott's formula (1925) Data was statistically analyzed according to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level, using SAS program.

RESULTS AND DISCUSSION

Results obtained in Tables (1, 2 & 3) showed the corrected mortality percentage of larvae fed on potato tuber cultivers treated with three concentration of the tested materials at four different time intervals 2,4,6 and 8 weeks after treatment

The percent mortalities after two weeks of treatment treated in case of potato tuber (Roseate cultivar) at the lowest concentration (7.5gm) were 41.5 %, 43.1 % and 53.8 % with Black pepper, Santonica and Cloves, respectively. while they were 61.5 %,73.8%, and 87.7% at the highest concentration 30gm. for the three powder plants, Black pepper, Santonica and Cloves respectively. Compared with control. The mortality after 4,6and 8 weeks showed nearly the same trend as indicated after two weeks.

Concerning the general means, all powder plants caused a significant reduction in larval numbers as compared with the control. The bioinsecticide protecto was the most effective against P.opreculella compared with the tested plant extract it gives 90.7%, 95 %, 94.4 % and 89.5 mortalities at 2,4,6 and 8 weeks of the treatment, respectively. Table.(1).

Table (1): Efficiency of bioinsecticide protecto and some plant powders against *Phthorimaea operculella* (Zeller) on potato cultivar (Roseta).

Treatments	Conc. gm	Mean larval numbers and% Mortalities after treatment								General mean	
		After 2 weeks		After 4 weeks		After 6 weeks		After 8 weeks		No	%
		No.	%	No.	%	No.	%	No.	%		
1- *Piper nigrum*	30	25	61.5	25	68.9	32	64.4	34	64.2	29*	64.8
	15	26	60.0	30	62.5	34	62.2	38	60.0	32*	61.2
	7.5	38	41.5	40	50.0	48	64.6	52	45.3	44.5*	45.9
2-*Matricaria chamomillia*	30	17	73.8	25	68.1	38	57.8	46	51.6	31.5*	62.8
	15	20	69.2	44	45.0	47	47.7	56	41.0	41.8*	50.7
	7.5	33	43.1	50	37.5	55	38.9	61	35.8	50.8*	38.8
3-*Syzguim aromaticus*	30	8	87.7	11	86.3	22	75.6	27	71.6	17*	80.3
	15	12	81.5	16	80.0	34	60.2	51	46.3	28.3*	67.0
	7.5	30	53.8	38	52.5	57	36.7	60	36.8	46.3*	44.9
4- *Protecto*	3. 5	6.0	90.7	4.0	95.0	5.0	94.4	10	89.5	6.3*	92.4
5- Control	-	65.0	-	80.0	-	90	-	95	-	82.5	

LSD at 5%= 23.5

The results in Table.(2) revealed that Protecto was the most efficient compound in protecting potato tubers against *P. operculella,* it caused 93.3% mortality after two weeks compared with control.

Table (2): Efficiency of bioinsecticide protecto and some plant powders against *Phthorimaea operculella* (Zeller) on potato (Herms) cultivar.

Treatments	Conc. gm	Mean larval numbers and% mortalities after treatment								General mean	
		After 2 weeks		After 4 weeks		After 6 weeks		After 8 weeks		No	%
		No.	%	No.	%	No.	%	No.	%		
1-*Piper nigrum*	30	21	72.0	30	65.1	35	62.4	40	59.6	31.5	64.8
	15	32	57.3	34	60.1	40	56.0	42	57.6	37*	57.8
	7.5	42	44.0	50	41.8	58	37.6	57	42.4	51.8*	41.5
2-*Matricaria chamomillia*	30	20	73.3	33	61.6	43	53.8	50	49.5	36.5*	59.6
	15	26	65.3	48	44.2	51	45.1	63	36.4	47.0*	47.8
	7.5	39	48.0	50.	34.8	63	32.1	66	33.3	54.5*	37.1
3-*Syzguim aromaticus*	30	15	80.0	20	62.8	27	70.9	34	65.6	24*	73.3
	15	24	68.0	32	62.8	40	56.9	54.9	45.4	37.7*	61.3
	7.5	37	50.6	45	47.8	55	40.8	62	37.4	49.8*	44.2
4- *Protecto*	3. 5	5.0	93.3	5.5	95.0	6.0	93.5	9.5	90.4	6.5*	92.7
5- Control	-	75.0	-	86.0	-	93.0	-	99	-	88.3	

LSD at 5%= 25.5

The mortality percentages after two weeks on treated potato tubers (Herms cultivar) at the lowest concentration (7.5gm.) were 44.0%; 48.0% and 50.6% with the three powder plants,(*Piper nigrum , Syzygium arematicum* and *Matricaria chamomillia* **,** respectively. While, they were 72.6 %, 73.3 % and 80 % at the highest concentration (30 gm.)respectively.

The results in Table (3) showed that mortalities of larvae after two weeks on treated potato tubers (Mondial cultivar) at the lowest concentration (7.5gm.) were 47.1%, 55.7% and 52.9%, while they were 68.5; 77 % and 82.6% at the highest concentration 30gm. with the three powder plants, *Piper nigrum , Syzygium arematicum* and *Matricaria chamomillia*, respectively.

Table (3): Effect of bioinsecticide protecto and some plant powders against *Phthorimaea operculella* (Zeller on potato (Mondial)cultivar.

Treatments	Conc. gm	Mean larval numbers and %mortalities after treatments								General mean	
		After 2 weeks		After 4 weeks		After 6 weeks		After 8 weeks		No	%
		No.	%	No.	%	No.	%	No.	%		
1-*Piper nigrum*	30	22	68.5	25	67.02	32	63.4	38	62.3	29.3*	62.3
	15	27	61.4	31	59.95	35	60.2	41	59.4	33.5*	59.4
	7.5	37	47.1	40	49.3	48	45.5	58	42.6	45.8*	42.6
2- *Matricaria chamomillia*	30	16	77.1	23	67.13	38	56.8	48	52.4	31.3*	52.4
	15	21	70	39	43.46	47	46.6	59	41.5	41.5*	41.5
	7.5	31	55.7	45	34.74	58	34.1	68	32.6	50.5*	32.6
3-*Syzguim aromaticus*	30	12	82.6	16	82.21	23	73.9	35	65.3	21.5*	65.3
	15	15	78.6	20	74.55	34	61.4	45	55.4	28.5*	55.4
	7.5	33	52.9	40	50.05	55	37.5	67	33.7	48.8*	33.7
4- *Protecto*	3.5	4.5	93.5	5	93.7	5.4	93.9	10	90.1	6.2*	90.1
5- Control	-	70	-	79	-	88	-	101	-	84.5	

LSD at 5%= 19.4

Percent mortalities after 4, 6 and 8 weeks showed nearly the same trend as indicated with two weeks after treatment. General means of larval numbers showed a significant reduction as compared with control. Also, Protecto was relatively the most efficient compound in protecting potato tubers against *P. operculella*

These results agree with the findings stated by Raman *et al*(1987); Lal (1987) and Doss *et al.* (1994) who concluded that *L. camara* significantly reduced Sponta damage compared with the untreated control and those covered with rice straw.

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فعالية بعض المساحيق النباتية والمبيد الحيوي (البر وتكتو) ضد فراشة درنات البطاطس على بعض أصناف البطاطس

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**** معهد بحوث وقاية النباتات – مركز البحوث الزراعية - الدقى – الجيزة - مصر**

أجري تقييم لثلاث مساحيق نباتية لبذور الفلفل الأسود وأزهار الشيح والقرنفل بالمقارنة بمبيد حيوي (البروتكتو) ضد يرقات فراشة درنات البطاطس في المخزن بتركيزات مختلفة (٧.٥، ١٥، ٣٠ جم) علي الثلاث أصناف من البطاطس (روزيتاوهارمس ومونديال) وأوضحت النتائج أن مسحوق أزهار القرنفل أقوي تأثير علي يرقات فراشة درنات البطاطس من مسحوق أزهار الشيح وبذور الفلفل الأسود بينما كان لمبيد البروتكتو الحيوي أكثر المركبات تاثيرا على يرقات فراشة درنات البطاطس حيث كانت النسبة المئوية لموت اليرقات على التوالى٩٠.٧ و٩٣.٦ و٩٣.٧٪ علي أصناف البطاطس (روزيتاوهارمس ومونديال).

وقد كانت نسبة موت اليرقات تزداد بزيادة تركيز المساحيق النباتية كما أن نسبة موت اليرقات علي الأصناف الثلاثة المختلفة كانت معنوية مقارنة بالكنترول (تجربة المقارنة).

قام بتحكيم البحث

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