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EFFICACY of DIFFERENT COMPUNDS FOR CONTROLLING POTATO TUBER MOTH, *Phthorimaea operculella* (ZELLER)

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ABSTRACT

A field experiment was conducted at the experimental farm attached to El-Khanater, Horticulture Research station, Qalubia Governorate during two successive seasons of (2000 and 2001) to study the population density of PTM in five potato varieties Field trials were carried out to estimate the number and duration of potato tuber moth *phthorimaea operculella* (Zeller) in the field and at storage . It appears that the reliable appearance of Potato tuber moth *phthorimaea operculella* (Zeller) moths took place during March until June in the field but at storage appears from July to the beginning of September ..The effect of some bioicides and Sumithion against PTM in storage was also studied. Results obtained showed that.

Most susceptible variety to the potato tuber moth (PTM) was Picasso followed by Nicola, Agria, and Santana variety while Desira variety was the least susceptible one.

The tested compounds arranged, according to the average effect percent reduction of infestation as follows: Sumithion, (Granulosis virus (GV) + Dieple 2-X), dieple2-X and GV descendingly

INTRODUCTION

The potato tuber moth *Phthorimaea operculella* (Zeller) is considered a serious pest of Solanaceous crops. It causes serious damage to potato leaves as well as tubers in the field and at traditional rustic storage. Losses to farmers consist of discards; reduced prices for damaged potatoes and increased handling costs.

Farmers also sustain an opportunity cost when they are forced to sell to low prices at avoid pest damage. So, the control of *Phthorimaea operculella (Zeller)* has incorporated the use of transgenic potato which offer certain degree of protection against feeding damage by potato tuber moth (Ebora *et al.*, 1994, Haines, 1977 and Raman and Redalfi, 1982), repellent plant extracts (Lal, 1987 and Raman et al., 1987). The chemical insecticide for controlling this insect pest is undesirable. There safer and yet effective methods for control of *Phthorimaea operculella (Zeller)* are being necessary. The promising alternative methods are the use of Granulosis virus, *Bacillus thuringiensis* as well as the insecticide namely Sumithion on the PTM. The experiments were conducted in Qalubia Governorate, Egypt.

The aim of the present study was the susceptibility of different potato varieties to PTM infestation and evaluate the possibility of using some bioicides and Sumithion methods for controlling potato tuber moth *Phthorimaea operculella (Zeller)* in Qalubia Governorate.

MATERIALS AND METHODS

Five imported potato varieties planting namely Picasso, Santana, Agria, Nicola, and Desira were cultivated at the experimental farm attached to EL-khanater Horticulture Research station, Qalubia Governorate in two successive seasons of 2000 and 2001. The field experiments carried out to estimate the population fluctuation of the PTM, *Phthorimaea operculella,* during the summer season and to evaluate the transition of the PTM from potato plants in the field to potato tubers in the storage. All agricultural practices were done and no pesticidal treatments were applied. During the growing period hundred plants per variety were chosen weekly at random to be inspected and number of infested leaves with PTM was recorded. At harvest time hundred of different potato size tubers were picked at random from the yield of each plot (300 tubers / variety) to be inspected in the field for the potato tuber worm.

In the field Delta baited sex pheromone traps were placed in cultivated potato area in both winter and summer potato plantations continuously. With regard to potato storage, traps were put in summer during the period of storing seed potatoes from July to the beginning of September. The traps were baited with the specific pheromone capsules . The pheromone capsules were replaced every 2 - 3 weeks by fresh ones

Materials used: Granulosis Virus (GV) at the rat of 300 gm powder / 1000 kg tubers .Bacterial formulations Dieple 2x (32×10^3 IU/ mg. Is known as B. Thuringiensis var. Kurstaki. The compound was used at the rat of 300 gm powder / 1000 kg tubers. Chemical treatment Potato tuber seeds were dusted with Sumithion 3% at the recommended rat of one kg / ton of potato tubers. Mixing Granulosis virus (GV)) with bacteria (BT) at the rat of (150 g of GV + 150 g of BT) powder / 1000 kg tubers Taking into account the percentage of PTM infestation under storage after 21, 42, 63 days of application.

RESULTS AND DISCUSSION

Data in Figs.(1) showed that male moths of Potato tuber moth *phthorimaea operculla (Zeller)* was the first observed as early as the 1ST half of March . The duration of this effectiveness period lasted for 5 - 6 months. The population density expressed as number of moths caught / trap / night tended to increase during the following month reaching an average of 48 moths / night / trap . Regarding of effectiveness period at storage, the moths of this effectiveness period were observed in the baited pheromone traps situated at storage (Nawala), during the 2nd week of June potato fields. The moths tended to occur in reliable numbers during the following weeks. These results showed that the population density of Potato tuber moth *phthorimaea operculla (Zeller)* moths were effectiveness. The third effectiveness period winter plantation: data revealed that the reliable occurrence of moths on the 2nd half of August . The occurrence continued up to the 1st half of January . The duration of this effectiveness period lasted 4 months . The number of male moths caught / night / trap during this period recorded 5.8. Results

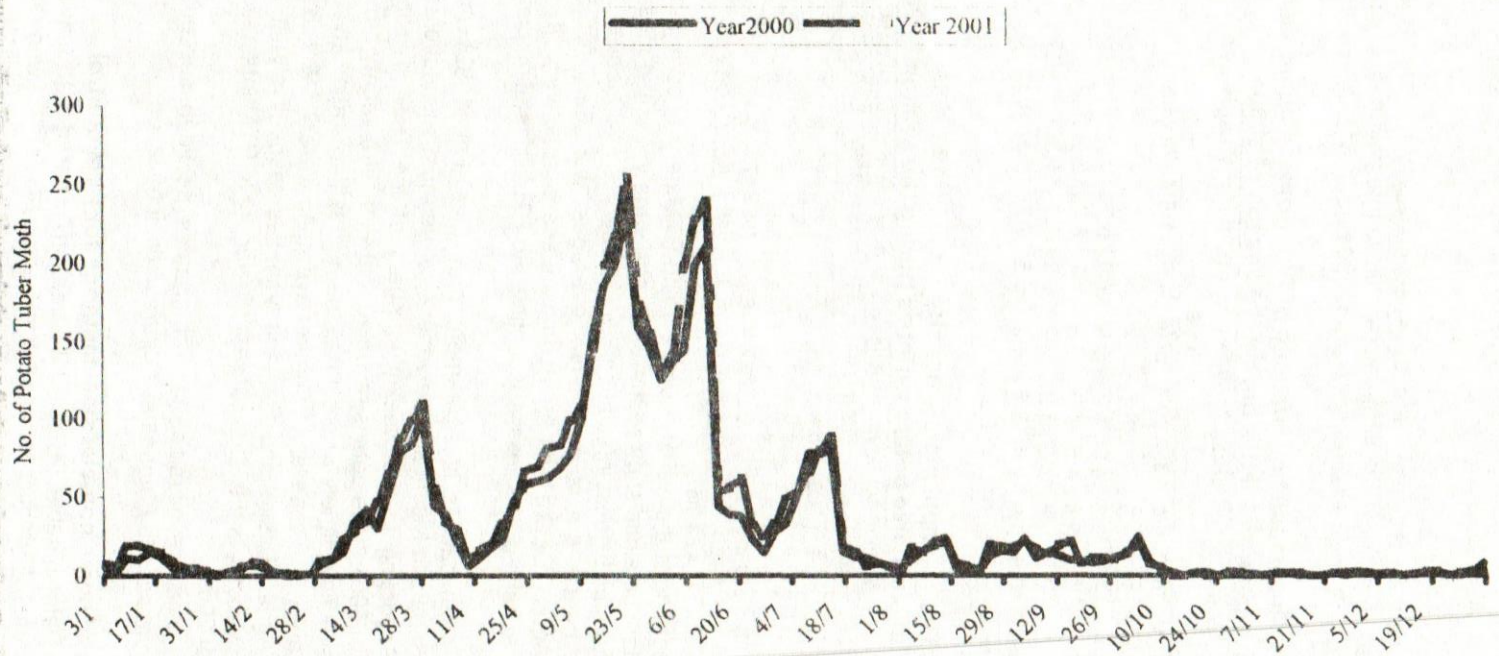

Fig (1) Approximated number and duration of potato tuber moth *Phthorimaea operculella* (Zeller) generation moths during 2000 and 2001 seasons at Qalubia Governorate

Tables (1 and 2) indicated that the susceptibility of the five tested varieties are differed to PTM *Phthotimaea operculella* infestation during the summer plantation of the two investigated years (2000 and 2001).

Table (1): The population density of *Phthorimaea operculella* larvae in five potato varieties during the season of 2000

Variety	Mean no. of larvae / 100 leaves at different inspection date											Mean
	23/3	30/3	6/4	13/4	20/4	27/4	4/5	11/5	18/5	25/5	1/6	
Picasso	0.7	2.9	4.0	5.4	6.3	7.2	8.3	9.7	14.9	18.2	22.3	9.0
Nicola	0.5	1.7	3.2	4.9	5.2	6.4	7.9	8.6	13.8	17.5	18.9	8.1
Agria	0.5	1.1	2.8	4.5	4.9	5.3	7.2	8.2	12.9	16.8	17.5	7.4
Desira	0.4	0.8	2.5	3.9	4.2	5.2	6.8	7.7	11.8	15.8	17.2	6.5
Santana	0.2	0.5	1.9	2.8	3.7	4.2	5.5	7.3	10.3	14.2	16.2	6.0

" F " value = .6511 ns

Table(2):The population density of *Phthorimaea operculella* larvae in five potato varieties during the season of 2001 .

Variety	Mean no. of larvae / 100 leaves at different inspection date											Mean
	21/3	28/3	4/4	11/4	25/4	2/5	8/5	16/5	23/5	30/5	6/6	
Picasso	0.9	3.8	4.5	5.4	6.4	7.4	8.3	9.5	17.2	23.5	32.5	10.8
Nicola	0.7	2.9	3.8	4.8	5.9	7.2	7.9	8.4	16.5	20.9	28.4	9.80
Agria	0.6	2.6	3.4	4.2	5.8	6.8	8.2	7.3	15.4	19.4	26.8	9.10
Desira	0.4	2.4	3.0	3.9	5.2	6.1	7.4	7.0	14.2	18.6	24.4	8.40
Santana	0.3	2.0	2.7	3.8	4.8	5.8	6.3	6.8	13.2	15.9	22.5	8.00

" F " value = .4.83 ns

According tc the weekly numbers and PTM density during the season of 2000 , data obtained showed that Picassoa variety was the most susceptible where it had the highest infestation level (9.0 larvae / 100 leaves).

Whereas the number larval averages were 8.1,7.4, 6.5 and 6.0 for Nicola, Agria, ,Desira and Santana varieties respectively. It is clear that Santana variety is the less susceptible to PTM infestation during the 2000 season.

These data is in agreement with Das et al (1992) who mentioned that Picassoa and Nicola are the varieties were most susceptible varieties.

According to the weekly numbers of the PTM density during the season of 2001 these data is revealed that Picassoa variety proved to be the most susceptible variety where it had the highest infestation level (10.8 larvae / 100 leaves). These larval number averages were 9.8, 9.1, 8.4 and 8.0 for Nicola, Agria, ,Desira and Santana varieties respectively. It is clear that Santana variety is the least susceptible variety to PTM infestation during the season of 2001.

There are no significant differences between susceptibility of tne different varieties to *Phthorimaea operculella*, infestation

Efficacy of some non-classical methods for PTM control.

Data in table (3) for 2000 season, cleared that Sumithion or GV + BT (mixture of granulizes virus with Bacteria Dieple 2x with ratio 1: 1) were

considered the most effective method for reducing the potato infestation rates by *Phthorimaea operculeila*.

Table (3) Efficacy of (GV) Granulosis virus,(BT) *Bacillus Thuringiensis*, GV + BT, and Sumithion on the PTM infection during 2000 season

Treatment	Variety	*Infected tubers in different sorts*			
		1st	2nd	3rd	% Reduction
GV	*Picasso*	8.47	9.89	13.55	68.09
	Nicola	8.45	8.99	12.79	69.77
	Agria	7.89	8.33	12.08	71.7
	Desira	6.58	7.89	11.42	74.11
	Santana	6.32	7.55	10.78	75.35
Dieple 2X	*Picasso*	7.34	8.01	10.35	74.30
	Nicola	7.21	7.66	10.11	75.02
	Agria	6.88	7.24	9.88	76.00
	Desira	6.25	6.24	9.45	78.06
	Santana	5.48	6.01	8.42	80.09
Sumithion	*Picasso*	1.09	2.54	7.05	89.41
	Nicola	0.99	2.33	6.89	89.79
	Agria	0.87	1.89	6.45	90.79
	Desira	0.85	1.47	5.28	92.4
	Santana	0.49	1.08	5.08	93.35
GV+BT	*Picasso*	6.55	7.02	11.57	74.86
	Nicola	6.08	6.42	11.25	76.25
	Agria	5.47	6.21	10.66	77.66
	Desira	5.21	5.22	9.890	79.68
	Santana	4.54	4.58	8.990	81.98
Control	*Picasso*	9.99	17.88	35.54	-
	Nicola	9.84	17.05	30.22	-
	Agria	9.08	16.88	29.48	-
	Desira	8.78	14.58	26.31	-
	Santana	8.25	13.55	24.55	-

F "value = 4.284 **LSD 0.01 = 2.817LSD 0.05 = 1.989

As respect to number of larvae / 100 tubers. Picassoa variety harbored (13.55, 10.35, 7.05, 11.57 and 35.54 larvae / 100 tubers) according to the treatments with GV, Dieple 2X, Sumithion, GV+BT and control respectively. Concerning Nicola variety it's infestation with PTM after treatments with the foregoing compounds were (12.79, 10.11, 6.89, 11.25 and 30.22 larvae / 100 tubers; respectively); whereas Agria variety infested with (12.08, 9.88, 6.45, 10.66 and 29.48 larvae / 100 tuber; respectively. On the other hand, Desira variety infested with the numbers of (11.42, 9.45, 5.28, 9.89 and 26.31 larvae / 100 tubers); respectively Santana variety considered the least susceptible variety to PTM infestation. There are highly significant differences between susceptibility of Picasso and Santana varieties. Desira and Agria varieties had a moderate infestation levels where the average numbers of larvae / 100 tubers were 10.78, 8.42, 5.08, 8.99 and 24.55 for Santana variety with GV, Dieple 2X, Sumithion, GV+ BT and Control, respectively. These data are in agreement with those of Abd EL - Salam et al. (1972) who mentioned that Santana variety has a moderate

susceptibility to infestation with PTM. Iskander (1992) mentioned that Santana and Nicola varieties have moderate susceptibility. On the other hand these data are indisagreements with Heeader (1987) who stated that Santana had a slight infestation variety.

During 2001 season the susceptibility of different varieties to infestation with PTM as respect to the average number of larvae / 100 leaves gave a similar trend to the previous season.

In Table (4) showed that Sumithion or GV + BT (mixture of granulizes virus with Bacteria Dieple 2x with ratio 1:1) were the most effective method for reducing the potato infestation rates by *Phthorimaea operculella*.

Table (4): Efficacy of (GV) Granulosis virus, (BT) *Bacillus Thuringiensis*, GV + BT, and Sumithion on the PTM infection during 2001 season

Treatment	*Variety*	*Infected tubers in different sorts*			
		1st	2nd	3rd	% Reduction
GV	*Picasso*	8.98	9.89	10.88	70.25
	Nicola	8.75	9.74	10.47	71.31
	Agria	7.89	9.23	10.32	72.56
	Desira	7.58	8.78	9.880	73.76
	Santana	6.89	8.36	8.780	75.97
Dieple 2X	*Picasso*	7.27	8.42	9.47	74.84
	Nicola	7.05	8.28	9.35	75.32
	Agria	6.99	7.85	9.00	76.16
	Desira	6.89	7.54	8.76	76.81
	Santana	6.25	6.89	7.85	79.01
Sumithion	*Picasso*	1.05	1.84	6.57	90.54
	Nicola	0.89	1.08	6.45	91.58
	Agria	0.87	1.00	5.78	92.35
	Desira	0.25	0.87	5.41	93.47
	Santana	0.09	0.76	4.89	94.24
GV+BT	*Picasso*	7.08	8.28	9.86	74.78
	Nicola	6.89	7.84	9.85	75.42
	Agria	6.54	7.32	9.32	76.82
	Desira	5.99	6.85	9.30	77.86
	Santana	5.35	5.54	8.59	80.52
Control	*Picasso*	8.09	18.08	37.55	-
	Nicola	7.84	17.55	35.45	-
	Agria	7.05	16.85	30.28	-
	Desira	6.98	15.99	29.89	-
	Santana	6.25	15.88	27.84	-

" F " value = 4.758 **LSD 0.01 = 1.85LSD 0.05 = 1.63

There are a significant differences between susceptibility of Picassoa and both of Santana and Desira varieties. On the other hand, there are no significant differences between Picassoa susceptibility and both Agria and Nicola varieties. As respect to number of larvae / `100 tubers with GV, Dieple 2X, Sumithion, GV+ BT and Control, respectively. Picassoa variety recorded

infestation levels of (10.88, 9.47, 6.57, 9.86, and 37.55 larvae / 100 tubers), respectively. Nicola variety infestation rates of (10.47, 9.35, 6.45, 9.85 and 35.45 larvae / 100 tubers ; respectively) . Agria variety harbored (10.32, 9.00, 5.79, 9.32 and 30.28 larvae / 100 tubers ; respectively). On the other hand, Desira variety had the infestation of (9.88, 8.76, 5.41, 9.30 and 29.89 larvae / 100 tubers respectively) .Thus Santana variety considered the least susceptible variety to PTM infestation.

It could be concluded that there are highly significant differences between Picasso variety susceptibility and other varieties except Santana and Agria varieties. According to the numbers of larvae/100 leaves there is no-significant difference between Desira and Santana varieties. Santana and Agria varieties had a moderately infestation levels .

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فعاليـــة بعـــض المركبـــات فى مكافحـــة فراشـــة دودة درنات البطـــاطس

عاطف احمد فرغلى-محمد جمعه رجب - سمير محمد توفيق

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - جيزه - مصر .

أجريت هذه الدراسة خلال الفترة من (٢٠٠٠ _ ٢٠٠١) بهدف دراسة التذبذب الطبيعى لفراشة دودة درنات البطاطس لأبعض الأصناف المنزرعة فى مصر وهى (بيكاسو - سنتانا - أجريا - ديـزرا - نيوكولا) لمعرفة حساسية هذه الأصناف للإصابة و كذلك تقيم استخدام بعض المركبات الحيوية لمكافحة هـذه الأفة . أظهرت النتائج المتحصل عليها كمايالى :

يوضح العدد الاسبوعى للفراشات التى تم اصطيادها بمصائد الفرمونات بأن هناك ثـلاث فـترات لنشاط هذه الحشرة وقد تبين أن بداية ظهور الحشرة خلال العروة الصيفى كان خلال شهر مـــارس حتـى شهر يوليو و خلال فترة التخزين من يوليو الى سبتمبر و العروة الشتوى من اغسطس الى يناير . لا يوجـد أى فروق معنوية بين حساسية الأصناف المختلفة للإصابة بل وقد سجل الصنف بيكاسو اعلى معدل أصابـه من حيث متوسط عدد اليرقات / ١٠٠ ورقة حيث بلغت متوسطات الإصابة (١٠,٨-٩,٠٠يرقـة / ١٠٠ درنة) خلال موسمى الدراسة ٢٠٠٠ , ٢٠٠١ على الترتب كما سجل الصنف سنتانا اقل معدل إصابة مـن حيث عدد اليرقات / ١٠٠ ورقة حيث بلغ متوسط الإصابة فى نهاية الموسم (٦,٠٠-٨,٠٠يرقة / درنـة) خلال موسمى الدراسة ٢٠٠٠ , ٢٠٠١ على الترتب.كما أوضحت الدراسة فعاليـة المسـتحضر الفيرسـى مخلوطا مع البكتريا دابيل ٢X و كذلك مبيد السومثيون من حيث خفض تعداد الآفة داخـل المخـزن لـذا يراعى اختيار الصنف المناسب والمقاوم للإصابة لفراشة دودة درنات البطاطس وكذلك عدم الاعتمـاد علـى المكافحة الكيماوية وحدها ولكن يجب استخدام وسائل مكافحة متعددة لمكافحة الآفة لتقليل سـرعة انتخـاب السلالات من الآفة لفعل المبيد .