

TRADITIONAL AND INNOVATIVE METHODS FOR CONTROLLING THE POTATO TUBER MOTH, *PHTHORIMAE OPERCULELLA* (ZELLER) ON STORED POTATOES IN OPEN FIELD

GOMAA, A. E.

Plant Protection Research Institute, ARC, Dokki, Giza

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Abstract

Spinosad compounds (Tracer 24% SC, Spinosad 0.125% WP), the bacterial pathogen *Bacillus thuringiensis* (Bt) in forms of Protecto 10% and Dipel2x, the Granulosis virus (GV) (Virotocto 4% and the natural infected larvae of PTM with (GV), Fars 5% E.C. an antimoulting compound (IGR), rice straw treated with Cidial 50% EC (an organophosphate insecticide) and the chemical insecticide Cypermethrin 10% E.C. (Pyrethroid) were evaluated to suppress potato tuber moth (PTM) *Phthorimaea operculella* (Zeller) on stored potato tubers in open field. The best reduction through all treatments, for both tuber infestations and gallery numbers during the whole storing period was related to Tracer with both rates (7.5 and 5 ml/ton). Spinosad treatment came on the 2nd rank, Fars in the 3rd rank, followed by Dipel 2x and GV infected larvae in the 4th rank. Using rice straw treated with Cidial gave a considerable reduction for both tuber infestations and gallery numbers. Very close reduction was recorded between Virotocto and Protecto for tuber infestation and gallery numbers. The Cypermethrin treatment proved ineffective at the final storing period. So, either Tracer 24% S.C at rate of 5ml/ton or Spinosad 0.125% WP at a rate of 1kg/ton could be a good tool for protecting potato tubers during the whole storing period. Also, the antimoulting agent Fars could be a good tool and in the same time much safer than the chemical ones.

INTRODUCTION

The potato tuber moth (PTM), *Phthorimaea operculella* (Zeller) (Lepidoptera: Gelechiidae) is a potato key pest which damage potato tubers in storage in many countries. In Egypt, farmers use to apply Actelliec, Sumithion and Malathion dust to combat this pest. The performance was satisfactory but the customers reject to buy the tubers due to the odor and toxicity. Pyrethroids insecticides have been introduced due to their excellent activity against a wide range of insect pests and their low-persistence in the environment. Pyrethroids include Cypermethrin which is a highly active synthetic insecticide against wide range of pests in many crops. Because of its rather fast breakdown forming less toxic products, and the low dose rates used in

good agricultural practice, it is unlikely that Cypermethrin will attain significant levels in the environment (Elliot *et al.*, 1977).

The bacterial pathogen *Bacillus thuringiensis* (Bt) is considered as the most common microbial insecticide, which largely applied against the PTM in stored potato. Dipel 2X is a highly selective biological insecticide of Bt for use against caterpillars of lepidopterous insects. A single pre-storage application of Dipel 2X gave a similar level of protection resulted from eight applications of the synthetic pyrethroid Fenvalerate that applied every 15 day (Raman *et al.*, 1987 and Ben-Salah and Aalbu, 1992). The *Phthorimaea operculella* Granulosis virus (PoGV) is a highly pathogenic specific disease inducing PTM larvae. Effect of GV on PTM was evaluated at a rate of 20 PTM infected larvae with GV /ton reduced damage induced in stored tubers by 70% after 45 days of treatment (Anon., 1990 and Lagnaoui, *et al.*, 1994). The Egyptian Ministry of Agriculture have decided to replace hazardous chemical insecticides with the safer microbial insecticides Protecto or Virosecto hoping to prevent environmental contamination and to reduce pesticide residues in potato exports and food stuffs. Both GV and Bt are superior to the chemical insecticide Sumithion 3%, in protecting potato tubers against the PTM infestation (Moawad *et al.*, 1997 and Gomaa, 1998).

The antimoulting compounds cause metamorphosis disorders by interference with ecdysteroid synthesis and action (Krishnakumaran, 1990). Sublethal doses of insect growth regulators caused reduced fertility in surviving adults (Carpenter and Chandler 1994).

Spinosad is classified as reduced-risk product and awarded the green chemical from the white house (USA) in 1999 and in response to its low human and environmental risk, the United States Environmental Protection Agency (EPA) determined that Spinosad meets their criteria as a reduced risk- material. They added that Spinosad received the first registration of a new ingredient for a food use under the new more stringent Food Quality Protection Act (FQPA) (Anon., 1997 and Thompson *et al.*, 1997). It is registered as organic product in Egypt. Spinosad has low toxicity to humans and pest specific with primary efficacy against the lepidoptera, and thus a good fit in bio-intensive IPM programs (Binning, 2000). It is also less toxic than pyrethrins and already approved for use on more than 200 crops, including eggplant, tomatoes, and cotton (Thompson *et al.*, 2000 and Anon., 2001). Spinosad treatments showed high efficiency against the PTM infestations and performed very long persistence through the whole storing period (Gomaa and El-Nenaey, 2006).

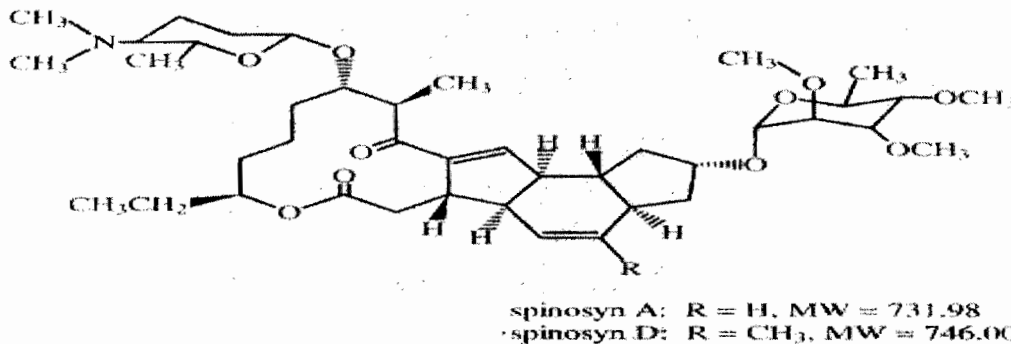
MATERIALS AND METHODS

An experiment was conducted during season, 2006 to evaluate the efficiency of Spinosad, *Bacillus thuringiensis Kurstaki* (Bt), granulosis virus (GV), the antimoulting compound Fars, the chemical insecticide Cypermethrin and the farmer traditional method by covering the stored potato tubers with a thick layer (1.5 m.) of rice straw which treated with the organophosphorus compound Cidial to reduce the PTM infestation on stored potato tubers, in an opened field of a private farm at kafr El-Manshi village, Tanta District, El-Gharbia Governorate, Egypt.

Spinosad a Dow AgroSciences product, is a mixtures of the two most active naturally occurring metabolite (85% Spinosyn A and 15% Spinosyn D) of the soil bacterium *Saccharopolyspora spinosa*. Structurally, these compounds are macrolides and contain a unique tetracyclic ring system to which two different sugars are attached.

Spinosyn A, Empirical Formula C₄₁H₆₅NO₁₀, MW 731.98

Spinosyn D, Empirical Formula C₄₂H₆₇NO₁₀, MW 746.00



Protecto (10% W.P.) and Virotocto (4% W.P.) are commercial products of Bt and GV produced and registered by the Insect Pathogen Unit (IPU), at Plant Protection Research Institute (PPRI), Agriculture Research Center, Ministry of Agriculture and Land Reclamation, Cairo, Egypt. The two formulations contain 32×10^6 IU/gm of *Bacillus thuringiensis Kurstaki* and 5×10^9 viral particle (PIB)/gm, respectively. The Ministry of Agriculture recommended Protecto and/or Virotocto at rate 150 gm/ ton of potato tubers, in stores.

An amount of 11 tons., of potato tubers which was not treated before with any insecticide in the field, was divided into eleven heaps, each (1 ton) for every tested compound. The applications were: three Spinosad applications (Tracer 24% SC. at rates 7.5 and 5 ml /ton, Spinosad .125% WP at rate 1kg./ton), two *Bacillus thuringiensis* formulations (Protecto and Dipel 2x both at rate 150 gm/ton), two GV

formulations (Virotecto at rate 150 gm/ton and GV infected larvae at rate 20 infected larvae with GV/ton), Fars 5% EC. as Insect Growth Regulator (IGR) was supplied by El-Gemmeza Research Experimental Station for testing pesticides at rate 1.2 ml/ton, the synthetic pyrethroid (Cypermethrin 10% E.C.), (RS) - α - Cyano - 3 - phenoxybenzyl (IRS)-cis, trans - 3 - (2, 2 -dichlorovinyl) - 2, 2 - dimethyl cyclopropane carboxylate. (CCN 52 imported) was supplied by ICI Company as 10% E.C. used at rate 3 ml/ton, Cidial 50% EC, S-a-ethoxycarbonyl benzyl O,O-dimethyle phosphorothioate, used to treat rice straw which needed to cover potato tubers as a farmer traditional method at rate 1 liter/200 liter of water and control.

Potato tubers were carefully sorted after harvest on 1st of May 2006, treated of different compounds on 15/5/2006. All products except Spinosad dust were applied by trigger spray using low volume of water as 1.5 L /ton. Rice straw was used to cover the potato tubers, where monitored four times, at 3 weeks intervals, on a sample of 100 tubers, replicated 3 times. The infested tubers, gallery numbers due to the PTM infestations for each treatment were counted and recorded after every sorting, where tuber infestation and gallery numbers is representing percentage and intensity of infestation, respectively. Tubers that have infestations were sorted out of each pile after every inspection. Temperature was around 28 °c and relative humidity 65 %.

Minitab program was used to work out the statistical analysis for tuber infestation and gallery numbers by comparing paired treatments using Duncan's Multiple Range Test (DMRT) at the 4th inspection. Percentages of reduction were calculated according to Fleming and Retakaran (1985) as follows:-

$$\text{Population Reduction} = 1 - \left\{ \frac{\text{Post-treatment population in treatment}}{\text{Pre-treatment population in treatment}} \times \frac{\text{Pre-treatment population in check}}{\text{Post-treatment population in check}} \right\} \times 100$$

RESULTS AND DISCUSSION

Evaluations of different compounds on tuber infestations were shown on table (1) through the whole storing period. It is clearly obvious that, Spinosad treatments through the whole four inspections were superior to others. Also, the very long persistence of Spinosad treatments to the end of the storing period was obvious where tuber infestation ranged between 0.0 to 6.

The granulosis virus treatments resembled Virotocto and the GV infected larvae showed higher infestation level at the end of the storing period (28.3 and 20.6 infested tubers), respectively. Both GV treatments could be used successfully until the 2nd inspection as it recorded only 11.3 and 9.3 infested tubers for the Virotocto and the GV infected larvae treatments, respectively. Also, the *Bacillus thuringiensis* treatments Dipel 2X and Protecto showed similar trend of protection as it recorded only (7.6 and 12.6) at the 2nd inspection and (12.13 and 16.7) infested tubers as averages for both formulations, respectively.

The antimoulting agent Fars 5% treatment gave a good result for tuber infestation through the whole four inspections ranged between 8 and 10.6 with an average of 9.88 infested tubers.

The chemical insecticide Cypermethrin treatment gave at the 1st and 2nd inspections a considerable level of tuber protection ranged between (2.6 and 13), respectively but did not persist later on the 3rd and 4th inspections where the tuber infestations reached 32.3 and 44.6, respectively and acquired the highest level of tuber infestation compared to other treatments.

The thick layer of rice straw treated with the high potent Cidial insecticide treatment showed better performance on tuber infestation when compared with Virotocto, Protecto and Cypermethrin. The average of tuber infestation for this treatment recorded only 15.7 and the respected figures for the previously mentioned treatments were 16.2, 16.7 and 23.13 infested tubers. Also, the 1st and 2nd inspections gave tuber infestations of (7.3 and 12.6), respectively.

The control treatment gained the higher level 78.3 of tuber infestation at the 4th inspection.

Statistical analysis for tuber infestation revealed that, the low rate of Tracer 5ml accorded high significant difference with the nearest value for Spinosad treatment ($P=0.0009$) which accorded high significant differences with all other treatments. The statistical analysis revealed high significance of GV infected larvae with each of Virotocto and Protecto, while the P values recorded (0.019 and 0.000), respectively. Fars 5% treatment recorded high significance with GV infected larvae ($P=0.000$), logically accorded high significant with the higher infestation values of rice straw plus Cidial, Cypermethrin and the control treatments. Rice straw plus Cidial treatment accorded high significant with Cypermethrin one (0.000).

There were no significance differences between Protecto and Virotocto, as well as between either Protecto or Virotocto and the traditional method of treating rice straw with Cidial insecticide. Also, no significant differences was recorded between GV infected larvae and Dipel 2x treatments.

Intensity of infestation resemble the gallery numbers per 100 tubers was shown in table (2) through the whole storing period and revealed that both Tracer rates gave complete protection with no sign of any gallery on tubers at the final inspection. Also, Spinosad treatment gave low level 4.88 galleries as an average number, followed by Fars (11.38), Dipel 2X (14.73), GV infected larvae (16.3), Virotecto (20.45), Protecto (21.05), rice straw + Cidial (22.3), Cypermethrin (35.63) and finally the control recording the highest 85.98 gallery numbers.

Statistical analysis for the gallery numbers showed high significant difference for the low rate of Tracer 5ml compared to Spinosad treatment ($P=0.008$). As Spinosad treatment came in the 3rd rank after the two treatments of Tracer, it was compared to Fars treatment and significant difference was found with P value of 0.047. High significant differences were proved between Fars treatment and each of Dipel 2x and GV larvae treatments ($P=0.007$ and 0.010), respectively. Also, high significant differences were indicated for Dipel 2x treatment and each of GV larvae, Virotecto, Protecto and rice straw treated with Cidial insecticide treatments where the P-values recorded (0.034,0.002,0.013 and 0.003), respectively. There were no significance differences between Protecto and rice straw + Cidial as well as between Virotecto and rice straw + Cidial treatments, although significant difference was recorded between Protecto and Virotecto ($P=0.013$). Virotecto treatment differ significantly with Cypermethrin ($P=0.005$). As Cypermethrin treatment recorded the highest gallery numbers after the control treatment and differ significantly with it ($P=0.000$), so the control treatment differ significantly with all preceded treatments.

Reductions of tuber infestation and gallery numbers at the 4th inspection were illustrated in table (3) and figure (1). Maximum reductions were obtained on applying the two rates of Tracer where recorded 100% for both tuber infestations and gallery numbers at the 4th inspection, respectively. Spinosad, treatment recoded reduction of 94 and 93.4 for both tuber infestations and gallery numbers, respectively. Fars treatment came in the 3rd rank where the reduction was 89.4 and 88.4 for tuber infestations and gallery numbers, respectively. The Bt treatments recorded reduction of (79.4 and 74.7) for Dipel 2x while Protecto was (70.4 and 61.7%) for tuber infestations and gallery numbers, respectively. The reduction of GV treatments recorded (79.4 and 71.1) for the GV infected larvae, where Virotecto treatment recorded (71.1 and 61.4%) for tuber infestations and gallery numbers, respectively. The farmers traditional way using rice straw + Cidial treatment gave reduction (74.4 and 65) for both tuber infestation and gallery numbers, respectively which was more than Virotecto and Protecto treatments. Finally the Cypermethrin treatment at the 4th

inspection gave reduction of 55.4 and 27.7 for tuber infestations and gallery numbers, respectively.

The results are leading to a conclusion of the importance of controlling the PTM in stored potato tubers. As, without an effective way for controlling the infestation losses can be devastating as it reached 78.3% of the stored tubers in the final inspection. The antimoulting agent Fars 5% is a good tool in controlling potato tubers through the whole storing period as its result came at the 3rd rank after the two rates of Tracer and Spinosad treatments and in the same time safer than the chemical ones which agreed with (Krishnakumaran, 1990).

The Cypermethrin treatment failed to give protection to tubers through the whole storing period. Although the treatment was not very promising in protecting potato tuber against the PTM especially on the long run as the reduction of tuber infestation collapse quickly after the 3rd inspection but could be a good control measure for the PTM only if potato is stored for one month. These findings from one hand are disagreed with those of (Elliot *et al.*, 1977) for its efficiency and agree with them for its fast breakdown of the Pyrethroid compound characteristic or the new persistence created of the PTM larvae to the chemical insecticide.

The present work indicated that, the biocides *Bacillus thuringiensis* and the Granulosis virus treatments giving better results than the chemical one are in agreement with those of (Anon., 1990, Lagnaoui, *et al.*, 1994, Moáwad *et al.*, 1997 and Gomaa 1998).

Tracer treatment even with the lower rate was much better than all other treatments. Also, it is of great interest to mention the long persistence period and fast acting of Tracer and Spinosad compared to other tested compounds. These findings are agree with those of Binning 2000, Thompson *et al.*, 2000, Anon 2001 and Gomaa and El-Nenaey, 2006).

On the other hand the farmer traditional method of covering the potato tuber with a thick layer of rice straw treated with the hazard organophosphorous insecticide Cidial 50% EC is giving a better protection level compared to Bt and GV compounds, but still the hazards of using chemical insecticide on edible crop is a great problem for the consumers health.

So either Tracer or Spinosad compounds could be recommended and used as a good control measure for the potato tuber moth on potato tuber replacing the hazard chemical insecticides and the current slow acting bio-insecticides in stores.

Table 1. Effect of different treatments on potato tuber infestation against the potato tuber moth during the storing period.

Treatments	Rates/ton	Inspection no.				Average
		1 st	2 nd	3 rd	4 th	
Tracer	7.5 ml	3	2.3	1.3	0.0	1.65
Tracer	5 ml	3.3	2.6	2.3	0.0	2.05
Spinosad	1 kg	3.3	3.3	4	6	4.15
Virotocto	150 gm	4.6	11.3	20.6	28.3	16.2
GV infected larvae	20 larvae	4	9.3	17.3	20.6	12.8
Dipel 2x	150 gm	4	7.6	16.3	20.6	12.13
Protecto	150 gm	6.3	12.6	18.3	29.6	16.7
Fars	1.2 ml	8	10.3	10.6	10.6	9.88
Cypermethrin	3 ml	2.6	13	32.3	44.6	23.13
Rice straw+Cidial		7.3	12.6	17.3	25.6	15.7
Control		16.3	38.6	65.6	78.3	49.7

Paired T-Test and CI: Tracer 5ml, Spinosad	P-Value = 0.009
Paired T-Test and CI: Spinosad, Virotocto	P-Value = 0.001
Paired T-Test and CI: Spinosad, GV larvae	P-Value = 0.002
Paired T-Test and CI: Spinosad, Fars	P-Value = 0.019
Paired T-Test and CI: Virotocto, Protecto	P-Value = 0.853
Paired T-Test and CI: GV larvae, Virotocto	P-Value = 0.019
Paired T-Test and CI: GV larvae, Protecto	P-Value = 0.000
Paired T-Test and CI: Fars, GV larvae	P-Value = 0.000
Paired T-Test and CI: GV larvae, Rice straw+Cidial	P-Value = 0.000
Paired T-Test and CI: Protecto, Cypermethrin	P-Value = 0.000
Paired T-Test and CI: Protecto, Rice straw+Cidial	P-Value = 0.052
Paired T-Test and CI: Rice straw+Cidial, Virotocto	P-Value = 0.129
Paired T-Test and CI: Rice straw+Cidial, Cypermethrin	P-Value = 0.000
Paired T-Test and CI: Cypermethrin, Control	P-Value = 0.000

Table 2. Effect of different treatments on Gallery numbers of the Potato tuber moth during the storing period.

Treatments	Rates/ton	Inspection no.				Average
		1 st	2 nd	3 rd	4 th	
Tracer	7.5 ml	3.3	2.6	1.3	0.0	1.8
Tracer	5 ml	3.6	3	2.3	0.0	2.23
Spinosad	1 kg	4	4.3	4.6	6.6	4.88
Virotocto	150 gm	5.6	12.3	25.3	38.6	20.45
GV infected larvae	20 larvae	4	10.3	22.6	28.3	16.3
Dipel 2x	150 gm	4	9.3	20.3	25.3	14.73
Protecto	150 gm	6.3	13.6	26	38.3	21.05
Fars	1.2 ml	10	11.6	12.3	11.6	11.38
Cypermethrin	3 ml	3.3	18.3	48.6	72.3	35.63
Rice straw+Cidial		8	18.6	27.6	35	22.3
Control		26.6	66.3	107	144	85.98

Paired T-Test and CI: Tracer 5ml, Spinosad

P-Value = 0.008

Paired T-Test and CI: Spinosad, Fars

P-Value = 0.047

Paired T-Test and CI: Fars, Dipel 2X

P-Value = 0.007

Paired T-Test and CI: Fars, GV larvae

P-Value = 0.010

Paired T-Test and CI: Dipel 2X, GV larvae

P-Value = 0.034

Paired T-Test and CI: Dipel 2X, Virotocto

P-Value = 0.002

Paired T-Test and CI: Dipel 2X, Protecto

P-Value = 0.013

Paired T-Test and CI: Dipel 2X, Rice straw + Cidial

P-Value = 0.003

Paired T-Test and CI: Protecto, Virotocto

P-Value = 0.031

Paired T-Test and CI: Protecto, Rice straw + Cidial

P-Value = 0.846

Paired T-Test and CI: Virotocto, Cypermethrin

P-Value = 0.005

Paired T-Test and CI: Cypermethrin, Control

P-Value = 0.000

Paired T-Test and CI: Virotocto, Rice straw + Cidial

P-Value = 0.073

Paired T-Test and CI: Rice straw + Cidial, Cypermethrin

P-Value = 0.002

Table 3. Percentage of reduction in tubers infestation and gallery numbers, at the end of storing period

Treatments	Rates/ton	Tuber infestation % of reduction	Gallery numbers % of reduction
Tracer	7.5 ml	100	100
Tracer	5 ml	100	100
Spinosad	1 kg	94	93.4
Virotocto	150 gm	71.1	61.4
GV infected larvae	20 larvae	79.4	71.7
Dipel 2x	150 gm	79.4	74.7
Protecto	150 gm	70.4	61.7
Fars	1.2 ml	89.4	88.4
Cypermethrin	3 ml	55.4	27.7
Rice straw+Cidial		74.4	65

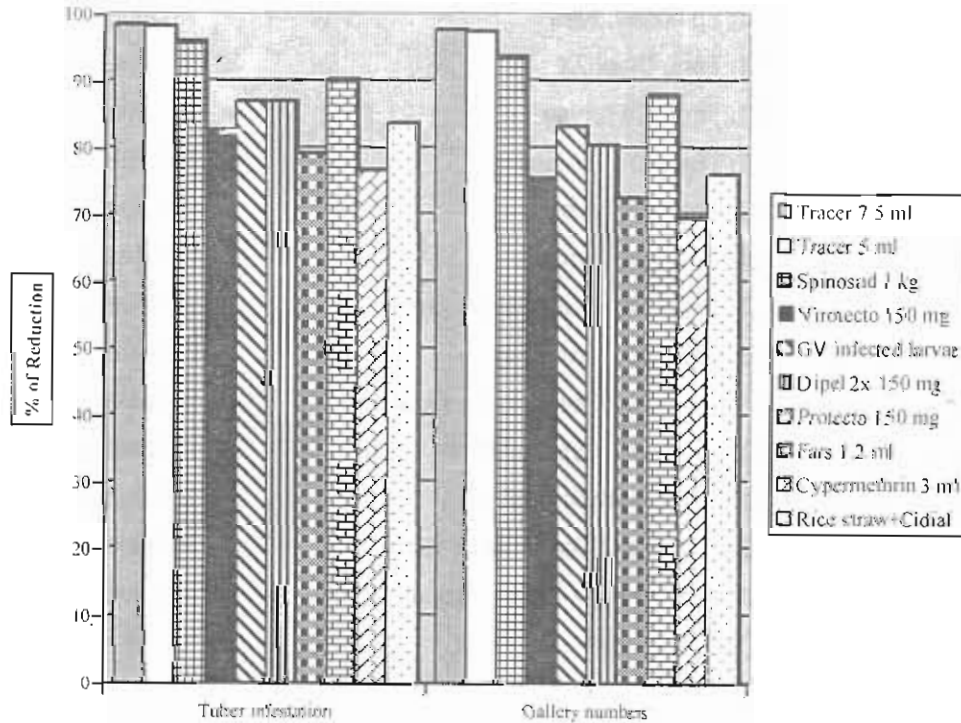


Fig. 1. Reduction percentages of tuber infestations and gallery numbers due to different tested compounds at the 4th inspection.

REFERENCES

1. Anonymous. 1990. Biological control. (CIP), Peru, Annual Report, 88-89.
2. Anonymous. 1997. Spinosad Pesticide Fact Sheet No. HJ 501C. EPA, Washington, DC: National Center for Environmental Assessment.
<http://www.epa.gov/ncea/exposfac.htm>.
3. Anonymous. 2001. Material Safety Data Sheet for Spinosad Technical Bulletin. Dow AgroSciences, Indianapolis, In. 15 pp.
4. Ben-Salah H. and R. Aalbu. 1992. Field use of granulosis virus to reduce initial storage infestation of the potato tuber moth *Phthorimaea operculella* (Zell.) in North Africa. *Agric. Environ.*, 38: 118-126.
5. Binning L. K. 2000. Commercial Vegetable Production in Wisconsin (A3422). University of Wisconsin-Extension Publications. 131 pp.
6. Carpenter J. E. and L. D. Chandler. 1994. Effects of Sublethal Doses of 2 Insect Growth-Regulators on *Helicoverpa Zea* (Lepidoptera, Noctuidae) Reproduction. *Journal of Entomological Science* 29(3): 428-435.
7. Elliot, M., A. W. Farnhan, N. F. Jones, P. H. Needham and D. A. Pulman. 1977. Synthetic insecticide with a new order of activity. *Nature (Lond.)*, 248: 710-711.
8. Fleming, R. and A. Retakaran. 1985. Evaluating single treatment data using Abbot's Formula with reference to insecticides, *J. Econ. Entomol.*, 78: 1179-1181.
9. Gomaa, A. E. 1998. Studies on certain insects attacking potato in the field at EL-Gharbia Governorate. M.Sc. Thesis, Fac. of Agric. Kafr El-Shiekh, Tanta Univ., 114 pp.
10. Gomaa, A. E. and H. M. El-Nenaey. 2006. Evaluation of certain controlling measures for *Phthorimaea operculella* (ZELLER) (Lepidoptera, Gelechiidae) on Potato in stores. *Egypt, J. Agric. Res.*, 84 (1): 31-41.
11. Krishnakumaran A. 1990. in `Morphogenetic Hormones in Arthropods', Ed. A.P. Gupta, Rutgers University Press, New Brunswick NJ, p. 182.
12. Lagnaoui A., H. Ben-Saleh and A. Ben-Temime. 1994. Potato tuber moth Granulosis virus, a prime candidate for integrated pest management. *Apa: The Third Triennial Conference, Sousse, Tunisia*.
13. Moawad G. M., R. A. El-Bedwey, S. Abd El-Halim, H. K. Bekheit, A. Mabrouk, A. Farghaly and L. Labnaoui. 1997. Large scale implementation of integrated pest management in Egypt. *International potato Center (CIP) 22 (3)* : 8-13
14. Raman K. V., R. H. Booth and M. Palacios. 1987. Control of potato tuber moth *Phthorimaea operculella* (Zell.) in rustic potato stores. *Tropical Science*, 72 (3): 175-194.

15. Thompson G. D., R. Dutton and T. C. Sparks. 2000. Spinosad a case study, an example from a natural products discovery program. *Pest Management Science* 56:696-702.
16. Thompson G. D., K. H. Michel, R. C. Yao, J. S. Mynderse, C. T. Mosburg, T. V. Worden, E. H. Chio, T. C. Sparks and S. H. Hutchins. 1997. The discovery of *Saccharopolyspora spinosa* and a new class of insect control products. *Down to Earth*. 52 (1), 1-5.

الطرق التقليدية والمستحدثة لمكافحة فراشة درنات البطاطس على البطاطس المخزنة بالحقل

عزيز السيد جمعه

معهد بحوث وقاية النباتات، مركز البحوث الزراعية - دقى

تم تقييم مركب سبينوساد فى صورة (تراسر ٢٤% محلول مركز، سبينوساد ٠,١٢٥% مسحوق تعفير) ،المسبب المرضى البكتيرى باسلس ثورينجينسز فى مركب (بروتكتو ١٠% مسحوق قابل للبلل بويديل 2x) والفيروس المحبب فى صورة (مركب فيروتكتو ٤% مسحوق قابل للبلل ،ويرقات فراشة درنات البطاطس مغيرة طبيعيا بالفيروس المحبب، ومانع الانسلاخ فارس ٥% ، والمبيد الكيماوى سيبرميثيرين ١٠% مركز قابل للاستحلاب من مركبات البيروثرويد، مقارنة بالاستخدام التقليدى من قبل المزارع بتغطية درنات البطاطس بطبقة كثيفة من قش الأرز المعامل بمبيد سيديال ٥٠% وهو من المركبات الفوسفورية العضوية، وذلك بغرض مكافحة فراشة درنات البطاطس على البطاطس المخزنة بأرض خلاء بقرية كفر المنشى القبلى بمركز طنطا بحافظة الغربية.

وجد أن مركب تراسر بالمعدلين (٧,٥ و ٥ مل/طن) أعط أحسن النتائج من جميع المعاملات الأخرى وذلك على مستوى نسبة الإصابة للدنات وعدد الأنفاق وطوال فترة التخزين حيث كانت الحماية من الإصابة بدرجة ١٠٠%. وجاءت المعاملة بمركب سبينوساد فى المرتبة الثانية حيث كانت نسبة الخفض (٩٤ و ٩٣,٤%) وذلك لنسبة الإصابة فى الدنات وعدد الأنفاق على التوالى. فى المرتبة الثالثة كانت المعاملة بمانع الانسلاخ فارس حيث كانت نسبة الخفض (٨٩,٤ و ٨٨,٤%) وذلك لنسبة الإصابة فى الدنات وعدد الأنفاق على التوالى، تلى ذلك المعاملة بكل من مركب دييل ٢x واليرقات المغيرة حيث بلغ الخفض فى نسبة الإصابة لعدد الدنات (٧٩,٤%) أما عدد الأنفاق فكان (٧٤,٧ و ٧١,٧%) على التوالى.

حققت المعاملة بالتغطية بقش الأرز المعامل بمبيد سيديال نسبة خفض (٧٤,٤ و ٦٥%) للإصابة فى الدنات وعدد الأنفاق على التوالى، تلى ذلك المعاملة بكل من المركبين فيروتكتو وبروتكتو بقيمة متقاربة حيث كانت نسبة الخفض فى الإصابة لعدد الدنات (٧١,١ و ٧٠,٤%) والخفض فى عدد الأنفاق (٦١,٤ و ٦١,٧%) للمركبين على التوالى، بينما كانت المعاملة بالمبيد الكيماوى سيبرميثيرين غير كافية عند نهاية فترة التخزين حيث كان الخفض (٥٥,٤ و ٢٧,٧%) لنسبة الإصابة وعدد الأنفاق على التوالى.

من هذا نجد أن المعاملة بمركب تراسر ٢٤% بمعدل ٥ مل/طن أو المعاملة بمركب سبينوساد ٠,١٢٥% بمعدل ١ كجم/طن تعطى أحسن النتائج لوقاية درنات البطاطس من الإصابة بدودة درنات البطاطس طوال فترة التخزين، وأيضا مانع الانسلاخ فارس أعطى نتيجة جيدة وأكثر أمانا من المبيد الكيماوى المختبر.