

COMPARATIVELY STUDIES ON SOME BIO AND CHEMICAL INSECTICIDES AGAINST MYZUS PERSICAE AND APHIS GOSSYPHII INFESTED TWO POTATO CULTIVARS AND ITS RELATION WITH YIELD.

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ABSTRACT

In order to evaluate the effects of bio and chemical insecticides for reducing the aphid infestation and response on the potato yield, two bio products namely [Biofly (entomopathogenic fungi) and Jojoba oil (plant extract) and K.z oil (mineral oil)] were compared with five recommended insecticides namely; fenvalerate (Sumicidin), fenpyroximate (Kindo), carbosulfan (Marshal), dinotifuran (MTI-446), (neo-nicotinoid); and, diafenthiuron, (Polo).

*Two cultivars of potato plants diamant and spunta were sprayed with the tested compounds at the recommended rates twice against two species of aphids, the green peach aphid *Myzus persicae* (Sulzer) and the cotton aphid, *Aphis gossypii* (Glover), during two successive seasons of 2003 and 2004 at El-Kenaiat district, Sharkia Governorate.*

*Reduction percentages cleared that *A. gossypii* exhibited slightly tolerant to tested compounds than *M. Persicae*.*

*During the 1st season (2003), the comparatively higher initial reduction percentages against *M. persicae* and *A. gossypii* were 97.5 and 98.37 % recorded for fenpyroximate against *M. persicae* on spunta cultivar at the 1st and 2nd sprays, respectively. The relatively higher residual effects were 95.16 and 94.83% recorded for carbosulfa and diafenthuron against *M. persicae* on spunta cultivar.*

The two bio products, Biofly, jojoba and mineral oil recorded relatively moderate general reduction percentages ranged between 50.42-73.42% against the two aphid species in the two potato cultivars.

*During the second season (2004) the relatively higher initial reduction percentages, recorded 97.99 and 96.67% for fenpyroximat against *M. persicae* infested spunta potato cultivar after 1st and 2nd spray, respectively. The two bioproducts and kz oil recorded reduction percentage ranged 50.47-74.04% against the two aphids species on the two tested cultivars.*

The aphids species infested diamant cultivar were more tolerant than that infested spunta cultivar, where the relatively higher reduction percentage recorded on spunta, that may be due to the food suitability and its effect insects response to tested compounds.

In respecting to the yield, there were significant differences between the different treatments except these plots treated with fenpyroximate which recorded the highest yield (106.20 & 115.25 kg /plot) for both of diamant and spunta cultivars respectively at the 1st season.

While at 2nd season, plots treated with fenpyroximate recorded highest yield of diamant (102.25k.g./plot) and the highest yield of spunta recorded for plots treated with carbosulfan (114.5 k.g./plot).

On the other hand, the best yield for bio-product was recorded for Jojoba oil which gave (100.25 and 102 kg /plot) when sprayed on diamant and spunta at the 1st season and 94 and 97 kg /plot at the 2nd season respectively. Therefore, it could be decided that Jojoba was the most efficient compound when we wanted potato as a bio-crop to avoid the hazard of chemical insecticides on health and environment which represent the principal aim of IPM programs.

Key words: Some bio- and chemical insecticides, *myzus persicae*, *aphis gossypii*, potato cultivars.

INTRODUCTION

Potato, *Solanium tuberosum* L. is a crop of an out standing importance in Egypt on account of its great value for local consumption and export. It occupies the second rank after onion in regard to vegetable exportation. Potato plants in Egypt are usually infested with serious insect pests which threaten the yield. The most economically important pests are the green peach aphid. *Myzus persicae* and cotton aphid, *Aphis gossypii* (Metwally 1976, Ali *et al.*, 1987 and Ibraheem, 1993).

On the other hand, Hemida (1981) found that the commercial potato varieties differed in their susceptibility to aphid infestation. Due to the high costs of insecticides and hazards of spraying on edible crop, the possibility that potato varieties may exhibit differential susceptibility to aphids was explored. Chemical control treatments are not the only way to control aphids and there are many other methods, such as using alternative bio-insecticides which depend on their efficacy as bio agents known as unharmed to mammals (Mikhael, 1995). The present work aimed study evaluating the insecticidal activity of eight compounds from miscellaneous groups against aphids.

MATERIALS AND METHODS

Field trials conducted in two successive seasons 2003 and 2004 at El-Kenaiat district, Sharkia Governorate. Two potato cultivars *Solanium tuberosum* L. (Diamont and Spunta) were sown on November 19 in 2003 season and October 24 in 2004 season in an separated area, each one was about half Feddan divided into 36 plots. Normal agricultural practices were applied as recommended for ordinary potato growing. Design of two varieties and their plots were a randomized complete block design including three replicates for each treatment and check. Each replicate consisted of 8 rows (42 m²). Knapsak sprayer with one nozzle was used. Application of different compounds were carried out after one month from sown. Number of aphids were carried out visually in the field. Two species of aphids were counted

directly before application and at 2, 5, 8, 11 and 14 days after application. At the end of experiment, yield from each treatment were harvested and weighted per plots. The obtained results subjected to compute the reduction percentages in according to Henderson and Tilton Formula (1955). Reduction percentage = $1 - (Ta/Tb \times Cb / Ca) \times 100$ Where :

Ta = number of aphids in treated plot after treatment

Tb = number of aphids in plot before treatment

Cb = number of aphids in check plot before treatment

Ca = number of aphids in check after treatment

Data of % reduction and yield were analyzed statistically to determine the significant of variances between treatments in according to little and Hill (1975).

Tested Material:

1- Chemical insecticides :

- Fenvalerate (Sumicidin) 20 % E.C; used at 150 ml./100 liter water (L.W.).
- Carbosulfan (Marshal) 25 % W.P.; used at 150 gm./100 L.W.
- Dinotefuran (M.T.I-446 neo-nicotinoid) 20% W.P.; used at 100 gm/100 L.W.
- Fenpyroximate (Kendo) 5% E.C.; used at 375 ml./Fed.
- Diafenthiuron (Polo) 50% Sc.; used at 150 ml. /100 L.W.

2-Biocides :

- Beauveria bassiana*. (Biofly – 30×10^6 cells/ ml. L.). used at 100 ml /100 LW.
- Mineral oil (K.Z. oil 95 % E.C.) used at 1.75 L. / 100 L.W.
- Al-Kanz 2000 (jojoba oil), (plant extract) *Simmondsia chinensis* (Link), used at 1000 ml./100 L.W.

RESULTS AND DISCUSSION

1. Effect of the tested materials at the first season:

Results in Table (1) indicated that, fenpyroximate exhibited relatively higher toxic against *M. persicae* and *A. gossypii* as a general effect recording, 90.8, 89.81, 89.63, 89.18 % at the 1st and the 2nd sprays on diamant cultivar and 93.49, 91.63, 92.53, 91.14 % R. at the 1st and the 2nd sprays on spunta cultivar, respectively.

Fenpyroximate exceeded all tested materials but it as not significant differences compared with carbosulfan and diafenthiuron at 1st spray and carbosulfan, diafenthiuron and fenvalerate at 2nd spray results on diamant and with dinotifuran on spunta at 1st spray.

On the other hand, biofly gave poor effect on the two aphids species as general effect, where 57.9, 58.99 & 56.25, 50.42 for the 1st and the 2nd sprays and 62.1, 59.04 & 57.72, 56.14 on spunta cultivar for the two sprays. Mineral oil reduced aphids number with relatively low reduction % as general effect, 67.91, 67.54 & 64.91, 60.27% R. in two species of aphids population on diamante and gave 69.59, 67.71 & 70.54, 64.76% R. on spunta at the two sprays respectively.

These results agree with those obtained by Rizk *et al.*, (1999). Who reported that, mineral oil CAPL2 gave low initial effect against aphid (50% R). These results found in a agreement with those obtained by El-Mezayyen *et al.*, (2003)who reported that, fenvalerate, biofly and K.Z. oil reduced *A. gossypii* numbers on cotton plant by 68.43, 55.30 and 88.98 % reduction respectively.

Reduction percentages of the eight tested compounds against *M. persicae* and *A. gossypii* on diamant cultivar were slightly less than on spunta. That's evidence on the two species of aphids on diamant were more tolerant than spunta, where biofly caused 57.9 , 58.99 and 56.25, 50.42 % reduction in population of *M. persicae* as a (G.I) at the 1st and the 2nd sprays, respectively on diamant cultiva while caused 62.1 , 59.04 and 57.72, 56.14% reduction on spunta cultivar at the 1st and the 2nd sprays, respectively.

The other compounds, fenvalerate, K.Z. oil, dinotifuran, fenpyroximate, Jojoba, carbosulfan and diafenthiuron recorded general reduction percentages, ranged 68.71 –90.03 and 60.27-89.63 % reduction as general effect at the 1st and the 2nd sprays on diamant cultivar while on spunta the reduction percentages ranged 72.67 – 72.83 and 68.83 –90.89% reduction at the 1st and the 2nd sprays on spunta cultivar, respectively.

2-Effect of the tested materials at the second season:

Results in Table (2) indicated that fenpyroximate exhibited highly initial effect and significant differences with other treatments, recording initial reduction percentages of 91.95, 93.26, 97.99 and 96.67 % against *M. persicae* and gave 92.60, 91.09, 96.65 and 96.03% reduction in population against *A. gossypii* at the 1st and the 2nd sprays on diamant and spunta cultivars, respectively.

Also, fenvalerate recorded relatively high reduction percentages of 91.21 and 90.23% reduction as a general effect on diamant cultivar at the 1st spray against *M. persicae* and *A. gossypii*, respectively while dinotifuran was record 88.85 and 86.26% reduction against the two aphids species at the 2nd spray.

Carbosulfan was the first compound against two aphid species on spunta cultivar recorded 95.42 and 93.44% reduction at the 1st spray and 92.94 and 93.39% reduction at the 2nd spray as a general effect.

Carbosulfan recorded relatively higher general effect on diamant cultivar at the 1st spray caused 89.53% against *M. persicae*, and 83.51% against *A. gossypii*. Jojoba recorded on spunta cultivar moderate general reduction percentage 70.34% at 2nd spray against *M. persicae* and 66.22% against *A. gossypii*.

Also, reduction percentages against two aphid species were higher on spunta more than it on diamante.

These results agree with those obtained by Drishpon *et al.*, (1989). who reported that, the carbosulfan was highly effective against *A. gossypii* on cotton plants.

The obtained results agree with those of El-Mezayyen *et al.*, (2003), who reported that, biofly and K.Z oil were reduced the population of *A. gossypii* as a mean of two sprays by 36.81 and 74.55% R. respectively on cotton. Also, El-Maghraby (1998) reported that, carbosulfan 25% W.P. at rate 150 gm / 100 L.W. reduced *M. persicae* population by 73 and 98.9% as initial and residual effect.

On the other hand, El-Hariry *et al.*, (1998) indicated that the Jojoba as a crude oil gives 70.5% R. on control of *A. gossypii*. Generally, it could be concluded that the *Aphis gossypii* was considered more tolerate of all tested materials specially biocides (Biofly and Jojoba) than *M. persicae*.

3- Relationship of yield and general aphid infestations:

The mean of general reduction in population of two species of aphids infesting two tested potato varieties during two successive seasons 2003 and 2004 and its relation with yield were shown in Table 3. Data indicated significant differences between general means of infestation which affected with the tested compounds for all treated plots and its increased significantly ($P < 0.05$) in comparable with untreated ones during the two seasons.

- a) At the 1st season, it could be classified into three categories, the 1st was including fenpyroximate, carbosulfan and fenvalerate with mean yield about 103 and 115.25 kg / plot, the 2nd which occupied diafenthiuron, dinotifuran and Jojoba with yield about 90.75 and 110.5 kg / plot, the last group had the rest treatments (between 77.0 –100.0 kg / plot).
- b) At 2nd season, the relatively high yield of potato was recorded for plots treated with carbosulfan, fenpyroximate, fenvalerte and diafenthiuron with yield values ranged between 100-114.5 kg /plot compared with 70.25-71.57 kg /plot for untreated plots.

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دراسة مقارنة بعض المركبات الحيوية والمبيدات الكيميائية الحشرية ضد من الخوخ الأخضر ومن القطن وعلاقتها بالمحصول لصنفين من البطاطس

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تم تقييم ومقارنة تأثير بعض المركبات أو المنتجات الحيوية وهي فطر *Beauveria bassiana* (بيوفلاي) ، فطر ممرض للحشرات ومستخلص نبات الجوجوبا (*Simmondsia chinensis* Link) (مستخلص نباتي) و(زيت معدني) K.Z. oil وذلك بخمسة مبيدات كيميائية من مجاميع مختلفة وهي فينفاليرات (سيموسيدين) ، فينبيروكسيمات (كندو) وهما من البيروثرويدات المصنعة وكاربوسلفان (مارشال) من مجموعة الكاربامات، داينوتيفيوران (أم-تي-أي - ٤٤٦) من مجموعة مركبات النيونيكوتينويد ، دايفنثيرون (بولو) من مركبات الثيويوريا.. وذلك ضد نوعين من حشرات المن وهما من الخوخ الأخضر *Myzus persicae* (Sulzer). ومن القطن *Aphis gossypii* اللتان تصيبان صنفين من البطاطس وهي صنف ديامونت وصنف أسبونتتا.

هذا وقد تمت التجارب في مركز القنایات - بمحافظة الشرقية وذلك من خلال رش المركبات المختبرة رشتين متتاليتين بفارق زمني أسبوعين بين كلاً منهما وعلى مدار موسمين زراعيين هما ٢٠٠٣ ، ٢٠٠٤م. ولقد أوضحت النتائج ما يلي:

١- أظهرت حشرات من القطن غالباً قدرًا قليلاً من التحمل للمركبات المختبرة عن من البطاطس.. ومن جهة أخرى فإن المركبات المختبرة كانت غالباً أكثر تأثيراً في الرشة الأولى في كلا الموسمين عنه في الرشة الثانية.

٢- سجل مركب فينبروكسيمات أعلى تأثير فوري ضد حشرتي من الخوخ ومن القطن حيث سبب انخفاضاً في تعداد أفراد من الخوخ بقدر ٩٧.٥% ، ٩٨.٣٧% على الصنف أسبونتاً بعد الرشة الأولى والثانية على التوالي. وكان أعلى تأثير متبقي نسبياً لمركب الكاربوسلفان وديافينثورون ضد حشرة من الخوخ على الصنف أسبونتاً حيث حقق ٩٥.١٦% و ٩٤.٨٣% انخفاض في التعداد على التوالي. وقد سجل المنتجان الحيويان بيوفلاي، جوجوبا وكذلك الزيت المعدني K.Z بصفة عامة درجة متوسطة من الانخفاض في التعداد تتراوح بين ٥٠.٤٢% ، ٧٣.٤٢% ضد نوعي المن على صنفی البطاطس المختبرين وذلك خلال الموسم الأول (٢٠٠٣).

٣- خلال الموسم الثاني (٢٠٠٤) فقد سجل مركب فينبروكسيمان أعلى معدل انخفاض فوري في تعداد حشرات من الخوخ التي تصيب الصنف أسبونتاً وتقدر بـ ٩٧.٩٩% و ٩٦.٦٧% بعد الرشة الأولى والثانية على التوالي، هذا وقد سجل المنتجان الحيويان وكذلك الزيت المعدني K.Z نسب مئوية للانخفاض في تعداد نوعي المن على كلاً من صنفی البطاطس ديامونت وأسبونتاً تتراوح بين ٥٠.٤٧% و ٧٤.٠٤%.

٤- وجد أن صنفی المن كان لهما قدرًا أكبر من التحمل في حالة تواجدهما على الصنف ديامونت مقارنة بالصنف أسبونتاً.

٥- اتضح أن هناك اختلافاً معنوياً لمتوسطات المحصول بين المعاملات وبين القطع الغير معاملة حيث سجل أعلى محصول ١٠٦.٢٥ كجم ، ١١٥.٢٥ كجم/ قطعة تجريبية في القطع التي تم رشها بـ فينبروكسيمات (كندو). وذلك للصنف ديامونت ، اسبونتاً خلال الموسم الأول بينما كان أعلى محصول في الموسم الثاني للصنف ديامونت للقطعة المعاملة بالمركب فينبروكسيمات حيث أعطت ١٠١ كجم وكان أعلى محصول للصنف أسبونتاً ناتج عن القطعة التجريبية المعاملة بالمركب كاربوسلفان (مارشال) حيث أعطت ١١٤.٥ كجم. من جهة أخرى كان أفضل محصول ناتج عن معاملات المركبات الحيوية هو الخاص بالقطعة المعاملة بالمركب جوجوبا حيث أعطت ١٠٠.٢٥ ، ١٠٢ كجم/قطعة تجريبية لكلاً من الصنف ديامونت ، الصنف أسبونتاً على التوالي وذلك في الموسم الأول ، ٩٤ ، ٩٧ كجم/قطعة تجريبية في الموسم الثاني على التوالي.

٦- يمكن استخدام المستخلص النباتي جوجوبا بالتركيز الموصي به في مكافحة كلاً نوعي المن وذلك عندما نرغب في الحصول على البطاطس كمنتج حيوي بعيداً عن خطر استخدام المبيدات الكيماوية الحشرية على الصحة والبيئة ضمن برامج المكافحة المتكاملة لحشرة المن على البطاطس.