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Efficiency of certain biopesticides against the olive black scale insect, *Saissetia oleae* (Olivier) on olive trees at Giza Governorate, Egypt

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ABSTRACT

An experiment was carried out to investigate the effect of some biopesticides for controlling the olive black scale insect, *Saissetia oleae* (Olivier) on olive trees at Giza Governorate, Egypt during April, 2010. Four biopesticides (Biover, Stanes-biocatch, Stanes-biomagic and Bioranza) and one plant extract (Nimbecidine) were tested.

The obtained results showed that all tested biopesticides and one extract were able to decrease the infestation with the olive black scale insect on olive trees through the three post treatment counts. Data clearly showed no significant differences among their efficiency (over 85%) and Nembicidine gave 80%.

INTRODUCTION

Olive is one of the most economically horticultural crops in Egypt. The cultivated area of olive trees in Egypt has been rapidly expanded year after year. In 2000, it was 108322 feddans and it reached 163273 feddans in 2010. The quantity of production reached about 281745 tons in 2000 and 390932 tons in 2010.

Olive trees are infested with different scale insects among them the olive black scale insect, *Saissetia oleae* (Olivier). It causes weakness of trees and yield loss. As a result of intensive use of pesticides, there is a resistance of pests to conventional pesticides and decrease in the populations of natural enemies. It is important to search for alternative control methods such as bio- and microbial pesticides.

Many studies were carried out to test the efficiency of entomopathogenic fungi as bioinsecticides for controlling scale insects; i.e. Valand and Vyas (1991); Pane *et al*., (1999); Cozzi *et al*., (2002); Ezz (2004); Haniotakis (2005); Sheng (2007); Ezz *et al*., (2008); Born *et al*., (2009); Marcelino *et al.* (2009) and Qun *et al.* (2011). In addition to the efficiency of plant extracts such as Kumar *et al*. (1989); Chiu (1993); Chiu *et al.* (1993); Reddy *et al.* (1996); Adoyo *et al.* (1997); Ponte *et al.* (1998); Razafindrakoto *et al.* (1999); Kelany (2005); El-Sobky (2006); Ismail *et al.* (2007); Born *et al.* (2009); Naik *et al.* (2009) and Eldoush (2011).

The aim of this investigation is to carry out the present experiment at Giza Governorate is to study the efficiency of some biopesticides against the olive black scale insect, *Saissetia oleae* (Olivier) infesting olive trees.

MATERIAL AND METHODS

The experimental orchard was applied by five treatments, 3 replicates for each treatment (15 trees/treatment), in addition to the untreated trees as control (15 trees). Spraying was applied on olive trees twenty years old, 2-2.5m height almost homogenous in infestation were not exposed to insecticides for two years prior to this

experiment. The tested biopesticides were four bioinsecticides (entomopathogenic fungi) and one plant extract as follows:

Entomopathogenic fungus

Stanes biomagic: Containing $1x10^9$C fu/ml of *Metarhizium anisopliae* used by 200 gm /100 L water.

Stanes biocatch: Containing $1x10^9$C fu/ml of *Verticillium lecanii* used by 200 gm/100 L water.

Biover: Containing 10% *Beauvaria bassiana* and 90% inert ingredient, used by 200 gm/100 L water.

Bioranza: Containing 10% *Metarhizium anisopliae* and 90% inert ingredient, used by 200 gm/100 L water.

Plant extract

Nimbecidine (0.03% EC): Containing 90.57% Neem oil, 5% Hydroxyl, 0.5% Epichlorohydrate, 3.90% Aromax and 0.03% Azadirachtin used by 200 cm^3/100 L water.

Motor sprayer "John Been" with a 600 liters tank, at a pressure of 400 P.S.I., at the rate of 20-25 liter per tree was used to secure complete coverage of all parts.

Samples of fifteen branches with their leaves were picked at random from all directions, replicated three times. These samples were taken in labeled paper bags to the laboratory for counting alive stages of the insect by the aid of stereoscopic microscope.

A pre-treatment count was carried out in April 2010 before spraying and 3 post-treatment counts were taken 3, 5 and 7 weeks after the application. The reduction percentages in the population density of *S. oleae* in relation to the pre-treatment count were calculated according to Henderson and Tilton formula, (1955) as follows:

$$\text{Reduction percentages} = 1 - \frac{T_a \quad C_b}{T_b \quad C_a} \times 100$$

Where: T_b and T_a are pre- and after-treatment counts, respectively.

C_b and C_a are untreated checks before and after treatment.

Data of the percentages reduction were subjected to simple analysis of variance.

RESULTS AND DISCUSSION

Reduction percentages of the obtained data in the different stages of *Saissetia oleae* (Olivier) during April 2010 are presented in Fig. (1). These data showed the superior efficiency of the five tested biopesticides with three post treatments (3-7 weeks). Regarding the whole experiment (after 7 weeks), data indicated that the five tested compounds achieved satisfactory reduction in *S. oleae* population within the experimental period (7 weeks). The total population showed that Stanes-biocatch caused the highest reduction (91.68%), Nimbecidine (90.22%), Stanes-biomagic (88.74%), Biover (87.41) and Bioranza (82%) reduction, respectively. As a general trend, nymphs and adult females showed slightly more reduction in their populations than ovipositing (gravid) females.

Biover caused the highest reduction in nymph population (97.28%), followed by Stanes-biocatch (95.1%), Bioranza (90.59%), Stanes-biomagic (89.96%) and Nimbecidine (89.15%), respectively.

All biopesticides in this experiment had the same effect on adult females (100% reduction) because adult females had few numbers in the time of applying this experiment. Nimbecidine showed (81.51%) reduction in numbers of ovipositing

females, followed by Stanes-biocatch (79.94%), Stanes-biomagic (76.25%), Biover (64.96%) and Bioranza (55.42%), respectively. The accompanied temperature and R.H. % ranged between (16-32°C) and (11-86%), respectively. "F" value was 22.72 (at 5% level) and L.S.D. = 10.04 Each post-treatment count will be discussed as follows:

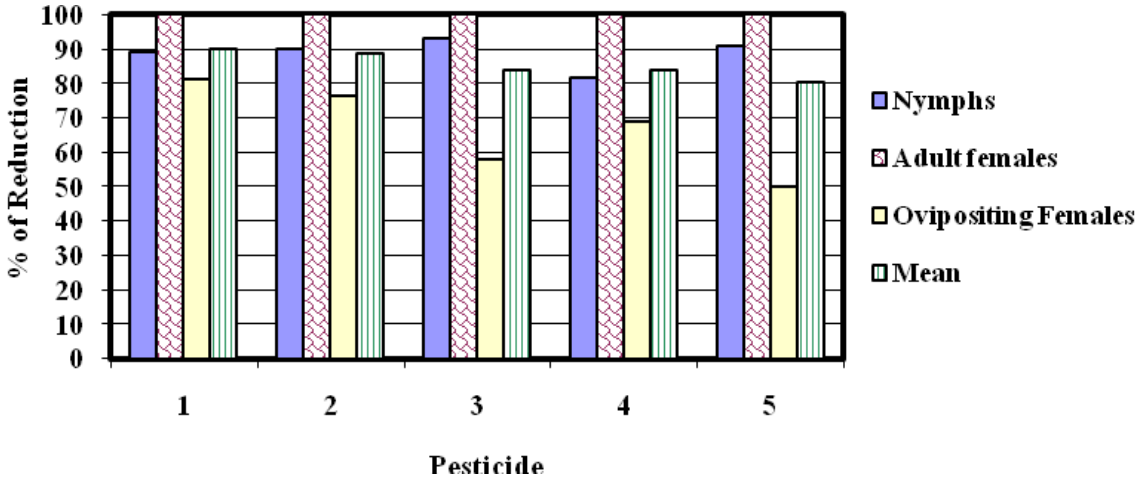

Fig. 1: Efficiency of certain bioinsecticides against *Saissetia oleae* (Olivier) after the whole period of experiment, Giza Governorate.

Regarding the first post-treatment count (3 weeks after spraying), data presented in Fig. (2a) indicated that Biover caused great reduction in the nymphal population (96.90%) followed by Stanes-biocatch (93.60%), Stanes-biomagic (89.25%), Bioranza (85.36%) and Nimbecidine (82.23%) reduction, respectively after 3 weeks after spraying. All the tested treatments had the same effect on adult female population (100%). Stanes-biocatch caused great reduction in ovipositing females (67.32%), followed by Nimbecidine (62.86%), Stanes-biomagic (60.00%); Bioranza (44.69%) and Biover (52.17%) reduction, respectively after 3 weeks after spraying. Stanes-biocatch caused great reduction in insect population (86.97%); followed by Stanes-biomagic (83.08%); Biover (83.02%); Nimbecidine (81.70%) and Bioranza (76.68%) reduction, respectively. There were no significant differences between the different treatments on *S. oleae* different stages where "F" value was 1.09; while there were significant differences between the different stages where "F" value was 65.44 (at 0.05 level) and L.S.D. = 12.33.

Concerning the second post-treatment count**,** data in Fig. (2b) showed the efficiency of the five tested biopesticides in the second post-treatment count against *S. oleae*. Biover caused great reduction in nymph population (97.28%); followed by Stanes-biocatch (95.1%); Bioranza (90.59%); Stanes-biomagic (89.96%) and Nimbecidine (89.15%) reduction, respectively after 5 weeks after spraying. All five biopesticides had the same effect on adult females' population (100%). Nimbecidine caused great reduction in ovipositing females (81.66%); followed by Biover (72.7%); Stanes-biocatch (72.5%); Stanes-biomagic (68.75%) and Bioranza (55.42%) reduction, respectively after 5 weeks after spraying. Nimbecidine caused great reduction in insect population (90.27%); followed by Biover (89.99%); Stanes-biocatch (89.2%); Stanes-biomagic (86.24%) and Bioranza (82%) reduction, respectively. There were no significant differences between the different treatments on *S. oleae* different stages where "F" value was 1.09 but there were significant

differences between the different stages where "F" value was 35.71 (at 5% level) and L.S.D.= 12.33.

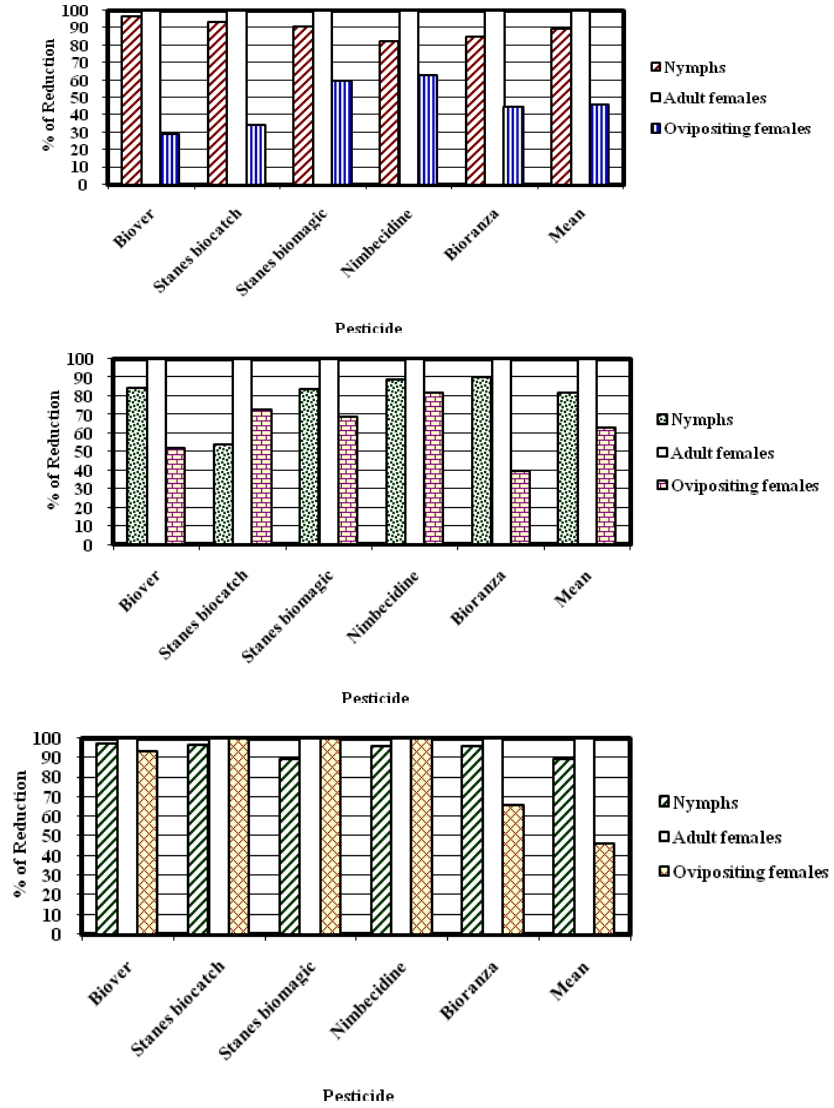

Fig. 2: Reduction percentages of certain bioinsecticides against *Saissetia oleae* (Olivier) three post-treatment counts; (3 weeks, a; 5 weeks, b and 7 weeks, c) from treating olive trees, Giza Governorate

The obtained data in the third post-treatment count showed that superior efficacy of the tested biopesticides was recorded in Fig. (2c) showed that Biover caused great reduction in nymph population (97.65%); followed by Stanes-biocatch (96.59%); Nimbecidine (96.06%); Bioranza (95.81%) and Stanes-biomagic (90.67%) reduction, respectively after 7 weeks after spraying. Stanes-biocatch, Stanes-biomagic and Nimbecidine had the same effect on ovipositing female's population (100%). Biover cuased 93.23% reduction; followed by Bioranza (66.15%) reduction, respectively after 7 weeks after spraying. Stanes-biocatch caused great reduction in insect population (91.68%); followed by Nimbecidine (90.22%); Stanes-biomagic (88.74%); Biover (87.41%) and Bioranza (82.00%) reduction, respectively after 7 weeks after spraying. There were no significant differences between the different treatments where "F" value was 0.90. Also, there were no significant differences between the different stages where "F" value was 1.08 (at 5% level).

There were significant differences between the different periods where "F" value was 50.44 (at 5% level) and L.S.D. = 5.90.

The results of biopesticides are in agreement with those found by Valand and Vyas (1991) who found that the entomopathogens *Aspergillus niger* and *A. flavus* reduced the number of coccid *Saissetia coffeae* on *Trichosanthes dioica* in India. Also, Cozzi *et al.* (2002) in Italy who stated that the insecticidal activity of *Fusarium larvarum* against *S. oleae* was significantly reduced with time. The insecticidal activity of the formulations was evident even after 80 days.

Kelany (2005) stated that neem formulations have more attention in controlling numerous pests in Egypt. El-Sobky (2006) recorded that jojoba oil showed 75.82% reduction against *Aonidiella orientalis* infesting *Ficus nitida* trees in Egypt. Sheng (2007) reported that *Verticillium lecanii* was highly pathogenic to *S. oleae* in Taiwan. Ezz *et al.* (2008) mentioned that *Beauveria bassiana* reduced the population of different stages of *S. coffeae*. Born *et al.* (2009) found that neem seeds extract gave the highest mortality of *Diaspis echinocacti*; while *Metarhizium anisopliae* was the least effective in Brazil.

The results of plant extracts are in agreement with those found by Kumar *et al.* (1989) who found that 1% kerosene and 4% neem-kerosene emulsion were considered effective against *Coccus viridis*. Chiu *et al.* (1993) found that oil emulsion of rubber tree seed oil with diesel oil (ratio 3:7) was very effective against *Hemiberlesia pitysophila* infesting pine trees in China. Chiu (1993) recorded that the control of *H. pitysophila* with chinaberry seed oil and rubber tree seed oil. Reddy *et al.* (1996) found that kemisal (garlic extract) at 1% effectively controlled *Coccus viridis* on Coffee under field conditions in, India. Ponte *et al.* (1998) recorded the efficiency of sprays with manipueira (a liquid extract from roots of cassava) with or without the addition of water against *S. oleae* in Brazil. Ismail *et al.* (2007) found that different extracts of the spicked centaury, *Centaurium spicatum* are effective against soft scale insect, *Pulvinaria tenuivalvata* on sugar cane leaves. Naik *et al.* (2009) mentioned that neem oil (5 ml/L) significantly reduced mussel scale, *Lepidosaphes piperis*. Eldoush *et al.* (2011) recorded that argel (*Solenostemma argel* Del. Hyne) and Usher (*Calotropis procera* Ait) should be recommended as an effective treatment to control the green date palm pit scale insect (*Asterolicanium phoenicis* Rao).

REFERENCES

Adoyo, F. J.; B. Mukalama and M. Enyola (1997). Using Tithonia concoction for termite control in Busia District, Kenya. ILEIA Newsletter, 13 (4): 24-25.

Born, F. de S.; M. J. C. de Araujo; H. M. A. Lima; V. de M. Rodrigues; S. M. F. Broglio-Micheletti; R. C. P. Trindade; E. E. P. de Lemos and D. M. P. da Silva (2009). Control of *Diaspis echinocacti* (Bouche, 1833) (Hemiptera:Diaspididae) in prickly pear. Acta Horticulturae, 811: 223-226.

Chiaradia, L. A. and D. M. da Croce (2008). Characterization of damage caused by and management of pests of olive trees. Agropecuaria Catarinense, 21(1): 53-55.

Chiu, S. F. (1993). Investigations on botanical insecticides in South China-an update. Botanical pesticides in integrated pest management, 134-137.

Chiu, S. F.; X. Q. Liu; Z. X. Huang; W. K. Chen; X. K. Wei and F. Y. Wen (1993). The chemical control of the pine armored scale, *Hemiberlesia pitysophila* Takagi. Acta Entomologica Sinica, 36 (2): 177-184.

Cozzi, G.; C. Stornelli; A. Moretti; A. Logrieco and F. Porcelli (2002). Field evaluation of *Fusarium larvarum* formulations in the biocontrol of *Saissetia oleae*. Acta Horticulturae, 586: 811-814.

Eldoush, K. O. A. M.; A. K. Taha; T. E. I. M. Idris; O. A. A. Sidhamed; F. E. A. Musa and H. G. Mardi (2011). Application of plant based extracts for the control of the green pit scale insect (*Astrolecanium phoenicis* Rao) with yield enhancement on date palm. Emirates J. Food and Agriculture, 23 (5): 404-412.

El-Sobky, H. F. A. (2006). Environmentally safe agents in the control of the yellow scale insect, *Aonidiella orientalis*. M. Sc. Thesis, Ain Shams Univ. 156 pp.

Ezz, N. A. (2004). Isolation and virulence of entomopathogenic fungi associated with certain homopterous insects on fruit trees in Egypt. Ph. D. Thesis, Cairo Univ., 127 pp.

Ezz, N. A.; I. A. Hameida; H. A. El-Shabrawy; O. M. N. I. El-Sahn and I. E. Helmy (2008). Evaluation of the entomopathogenic fungus *Beauveria bassiana* (Balsamo) as a biocontrol agent against the soft scale insect, *Saissetia coffeae* (Walker) (Homotera:Coccidae). Egypt. J. Biol. Pest Cont., 18 (1): 75-80.

Guario, A.; F. Saccomanno; N. Antonio; O. Grande; V. Lasorella and G. Milella (2008). Giornate Fitopatologiche (Cervia, R. A. ed.), 12-14 Marzo, 1: 157-158.

Haniotakis, G. E. (2005). Olive pest control: present status and prospects. Bull. OILB/SROP, 28 (9): 1-9.

Henderson, C. F. and E. W. Tilton (1955). Test with acaricides the brown wheat mite. J. Econ. Ent., 48: 157-161.

Ismail, I. A.; E. A. El-Shazly and R. S. Abdel-Rahman (2007). Impact of some bio-insecticides on certain biological aspects of *Pulvinaria tenuivalvata* (Newstead) (Fam.:Coccidae, Order:Homoptera) infesting sugar cane. Bull. Nat. Res. Cent., Cairo, 32 (6): 675-694.

Kumar, M. G.; P. K. Bhat and C. K. Vijayalakshmi (1989). Screening of the kerosene and neem extract against coffee green scale. J. Coffee res., 19 (1): 51-55.

Marcelino, J. A. P.; S. Gouli; B. L. Parker; M. Skinner; L. Schwarzberg and R. Giordano (2009). Host plant associations of an entomopathogenic variety of the fungus, *Colletotrichum acutatum* recovered from the elongate hemlock scale, *Fiorinia externa*. J. Insect Sci., 9: 13.

Naik, D. J.; D. Thippesha; V. V. Belavadi; K. M. Devaraju; D. Lakshmana; S. D. Rangaswamy; J. Ven Katesha (2009). Evaluation of insecticides and organic products against pepper mussel scale, *Lepidosaphes piperis* Gr. and its correlation with weather factors. Karnataka J. Agric. Sci., 22 (3): 582-584.

Nouri, H. (2007). Integrated olive pest management in Iran. Bull. OILB/SROP, 30 (9): 307-311.

Pane, A.; G. T. Garzia; S. O. Cacciola; G. M. di S. Lio; Grasso and G. Perrotta (1999). Biological control of insect pests of agricultural crops with entomopathogenic fungi. Phytophaga Palermo, Supplement 9, 105-115.

Pascual, S.; G. Cobos; E. Seris and M. Gonzalez Nunez (2010). Effects of processed kaolin on pest and non-target arthropods in a Spanish olive grove. J. Pest Sci., 83 (2): 121-131.

Ponte, J. J. da; F. J. Silveira; Y. C. A. Holanda and N. C. Andrade (1998). Pests of the Barbados cherry plant in the state of Ceara and their control with manuipueira. Revista Brasileira de Fruticultura, 20 (1): 100-103.

Qun, L. C.; B. L. Huang; M. J. Qiao; J. G. Wei and B. Ding (2011). Entomopathogenic fungi on *Hemiberlesia pitysophila*. PLOS ONE, August, e 23649.

Razafindrakoto, C.; J. J. da Ponte; N. C. de Andrade; F. J. Silveira and G. F. Pimentel (1999). Manipueira and heat treatment for the treatment of cassava cutting attacked by scale insects. Revista de Agricultura (Piracicaba), 74 (2): 127-136.

Reddy, K. B.; M. G. Venkatesha and H. G. Seetharama (1996). Bioefficacy of Kemisal against green scale, *Coccus viridis* (Green) in coffee. J. Coffee Res., 26 (2): 73-78.

Sheng, K. S. (2007). Current status of biopesticides, development, farmer's acceptance and utilization and future perspective in Taiwan. Extension Bull., Food and Fertilizer Technology Center, 599, 20 pp.

Valand, V. M. and H. G. Vyas (1991). Control of brown scale, *Saissetia coffeae* Wlk. (Homoptera:Coccidae) on pointed gourd with *Aspergillus* spp. Gujarat Agric. Univ. Res. J., 16 (2): 91-93.

ARABIC SUMMARY

فعالية بعض المبيدات الحيوية ضد حشرة *Saissetia oleae* (Olivier) علي أشجار الزيتون في مصر

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تم إجراء تجربة حقلية عام 2010 لتقييم فعالية بعض المبيدات الحيوية في مكافحة حشرة الزيتون السوداء التي تصيب أشجار الزيتون بمحافظة الجيزة - ج.م.ع. وذلك باستخدام خمسة مبيدات حيوية هي Biover – Stanes-biomagic - Stanes-biocatch - Bioranza (بتركيز 200 جم/100 لتر ماء) ومستخلص نباتي Nimbecidine (نيم بتركيز 200 سم^3/100 لتر ماء).

وقد حققت هذه المبيدات الحيوية نتائج ممتازة في خفض تعداد الحشرة وكانت أعلي كفاءة لمبيد Nimbecidine (90.07%) مع عدم وجود فروقاً معنوية بينه وبين المبيدات المستخدمة بعد 7 أسابيع من الرش. كما أثبتت النتائج إستجابة كل من طوري الحورية والإناث البالغة لهذه المبيدات الحيوية عن الإناث الواضعة للبيض التي تستجيب لها بمرور الوقت أي بعد 5 أسابيع ، 7 اسابيع من الرش.

بناء علي هذه النتائج يمكن استخدام هذه المبيدات الحيوية كبدائل أساسية للمبيدات الحشرية للآفات في برامج المكافحة المتكاملة للحشرات القشرية التي تصيب أشجار الزيتون في مصر.