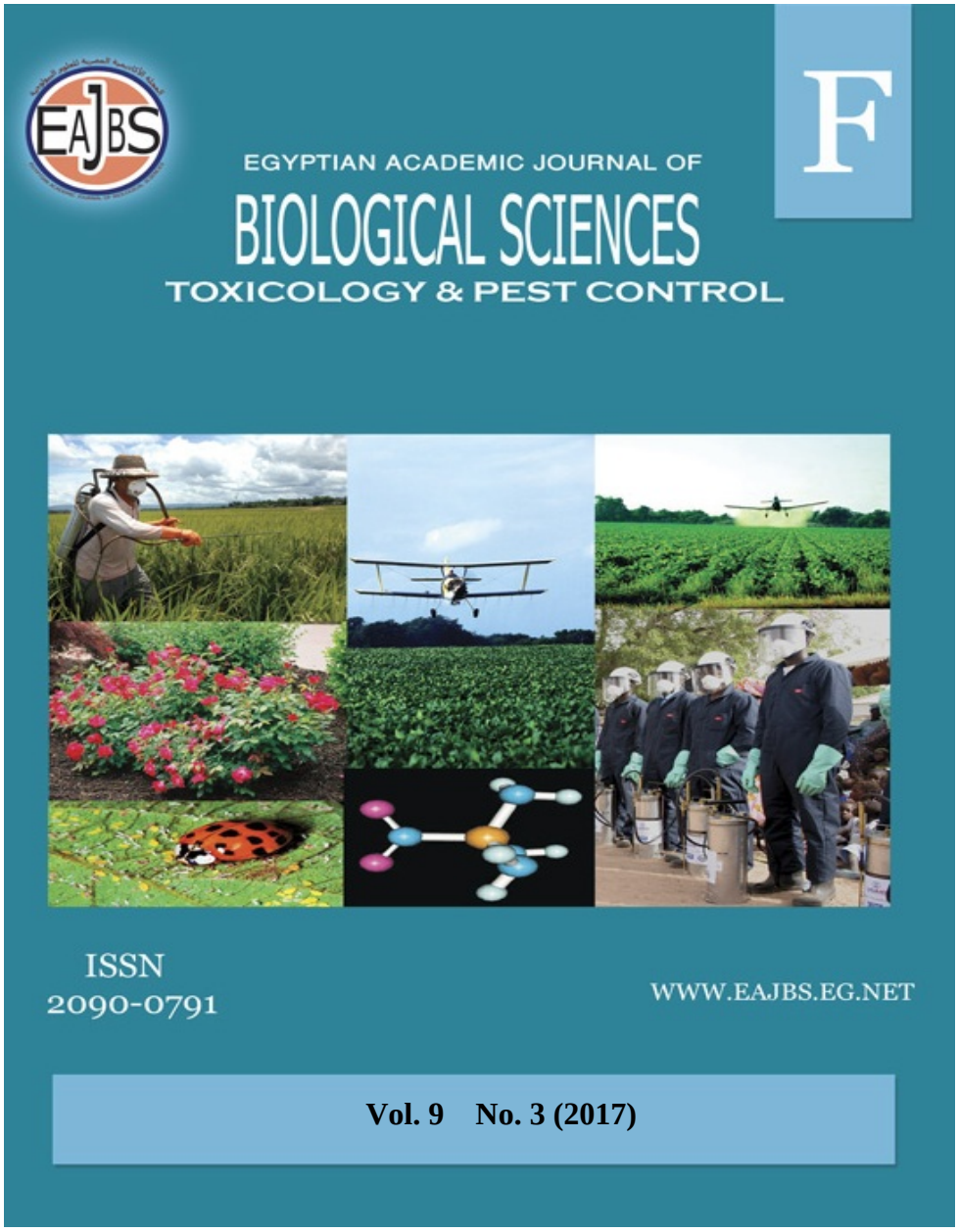

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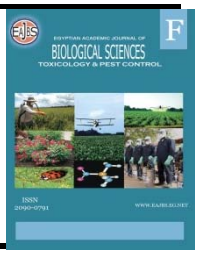

Control of leopard *Zeuzera pyrina* (L.) (Lepidoptera: Cossidae), by imidaclorprid in olive Trees.

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ABSTRACT

Olive tree is subjected to attack by many insect pest species that effect on the yield quality and quantity. Among the most common pest species surveyed in Egypt is; the leopard *Zeuzera pyrina* (L.) (Lepidoptera: Cossidae), which considered a serious pest in olive fields causing a lot of damage and loss in olive trees. Imidacloprid is one of the natural insecticide cause the infestations decrease of many insect pests. The effect of Imidacloprid was tested under laboratory and field conditions against *Z. pyrina*. Results showed that the LC_{50} of Imidacloprid recoded 120 ppm when *Z. pyrina* treated with different concentrations. When the nano imidaclorprid applied on the target pests the LC_{50} recorded 47 ppm. Under field conditions, the infestations were significantly decreased to 23±8.9 and13±2.1 individuals after treated with Imidacloprid in Ebn Malek and Ismailia, respectively. In the same last places the nano Imidacloprid application showed a significant decrease in the pests infestations reached to 15±5.1 and 6±6.6 larvae as compared to 95±1.9 and 96±3.4 larvae in the control. The yields weights in both two regions were significantly increased as the result of nano imidacloprid applications.

INTRODUCTION

Olive has become one of the important economical crops in Egypt. Its cultivated area has been expanded largely in the last decade, particularly in new reclaimed arid areas (Western side of the Nile). Its area reached 49000 Hectares in 2010 (productivity = 6327 Kg/ Hectare) (Mohamed, 2009). The leopard moth, *Zeuzera pyrina* (L.) (Lepidoptera: Cossidae), is a harmful pest for many fruit trees (e.g., apple [*Malus* spp.], pear [*Pyrus* spp.] peach [*Prunus* spp.], and olive [*Olea*]). Recently, it caused yield losses in the newly established olive orchards in Egypt, including the death of young trees Moore & Navon (1966). Chemical controls have shown limited efficiency against this pest. Imidacloprid is a systemic insecticide with translaminar activity with contact and stomach action. Readily taken up by the plant and further distributed acropetally, with good root-systemic action. Imidacloprid is used for controlling the sucking insects, including rice-, leaf- and plant hoppers, aphids, thrips, Lepidopterous and whitefly. Also effective against soil insects, termites and some species of biting insects, such as rice water weevil and Colorado beetle. The mentioned compound has no effect on nematodes and spider mites.

Imidacloprid is also used as a seed dressing, as soil treatment and as foliar treatment in different crops, e.g. rice, cotton, cereals, maize, sugar beet, potatoes, vegetables, olive trees, citrus trees fruit and stone fruit. The rate of uses are 25-100 g/ha for foliar and 50-175 g/100 kg seed. Imidacloprid is a systemic insecticide which acts as an insect neurotoxin and belongs to a class of chemicals called the neonicotinoids which act on the central nervous system of insects with much lower toxicity to mammals. The chemical works by interfering with the transmission of stimuli in the insect nervous system. Specifically, it causes a blockage in the nicotinergic neuronal pathway. This blockage leads to the accumulation of acetylcholine, an important neurotransmitter, resulting in the insect's paralysis, and eventually death. It is effective on contact and via stomach action Pesticide Information Profiles (2012). Because Imidacloprid binds much more strongly to insect neuron receptors than to mammal neuron receptors, this insecticide is selectively more toxic to insects than mammals (Gervais *et al.* 2010). Imidacloprid is currently the most widely used insecticide in the world. Yamamoto, Izuru (1999). It is sold under many names for many uses; it can be applied by soil injection, tree injection, application to the skin of the plant, broadcast foliar, ground application as a granular or liquid formulation, or as a pesticide-coated treatment. Herms *et al.* (2009) Imidacloprid is widely used for pest control in agriculture. Other uses include application to foundations to prevent termite damage, pest control for gardens and turf, treatment of domestic pets to control fleas, protection of trees from boring insects, Carrington *et al.* (2012).This work aims to control leopard *Zeuzera pyrina* (L.) larvae by using Imidacloprid compound.

MATERIALS AND METHODS

Rearing of *Zeuzera pyrina* (L.):

Laboratory studies: The larvae (1st, 2nd, 3rd) were collected from heavy infested trees during May, April, rearing technique according to Moore & Navon (1966).

Imidaclorprid obtained Shanghai Fuang Agrochemical Co. Ltd. Imidaclorprid prepared into 6 concentrations 2, 1.5, 0.75, 1, 0.5, 0.25, 0.125 ppm. The target insect pest treated with the last concentrations. Dead insect pests were counted and removed from the cages daily for 21 days. Each treatment was replicated five times The percentages of mortality were calculated after seven days and corrected according to Abbott's formula (Abbott, 1925), while the LC50 value was calculated through Probit analysis according to Finney equation (Finney, 1971). All experiments were applied at (25±2ºC and 65±5% R under laboratory conditions.

Field applications:

The study was conducted from 2015 to 2016 in a densely planted olive orchard (240 ha, 336 trees/ha) located in two regions, El Nobaryia (Ebn Malek) and Ismailia (Kassaseen). Each farm is divided into 88 isolated plots (3.0-3.5 ha, each) by windbreak hedges (*Casuarina stricta*). Each plot is divided into 10 sectors 'strips', each 3 × ≈ 26 to 30 trees. Each strip combines three lines of one variety alternated by another strip 3 lines of the second variety and so on "strip cropping system". So the width of each strip is similar. The orchard has been established in 2012, it is drip irrigated and not in close proximity of apple plantation or any other known host plants of *Zeuzera* species. Dolce, Sennara, Shami, Manzanillo, Toffahi, Hamed, Kalamata, Picual and Akss are the principal varieties of table olives, constituting approximately 5.3, 5.8, 4.2, 26.1, 12.4, 4.7, 8.1, 27.2 and 6.2%, respectively, of the total bearing 61774

olive trees. Trees were approximately 3-4 m height, planted at 5 m distance along the row and 6 m distance between two lines. No chemical control was applied on monitoring or experimental plots during the experimental period. The Imidacloprid was applied at 200ppm and nano Imidacloprid was applied at 55ppm. Three applications were made at one week interval at the commencement of the experiment. Treatments were performed at the sunset with a ten litre sprayer. Percentage of infestation/sample was calculated after 20, 50, 90 and 120 days from the application. Each treatment was replicated four times. Four plots were treated with water as the control. Random samples of leaves and fruits weekly collected from each treatment and transferred to laboratory for examination. The infestation of, *Z. pyrina* were estimated in each case.

After harvest, yield of each treatment was estimated as Kg/Feddan.

RESULTS AND DISCUSSIONS

Data in Table (1) show that the LC_{50} of Imidacloprid recoded 120 ppm when *Z. pyrina* larvae treated with different concentrations of Imidaclorprid. When the nano imidaclorprid applied on the target pest, the LC_{50} recorded 47 ppm (Table 1) under laboratory conditions.

Table 1: Effect of Imidacloprid on *Zeuzera pyrina* (L.) larvae under laboratory conditions

insecticide tested	LC_{50}	Slope	Variance	95%confidence limits
Imidacloprid	120	0.01	0.02	137-77
Nano-Imidacloprid	47	0.01	0.03	88-33

Table 2 show that infestations by *Z. pyrina* larvae significantly decreased after imidacloprid applied. Under field conditions the infestations were significantly decreased to 23±8.9 and13±2.1 larvae after treated with Imidacloprid in Nobaryia at Ebn Malek and Ismailia, (Kasaseen) respectively during season 2016. In the same two places, the nano Imidacloprid application showed a significantly decrease in the pest infestations reached to 15±5.1 and 6±6.6 larvae as compared to 95±1.9 and 96±3.4 larvae in the control during season 2016. The yields weights of olive fruits were significantly increased after treated with Imidacloprid to 2598± 39.38 and 2691± 62.31 kg/ feddan in Nobaryia Ebn Malek and Ismailia (Kassaseen) during season 2016.

Table 2: Larval numbers of *Z. pyrina* after treatment with Imidacloprid under field conditions throughout the two 2015 and 2016 seasons.

Treatments	Days after treatment	Larval numbers			
		Nobaryia (Ebn Malek)		Ismailia (Kassaseen)	
		2015	2016	2015	2016
Control	20	29.1±2.1	30.2±14	25.4±2.3	26.2±2.4
	50	61±2.3	70±.2	67±3.4	72±3.4
	90	78±3.4	81±2.4	88±3.7	89±4.6
	120	95±1.2	95±1.9	96±3.3	96±3.4
Imidacloprid	20	0±0.0	1.1±1.2	1.0±2.1	2.4±5.3
	50	3±2.2	3±3.1	9±4.5	10±4.4
	90	10±4.1	11±3.1	13±3.4	17±3.4
	120	25±5.2	23±8.9	17±8.5	13±2.1
nano Imidacloprid	20	0±0.0	0±0.0	1±1.1	3 ±2.8
	50	1±1.1	1±2.1	4±3.4	3±2.8
	90	6±2.2	7±1.2	8±3.4	7±1.7
	120	12±2.9	15±5.1	9±3.9	6±6.6

During the same season after nano Imidacloprid applications, the weight of the olive fruits increased to 2998± 42.34 and 2999± 42.71 kg/feddan for the corresponding regions as compare to 2169± 62.12 and 2150± 34.36 kg / feddan in the control at Nobaryia (Ebn Malek) and Ismailia (kassaseen).

In all treatments the weight in both two regions were significantly increased in the two areas after the nano Imidacloprid applications. Fig. 1 show the scanning electron microscopy of nano Imidacloprid at 200 nanometer. Figure 2 show that the infestations of *Z. pyrina* were significantly decreased after treatments. Sabbour and Singer (2015) use the toxin of the fungus *Metarhizium anisopliae* against the olive insect pests and found that the toxin Destruxin could to control these pests under laboratory and field conditions. Sabbour, (2015) control *P. oleae, B. oleae* and *Ceratitis capitat*a by Imidacloprid under laboratory and field conditions. They reported that the infestations of the three pests, reduced under field conditions. In (2013), Sabbour a and b reported that the three olive pests recoded a low application percentages in the field after *Nomuraea rileyi*, *Isaria fumosorosea* and Spinosad treatments under field and laboratory conditions. The same results agree with Sabbour and Abd El Raheem (2012).

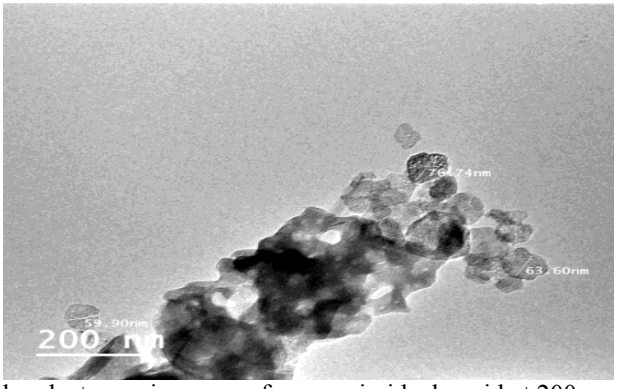

Fig. 1: Scanning by electron microscopy for nano-imidaclorprid at 200 nanometer**.**

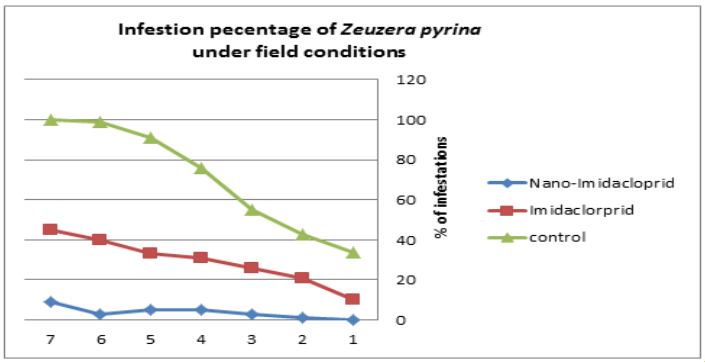

Fig. 2: Infestations of *Zeuzera pyrina* (L.) larvae in the olive field during 2015, 2016 seasons.

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REFERENCES

Abbott, W.W. (1925). A method of computing the effectiveness of an insecticide. J. Economic Entomol.,18: 265-267.

Carrington , Whitehorn, P. R.; O'Connor, S.; Wackers, F. L.; Goulson, D. (2012). "Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and

Queen Production". Science., 336 (6079): 351–2. (2012

Herms, Daniel A , Deborah G. McCullough, David R. Smitley, Clifford S. Sadof, Whitney Cranshaw, 1999. Insecticide Options for Protecting Ash Trees from Emerald Ash Borer. Second Edition chapter1, ppt20.

Finney, D. J. (1971). Probit Analysis, Cambridge: Cambridge University Press.

Gervais, J. A.; Luukinen, B.; Buhl, K.; Stone, D. (2010). Imidacloprid Technical Fact Sheet", National Pesticide Information Center, regon State University Extension Services.

Mohamed, F.M. (2009). Pathogenicity of three commercial products of entomopathogenic fungi *Beauveria bassiana*, *Metarhizium anisopliae* and *Lecanicillium lecanii* against adult of olive fly *Bactrocer aoleae,* (Gmelin) (Diptera: Tephirtidae) in the laboratory. Plant Prot. Sci., 3: 98-102.

Moore**,** I. and A. Navon (1966). The rearing and some bionomics of the leopard moth *Zeuzera pyrina* L., On an artificial medium. Entomophaga, 11(3): 1966- 285-Z96

Sabbour M. M and S. M. Singer (2015). The entomotoxicity of Destruxin and Nano-Destruxin against three olive pests under laboratory and field conditions International J. Sci. Engin. Res., 6(8): 1954-1961.

Sabbour, M. M. (2015). Nano-Imidaclorprid Against Three Olive Pests Under Laboratory and Field Conditions Open Science Journal of Bioscience and Bioengineering 2 (5): 45-49.

Sabbour M. M. (2013b). Efficacy of *Nomuraea rileyi* and Spinosad against olive pests under laboratory and field conditions in Egypt. Global Journal Of Biodiversity Science and Manag-ement, 3(2): 228-232.

Sabbour, M. M. (2013a). Efficacy of *Isaria fumosorosea* against olive pests under laboratory and field conditions in Egypt. I. J of development (1): 55-61.

Sabbour; M. M. and M. A. Abd-El- Raheem. (2012). Efficacy of some microbial control agents against olive insect pests in Egypt. J. Appl. Sci. Res., 8(7): 3448-3452.

Yamamoto, Izuru (1999). "Nicotine to Nicotinoids: 1962 to 1997". In Yamamoto, Izuru; Casida, John. *Nicotinoid Insecticides and the Nicotinic Acetylcholine Receptor*. Tokyo: Springer-Verlag. pp. 3–27. ISBN 443170213X.

ARABIC SUMMERY

مكافحة حفار ساق التفاح ,(L.) *Zeuzera pyrina* بإستخدام إيميداكلوربريد في أشجار الزيتون.

ماجدة صبور

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تتعرض شجرة الزيتون للهجوم من قبل العديد من أنواع الآفات الحشرية التي تؤثر على كمية و جودة المحصول والكمية .ومن أكثر أنواع الآفات شيوعا في مصر هي :حفار ساق التفاح *Zeuzera pyrina* (L.) وهى آفة خطيرة في حقول الزيتون مما تسببت في الكثير من الاضرر في أشجار الزيتون .إيميداكلوبريد هو احد المبيدات الحشرية الطبيعية الذى يؤدى الى تقليل الإصابات العديد قمن الآفات الحشرية. و منها حفار ساق التفاح تم اختبار الكفاءة الإبادية لمركب ايمياكلوبراید للمركب. تحت ظروف المعمل و الحقل٠ وأظهرت النتائج أن التركيز النصف المميت من مركب إميداكلوبريد هو ١٢٠ جزئ من المليون عندما معاملة *Z. pyrina* بالتركيزات المختلفة من إيميداكلوبريد .عند معاملة الحشرة المستهدفة بالمركب اميداكلوبريد نانو كان التركيز النصف المميت الآفات المستهدفة 47 50 جزئ من المليون .وفي ظل الظروف الحقلية، انخفضت الإصابات بشكل ملحوظ إلى ٢٣ ± ٨.٩ و ١٣ ± ٢.١ فرد بعد معاملتها بإيميداكلوبريد في قرية ابن مالك النوبارية والقصاصين الإسماعيلية، على التوالي .في نفس اماكن الأختبار أظهر تطبيق ايميدوكلوبريد نانو انخفاضا ملحوظا في كل الحالات حيث زصلت الاصابة بالآفات إلى ١٥ ± ٥.١ و ٦ ± ٦.٦ يرقات بالمقارنة مع ٩٥ 1.9 ±و ٩٦ ± ٣.٤ يرقة في المناطق الغير معاملة وزاد وزن المحصول في كلتا المنطقتين زيادة كبيرة بعد المعاملات بالاميداكلوبريد نانو.