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THE SELECTIVE TOXICITY OF CERTAIN INSECTICIDES ON THE APHID PREDATOR *HIPPODAMIA CONVERGENS*

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ABSTRACT

The toxic effect of four insecticides i.e. actara, cam mek, neomyl and malathion were evaluated in laboratory against the cabbage aphids *Brevicoryne brassicae*. The side effect of the tested insecticides was estimated on the predator *Hippodamia convergens*. The obtained values on aphids at LC_{50} were 112.75, 126.29, 164.84 and 213.24 ppm for actara, cam mek, neomyl and malathion respectively. At LC_{90} level, cam mek recorded 452 ppm followed by actara 1590.89 ppm, neomyl 3611.84 ppm and malathion 3839.13 ppm. The toxicity values on the predator, that malathion was the most toxic compound based on LC_{50} (2.69 ppm) followed by cam mek (4.24 ppm), neomyl (10.26 ppm), and actara (32.15 ppm), whereas the LC_{90} values were 196.1 ppm (neomyl), 237.4 ppm (malathion), 608.92 ppm (actara) and 1183.9 ppm (cam mek). The general selectivity ratio of the tested insecticides which avoid the difference in selective toxicity values between LC_{50} and LC_{90} level were calculated. The ratios were 2.64, 0.38, 9.96 and 16.28 ppm for actara, cam mek, neomyl, and malathion, respectively. Cam mek can be considered the effective compound against the cabbage aphid's *Brevicoryne brassicae* (as the main target) and simultaneously safe for the prevailing predator.

Key words: Canola (rapeseed), insecticides, *Brevicoryne brassicae*, *Hippodamia convergens,* selective toxicity.

INTRODUCTION

Rapeseed (*Brassica napus* L.) is one of the important oil crops in many countries in the world. This crop is characterized by high seed oil content (40–45%), protein (23–25%) and healthy oil. Canola oil has the lowest level of saturated fats of all major oil crops.

It also has an excellent fatty acid profile, with high levels of Omega-3 fatty acids whose intake is associated with a lower risk of heart disease and lower blood cholesterol levels. It tested as alternative oil for petroleum products like motor fuels (called biofuels) and motor oils **Barth (2007)**.**Economic Research Service (ERS) (2001),** reported that canola (oilseed rape) is the second only to soybean as the most important source of vegetable oil in the world. During the past 20 years, this crop has passed peanut, sunflower and, recently, cotton seed in worldwide production.

Cultivation of canola in Egypt may provide an opportunity to overcome some of the local deficit of vegetable edible oil production, particularly it could be successfully grown during winter season in newly reclaimed land, outside the old one of Nile Valley, to get-arround the competition with other crops occupied the old cultivated area.

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Aphid is the most serious pests on canola plants **(Ali and Munir 1984).** It sucks plant juices, not only from but also leaves inflorescence. The insect deform both. The depletion of the nutrients in the plant cause adversely effects on crop's growth and seed yield. In case of severe infestation, yield may be reduced up to 35%.

Numerous insecticides are used to control aphids on canola plants. The conventional (bifenthrin, carbosulfan and methamidophos) and neonicotinoid insecticides (thiamethoxam and imidacloprid) were sprayed to control cabbage aphid, *B. brassicae* L. **(Amer *et al.* (2010)**. **Aslam *et al.* (2001)** applied (Carbamate, Organophosphate and Neonicotinoids) against the aphid.

The cabbage aphid was suitable prey for the predator *Hippodamia convergens* **(Jessie, 2013). Silva *et al.* (2016)** showed that the natural enemies on Brassicaceae were Syrphidae larvae and *H. convergens*. The present study aims to evaluate the efficiency of certain insecticides in controlling aphid *B. brassicae* (L.) and clarify the selectivity of these insecticides on the natural enemy, *H. convergens*, in order to establish the compatibility between each integrated aphid management programmes.

MATERIALS AND METHODS

Insecticides used: Table (1).

Laboratory Experiment

The experiment was conducted at the Laboratory of Plant Protection Department, Ismailia Agricultural Research Station (IARS) to evaluate the toxicity of the previous aforementioned insecticides on cabbage aphid *Brevicoryne brassicae* and its predator *Hippodamia convergens*.

Maintenance of the Colonies

The Cabbage aphid, *Brevicoryne brassicae.*

Six plastic pots 20 x 30 cm were provided with proper soil. Seeds of canola serw 4 cultivare were sown in the pots, that kept in cages (60x60x100cm) covered with cheese cloth away from any insecticides contamination. The cages were kept in glass house under conditions 25˚ ± 2 and 65 ± 5% R.H and 12 hr. daily illuminations by using fluorescent tubes of 40 watt. The aphids' *B. brassicae* were collected from canola plants on farm of IARS. The aphid were added to canola plants in pots.

The predator, *Hippodamia convergens.*

The original samples of the predator were received from Plant Protection Division, Faculty of Environmental and Agricultural Sciences, Arish University, Egypt. To get plenty numbers of the predator, the steps of **Shaw (1982)** were carried out. Twenty five glasses tubes (5 x 10cm), each was provided with canola leaves heavy infested by aphids. The predator was transferred with a fine brush on aphid infested leaves. The leaves were supplied with aphids when it is necessary.

Toxicological Procedures

The efficacy of tested insecticides on the cabbage aphid

Direct spray technique was used to test the efficiency of the tested insecticides against cabbage aphids. Canola leaves were placed in Petri-dish 9-cm diameter lined with water-saturated cotton wool. Thirty of *B. brassicae* were transferred on the surface of the leaves. Serial concentration dilutions of each of the tested insecticide were prepared in aqueous solution. Five concentrations for each insecticide and three replicates for each concentration were used. Leaves were sprayed with a constant amount of the toxicant solution determined by spraying pressure for five seconds by means of class manual atomizer **(Kimax, USA)**.

The treatments were kept under constant temperatures 25˚C ± 1 and 70±5 % R.H., photoperiod 12:12 (L: D). The mortality were calculated after 24 hr. The criterion for mortality was the failure to respond positively by leg movement following light Prodding with a fine brush.

Table (1): Insecticides used.

Trade name	Active ingredient	Chemical name	Recommended concentration g or mL/100 liter water
		a- Conventional insecticides	
Neomyl 90 % (sp)	Methomyl 90 % (sp)	*(E, Z)-methyl N-{[(methylamino) carbonyl] oxy} ethanimidothioate.*	200 g
Malathin 57% (EC)	Malathion 57% (EC)	(dimethoxyphosphorothioyl)-Diethyl 2 sulfanyl] butanedioate, 2Di (ethoxycarbonyl) ethylO, O-dimethyl phosphordithioate.	150 ml
Actara 25% (WG)	Thiamethoxam 25% (WG	(NE)-N-[3-[(2-chloro-1,3-thiazol-5-yl)methyl]-5- methyl -1,3,5-oxadiazinan-4-ylidene] nitramide.	20 g
		b- Bioinsecticides	
Cam-mek 1.8% (EC)	Abamectin (1.8 % EC)	(1R,4S,5′S,6S,6′R,8R,12S,13S,20R,21R,24S)-21,22-dihydroxy-6′-isopropyl-5′,11,13,22-tetramethyl-2-oxo-(3,7,19-trioxatetracyclo[15.6.1.14,8.020,24] pentacosa-10,14,16,22-tetraene)-6-spiro-2′-(5′,6′-dihydro-2′H-pyran)-12-yl 2,6-dideoxy-4-O-(2,6-dideoxy-3-O-methyl-α-L-arabino-hexopyranosyl)-3-O-methyl-α-L-arabino-hexopyranoside	40 ml

Toxicity Effect of the Tested Insecticides on Predator *H. convergens*.

Direct spray technique was used to test the efficiency of the tested insecticides against cabbage aphids. Canola leaves was placed in petri-dish 9-cm diameter lined with water saturated cotton wool. Ten larvae of the predator were transferred on the surface of the leaves, which provided with the prey, *B. brassicae* as a sufficient food supplies for the predator.

Serial concentrations each of the tested insecticide were prepared in aqueous solution; four concentrates for each insecticide and three replicates for each concentrate were used. Leaves were sprayed with a constant amount of the toxicant solution determined by spraying pressure for five seconds by means of Class manual atomizer (Kimax, USA).

The treatments were kept under constant temperatures 25˚C ± 1 and 70±5 % R.H., and 16 hr. illumination. The mortality were calculated after 24 hr. The criterion for mortality was the failure to respond positively by leg movement following light prodding with a fine brush.

Toxicity lines were statistically analyzed according to the method described by **Finney (1952)**. The relative efficiency of the tested compounds was determined by the formula of **Sun (1950)** as follows:

$$\text{Toxicity index} = 100 \times \frac{LC_{50}\text{ of the compound A}}{LC_{50}\text{ of the compound B}}$$

A = the most effective compound

B = the other tested compound

Relative potency of the tested insecticide on aphids and their predators were determined according to **Finney (1978)** as shown in the following equation:

$$\text{Relative potency} = \frac{LC_{50} \text{ of the least effective compound}}{LC_{50} \text{ of tested compound}}$$

To calculate the General selective toxicity ratio of the tested insecticides, the methods of **Abdel-Aal *et al.* (1979)** modified by **El-Adawy *et al.* (2000)** used as follow:

The selective ratio (S.R.) at LC_{90} level can be combined with LC_{50} in one parameter by employing the following equation:

$$\text{Selective ratio (S.R)} = \frac{LC_{50} \text{ of pest}}{LC_{50} \text{ of natural enemy}}$$

G.S.T.R = (experimental S.R. at LC_{50}) x $10^{1.28\,(bp-bm)/bp*bm)}$

Where:

G.S.T.R = General selective toxicity ratio.

bp = slope of the toxicity line of the parasitoid or the predator.

Bm= slope of the toxicity line of the aphids.

RESULTS and DISCUSSION

Laboratory Experiment

The toxicity of certain insecticides on cabbage aphids

The toxic effect of four insecticides, i.e actara, cam mek, neomyl and malathion were tested against the cabbage aphids (*B. brassicae*).

Results in Table 2 and Fig. 1 show the toxicity of the four tested insecticides. The values at LC_{25} level can be arranged as descending order: actara, neomyl, malathion and cam mek. The values were 28, 32.47, 46.58 and 64.89 ppm, respectively, whereas the values at LC_{50} were 112.75, 126.29, 164.84 and 213.24ppm for actara, cam mek, neomyl and malathion, respectively. At LC_{90} level, cam mek recorded 452 ppm followed by actara 1590.89 ppm, neomyl 3611.84 ppm and malathion 3839.13 ppm.

On the bases of slope values (b), cam mek had the steepest toxicity line with higher slope (b) value of (2.31); whereas neomyl had the flattest one (0.97). The other values came between the two former values. The values were 1.12, for actara and 1.02 for malathion. Concerning the toxicity index calculated on the basis of LC_{50} values, the most effective compound was actara (toxicity index = 100) followed descendly by cam mek (89.27), neomyl (68.39) and malathion (52.87), whereas the values at LC_{90} level were 100, 28.41, 12.51 and 11.77 for cam mek, actara, neomyl and malathion ,respectively. The toxicity index reflects the differences among the tested insecticides in their toxicity.

It's known as reported by **Hoskins and Gordon (1956)** that the slope value of log concentration- probity line is considered as a reaction indicator between the chemical and the effected organism. In other words the highest slope value mean more homogeneity in response of the organism towards the chemical and in the same time the chemical is acting as a selection factor producing an organism strain as pure genetically as possible, while the low slope value indicates heterogeneous aphids population, in its response to the chemical.

Considering the LC_{90}/LC_{50} ratio cam mek, which possess the steepest toxicity line slope, recorded the lowest ratio (3.58); whereas neomyl which have the flattest slope, recorded the highest ratio (21.91). The rest toxicants had ratios ranges between the listed below two ratios Table (1).

Discussing the foregoing results, it could be seen that actara had the most toxic effect against the cabbage aphids *B, brassicae*, whereas malathion had the lowest effect.

Table (2): Toxicity of certain insecticides against the cabbage aphids *Brevicoryne brassicae.*

Insecticide	LC_{25} ppm	LC_{50} ppm	LC_{90} ppm	Slope (b)	Toxicity index		LC_{90}/LC_{50}	Relative potency
					LC_{50} ppm	LC_{90} ppm	ratio	
Actara	28	112.75	1590.89	1.12	100	28.41	14.11	1.89
Cam mek	64.89	126.29	452	2.31	89.27	100	3.58	1.69
Neomyl	32.47	164.84	3611.84	0.97	68.39	12.51	21.91	1.29
Malathion	46.58	213.24	3839.13	1.02	52.87	11.77	18	1

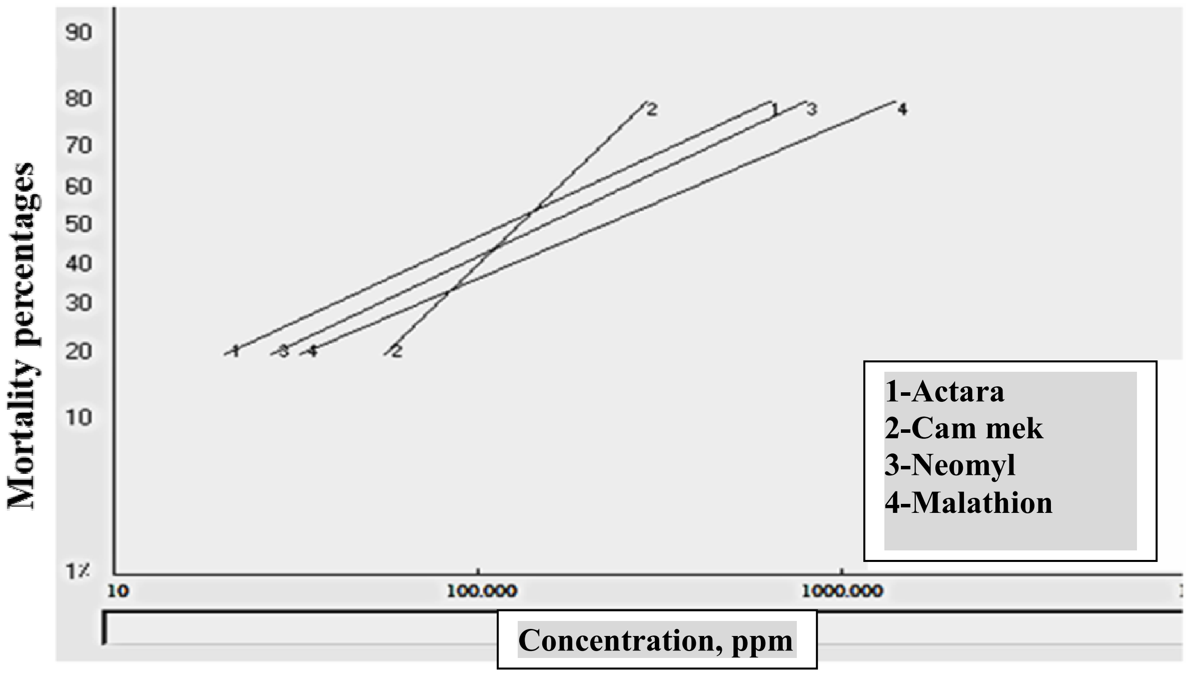

Fig. (1): Dosage mortality regression lines of certain insecticides against the cabbage aphid's *B. brassicae.*

The Toxicity Effect of the Tested Insecticides on the Predator *Hippodamia convergens*

Results in Table 3 and Fig. 2 show that malathion was the most toxic compound against *H. convergens* based on LC_{50} level (2.69 ppm) followed by cam mek (4.24 ppm), neomyl (10.26 ppm), and actara (32.15 ppm), whereas the LC_{90} values were 196.1 ppm (neomyl), 237.4 ppm (malathion), 608.92 ppm (actara) and 1183.9 ppm (cam mek) (Fig. 2). On the basis of slope values of the tested insecticides against *H. convergens*, actara was found to have the steepest toxicity line (1.003), whereas cam mek had the flattest one (0.524).

The Selective Toxicity Ratios of the Four Tested Insecticides

The selectivity ratio (S.R) is presented in Table 3. The highest selectivity ratio was found for actara 3.51 at LC_{50} level; whereas it was for cam mek ratio 0.38 at LC_{90} level. The lowest selectivity ratio was shown by malathion 79.27 at LC_{50}, while neomyl was 18.42 at LC_{90} levels.

Although, actara had the most toxic compound on the cabbage aphids *B. brassicae* value at LC_{50} and cam mek was the most toxic on the cabbage aphids *B. brassicae* value at LC_{90}, malatheion was proved to be the most toxic compound against the predator *H. convergens* and actara was the least toxic one based on LC_{50} (Fig.3). The obtained results showed that all compounds were toxic on predator *H. convergens* at the level LC_{50}, whereas at the level LC_{90} all compounds were toxic on predator except for cam mek.

General Selective Ratios

The general selectivity ratio of the tested insecticides which avoid the difference in selective toxicity values between LC_{50} and LC_{90} level was calculated according the formula of **Abdel-Aal *et al.* (1979)** modified by **El-Adawy *et al.* (2000)** (Table 3).

The values of the general selectivity ratio of the tested insecticides on each of the aphids and the predator *H. convergens* are showen in Table (3). The ratios were2.64, 0.38, 9.96 and 16.28 ppm for actara, cam mek, neomyl, and malathion, respectively. It was obvious that cam mek had the lowest general selectivity ratio 0.38 ppm; whereas malathion had the highest one (16.28 ppm).

Similar results were observed by **Abd-Ella (2014)** who showed that thiamethoxam was the highest toxic effect on Aphid. **Galvan *et al.* (2002)** observed organophosphates have presented low selectivity to natural enemies. The favourable selectivity of the neonicotinoids occurs largely at the target level (**Nauen *et al.*, 2001; Tomizawa *et al.*, 2007**). Reported that Neonicotinoids, exemplified by the major thiamethoxam was the most important new class of insecticides of the past three decades. It was effective against homopteran pests, such as aphids (**Elbert *et al.*, 1991**). Neonicotinoid insecticides are highly effective against different aphids and reduced the population of this pest under field conditions (**Abdu-Allah 2012; Halder *et al.*, 2011**).

In contrast, **Liu *et al.* (2001)** reported that thiomethoxam (actara) did not show good control of *B. brassicae* on canola crops. **Cabral *et al.* (2008)** showed that pirimicarb (carbamate) was unharmful to *Coccinella undecimpuncata* preimaginal stages and adults. **Farooq and Tasawar (2009)** showed that Lannate (carbamate) was the most effective (98.25%) and gave maximum reduction in aphid population at all the post treatment intervals and was equal statistically with the population reduction of *B. brassicae* recorded in all the insecticides application at 7 days after spray.

Conclusion

Based on the general selectivity ratio, it is clear that cam mek (Abamectin -biocide) can be considered as the safest compounds on the predator *H. convergens*, therefore it can be used in IPM systems (Integrated Pests Management). Cam mek can be considered as effective against the cabbage

Table (3): Selectivity of the four tested insecticides to the aphid, *B. brassicae* and the predator *H. convergens.*

Insecticides	*B. brassicae*			*H. convergens*			S.R. at level		G.S.T.R.
	LC_{50} ppm	LC_{90} ppm	Slope	LC_{50} ppm	LC_{90} ppm	Slope	LC_{50} ppm	LC_{90} ppm	
Actara	112.7	1590.9	1.11	32.15	608.92	1.003	3.51	2.61	2.64
Cam mek	126.3	452	2.31	4.24	1183.9	0.524	29.79	0.38	0.38
Neomyl	146.71	3611.8	1.14	10.26	196.1	1.00	14.30	18.42	9.96
Malathion	213.24	3839.1	1.02	2.69	237.4	0.659	79.27	16.17	16.28

***S.r** (Selectivity ratio) = LC_{50} (LC_{90}) of B. / LC_{50} (LC_{90}) of H.

G.S.T.R. = General selective toxicity ratio.

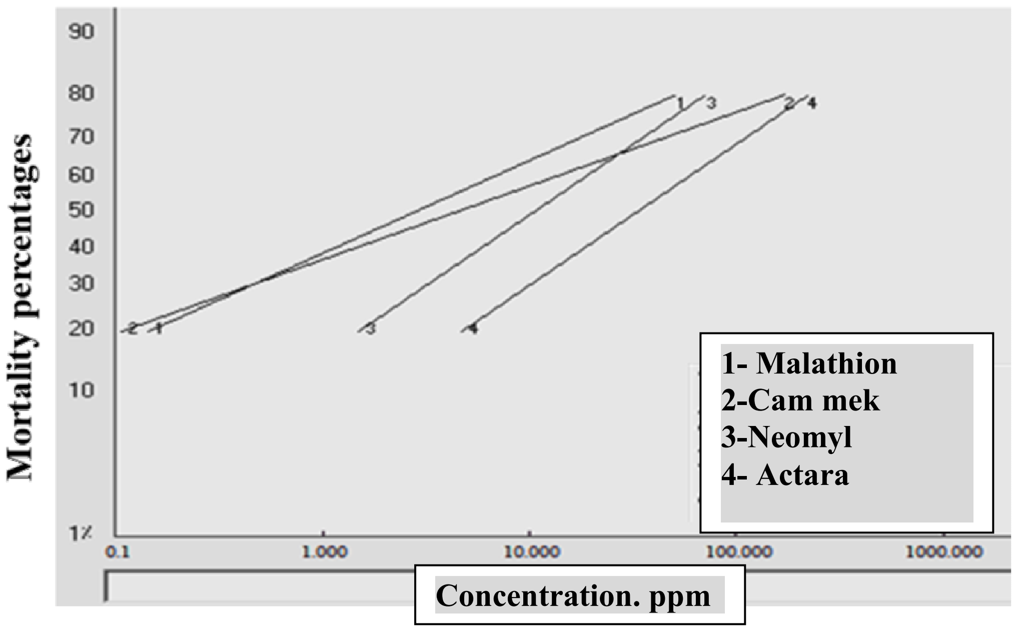

Fig. (2): Ld-p regression line of certain insecticides tested against the predator *H. convergens.*

aphid *B. brassicae* (as the main target) and simultaneously safe for the prevailing predators in Ismailia.

REFERENCES

Abdel-Aal, Y.A.I; El-Sayed, A.M.K.; Negm, A.A.; Hossein, M.H. and El-Sabae, A.H. (1979). The relative toxicity of certain insecticides to *Spodoptera littoralis* (Boisd) and *Coccinella undecimpunctata* L. Int. Pest Control, 79-82.

Abd-Ella, A.A. (2014). Toxicity and persistence of selected neonicotinoid insecticides on cowpea aphid, *Aphis craccivora* Koch (Homoptera: Aphididae). Archives of Phytopathol. and Plant Prot., 47 (3): 366-376.

Abdu-Allah, G. (2012). Aphicidal activity of imidacloprid and primicarb compared with certain plant extracts on *Brevicoryne brassicae* L. and *Aphis craccivora* Koch. Assiut. J. Agric. Sci., 43: 104-114.

Ali, N. and M. Munir (1984). Production technology of rape and mustard in Pakistan, Manual on rapeseed and mustard production technology, PARC, Islamabad., 33-46.

Amer, M; M. Aslam; M. Razaq and S.A. Shad (2010). Effect of conventional and neonicotinoid insecticides against aphids on canola, *Brassica napus* L. at Multan and Dera Ghazi Khan. Pak. J. Zool., 42 (4): 377-381.

Aslam, M.; Razaq, M.; Islam, Z.U. and Anjum, S. (2001). Effecicacy of different insecticides for the control of Aphid, *Brevicoryne brassicae* (Linn.) (Homoptera; Aphididae) on canola, *Brassica napus* (L.). J. Res. Sci., Bahauddin Zakariya Univ., 12 (2): 163-166.

Barth, C.A. (2007). Rapeseed for human nutrition–present knowledge and future options. Proc. of the 12th Int. Rapeseed. Sustainable development in cruciferous oilseed crops production, Wuhan, China, 5: 3-5.

Cabral, S.; Garcia, P. and Soares, A. (2008). Effects of pirimicarb, buprofezin and pymetrozine on survival, development and reproduction of *Coccinella undecimpunctata* (Coleoptera: Coccinellidae). Bio. Sci. and Technol., 18 (3): 307-318.

Economic Research Service (ERS), (2001). Oil crops situation and outlook. OCS, ERS, USDA, p. 66.

El-Adawy, A.M.; Yousri, H.; Ahmed, Y.M.; Tiilikkala, K. and El-Sharkawy, T.A. (2000). Estimation of general selective toxicity ratios of certain acaricides to *Stethorus gilvifrons* (Mulsant) and its prey *Tetranychus urticae* Koch. Egypt. J. Agri. Res., 78 (3): 1081-1089.

Elbert, A.; Becker. B.; Hartwig, J. and Erdelen, C. (1991). Imidacloprid-a new systemic insecticides. Pflanzenschutz-Nachrichten Bayer (Germany, FR).

Farooq, A. and Tasawar, Z. (2009). Comparative efficacy of five different insecticides against *Brevicoryne brassicae* (Linn.) (Homoptera: Aphididae), a pest on canola in Southern Punjab, Pak. Pak. J. Zool., 41(1): 79-81.

Finney, D.J. (1952). Probit analysis- a statistical treatment of the sigmoid response curve. Cambridge Univ. Press. (c.f. M.Sc. Thesis Sherif Zagazig, 1978).

Finney, D.J. (1978). Quantal responses and the tolerance distribution. In Statistical Method in Biological Assay, 3rd Ed. London, Charles Griffin, 349-369.

Galvan, T.; Picanço, M.; Bacci, L.; Pereira, E. and Crespo, A. (2002). Selectivity of eight insecticides to predators of citrus caterpillars. Pesquisa Agropecuária Brasileira., 137 (2):117-22.

Halder, J.; Kodandaram, M.H. and Rai, A.B. (2011). Differential responses of major vegetable aphids to newer insecticides molecules. Veg. Sci., 38 (2): 191-193.

Hoskins, W.M. and Gordon, H.T. (1956). Arthropod resistance to chemical. Annu. Rev. Entomol., 1:89-122.

Jessie, W.P. (2013). Suitability of *Brevicoryne brassicae*, *Lipaphis erysimi* and *Myzus persicae* (Hemiptera: Aphididae) from winter canola for development and survival of *Hippodamia convergens* (Coleoptera: Coccinellidae) and *Chrysoperla carnea* (Neuroptera: Chrysopidae) Oklahoma State Univ., Ann., 48106 – 1346.

Liu, T.X.; Spark, A.N.; Bisong, Y. and Yue, B.S. (2001). Toxicity and efficacy of triazaphos against turnip aphid on cabbage. J. Entomol. Sci., 36 (3): 244-250.

Nauen, R.; Ebbinghaus-Kintscher, U.; Elbert, A.; Jeschke, P. and Tietjen, K. (2001). Acetylcholine receptors as sites for developing neonicotinoid insecticides. Biochemical sites of insecticide action and resistance. Springer Berlin Heidelberg., 77-105.

Silva, V.I.F.D; Silveira, L.I.C.A.P.; dos Santos, A.; dos Santos, A.J.N. and Tomazella, V.B. (2016). Companion plants associated with kale increase the abundance and species richness of the natural-enemies of *Lipaphis erysimi* (Kaltenbach) (Hemiptera: Aphididae). Afr. J. Agri. Res., 11 (29): 2630-2639.

Sun, Y.S. (1950). Toxicity indexes an improved method of comparing the relative toxicity of insecticides. J. Econ. Entomol., 43: 45-53.

Tomizawa, M.; Maltby, D.; Medzihradszky, K.; N. Zhang; K. Durkin; J. Presly; T. Talley; P. Taylor; A. Burlingame and J. Casida (2007). Defining nicotinic agonist binding surfaces through photoaffinity labeling. Bio., 46 (30): 8798-8806.

الملخص العربى

السمية الإختيارية لبعض المبيدات الحشرية على مفترس المن *Hippodamia convergens*

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يعتبر المن من أهم الآفات التى تصيب نباتات الكانولا، تم تقدير التأثير السام لأربعة مبيدات حشرية على من الكرنب *Brevicoryne brassicae*. وعلى المفترس *Hippodamia convergens*، وجد ان التركيز القاتل لـ ٥٠% على من الكرنب هى ١١٢,٧٥، ١٢٦,٢٩، ١٦٤,٨٤ و ٢١٣,٢٤ جزء في المليون للمركبات أكتارا، كام ماك، نيوميل وملاثيون على التوالى؛ بينما عند مستوى تركيز قاتل لـ ٩٠ %، كان المبيد الأكثر فعالية كام ماك ٤٥٢ يليه فى السميه مبيد أكتارا ١٥٩٠،٨٩ جزء في المليون، نيوميل ٣٦١١،٨٤ جزء في المليون والملاثيون ٣٨٣٩,١٣ جزء في المليون. وجد أن مبيد الملاثيون أكثر المبيدات المختبره سمية على مفترس *H. convergens* عند مستوى تركيز قاتل لـ ٥٠% (٢،٦٩) يليها كام ماك (٤،٢٤)، نيوميل (١٠،٢٦)، ثم أكتارا (٣٢،١٥)؛ في حين كان ترتيب المبيدات حسب التركيز القاتل لـ ٩٠% نيوميل أكثرهم سمية ١٩٦،١ ثم ٢٣٧،٤ (ملاثين)، ٦٠٨،٩٢ (أكتارا) و أقلهم كام ماك ١١٨٣،٩ جزء في المليون. تم حساب نسبة الأختيارية العامة للمبيدات الحشرية التي تم اختبارها والتي تتفادى الفرق بين قيم السمية الانتقائية للتركيز القاتل لـ ٥٠% والتركيز القاتل لـ٩٠% وكانت النسب ٢,٦٤، ٠,٣٨، ٩,٩٦ و١٦,٢٨ جزء في المليون للمركبات أكتارا، كام ميك، نيوميل، والملاثيون على التوالي، يمكن اعتباركام ميك مركب فعال على من الكرنب *B. brassicae* وآمن فى نفس الوقت على مفترس *H. convergens*.

الكلمات الاسترشادية: السمية الإختيارية، المبيدات الحشرية، مفترس المن *Hippodamia convergens*.

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