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EFFECT OF ACTELLI C, MARSHAL AND THE MINERAL OIL (CAPL- 2) ON THE ACTIVITY OF CERTAIN ENZYMES OF *APHISGOSSYPII*, *BREVICORYNE BRASSICAE*AND THE PREDATOR *CHRYSOPERLA CARNEA.*

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ABSTRACT: Changes in activity of certain enzymes of cotton aphid, *Aphis gossypii* Glov.; cabbage aphid, *Brevicoryne brassicae L.* and the predator *Chrysoperla carnea* Stephen as influnced by Actellic, Marshal and the mineral oil (Capl-2) were studies under laboratory conditions.

The results indicated that Actellic increased trehalase, invertase, amylase, GOT and GPT activity while it reduced soluble protein content in *B. brassicae* (that infested different cruciferous treated hosts), *A. gossypii* (on treated cucumber) and *C.carnea* that fed on the two poisoned aphid species.

Marshal increased trehalase, GOT and GPT activity while reduced invertase, amylase activity and soluble protein content of *B. brassicae* infesting treated cruciferous plants, *A. gossypii* on treated cucumber and *C. carnea* fed on the previous treated aphid species. Mineral oil (Capl-2) decreased invertase, amylase, GOT and GPT activity and increased soluble protein in insects on different plants and had no effect on trehalase in *B. brassicae* (on radish, roquet and turnip) but decreased it in the same insect (on cabbage and cauliflower) and also in *A. gossypii* on cucumber. It could be

concloded that the tested pesticides had affected some vital biochemical systems and the effect was differed in accordance to insect species, host plant for aphids and feeding kind of the predator *C. carnea*.

INTRODUCTION

Carbohydrates are vital important components since they can be utilized by the organism for producing energy or conversion to lipids or protein, (Chippendal (1978). Metabolism of carbohydrates are controlled mainly by trehalase, invertase and amylase enzymes (Wyatt, 1967 and Wig lesorth, 1972).

Also, the transaminase enzymes activity and total soluble protein content have an important role in biological and physiological activities of insects. Therefore, the effect of insecticides on these biosystems were studied by many authors on many insects.

The effect of insecticides on biochemical activities of target and nontarget insect must be considered as an important aspect in integrated pest management stratigy to drow complete mape of insectidies effeciency. The mainly biochemical responses taking in considration were carbohydrate hydrolyzing enzymes, transaminase enzymes and total soluble protein content. The present work was conducted to determine the effect of Actellic. 50% EC, O,O- dimethyl O- (2-diethyl amino- 6 – methyl – 4-byrimidinyl phosphorothioate. Marshal, 25 % W.P. 2,3 dihdro – 2 , 2 dimethyl – 7- benzofuranyl (dibutylamino) thiomethyl carbamate and the mineral oil (Capl-2) on the activities of some biochemical systems such as carbohydrate hydrolyzing enzymes (trehalase, invertase and amylase). transaminase enzymes (GOT and GPT) and total soluble protein in two aphid species (*Aphis gossypii*, *Brevicoryne brassicae* and the predator *Chrysoperla carnea*.

MATERIALS AND METHODS

The biochemical responses of two aphids species, *A. gossypii*, *B.brassicae* and their predator (*C. carnea* to an organophosphorus insecticide (Actellic), carbamate insecticide (Marshal) and the mineral oil (Capl-2) were assesed under laboratory conditions.

a- Rearing and sampling of insects

The two aphid species were collected from infested plants in the field (cucumber, radish, cabbage, turnp, roquet and cauliflower) then transferred to the same hosts grown in pots in the laboratory and left to colonize on these plants for many generations. The infested plants were arranged to four groups; three of which were sprayed with Actellic, Marshal and Capl-2 at the recommended rates; 1L, 750gm and 3 L./fedan respectively, but the 4th group was sprayed with water only to be used as a check.

Aphid samples of about 200 nymphs each (one gram approximately) were collected from the four treated groups using a fine camel hairbruch after 48hr of treatment and put separately in small jars. The jars were kept in freezer till biochemical analysis.

As for Green lacewing *C.carnea*, adults were collected from the field and reared on aphids as prey in the laboratory for more than one generation. The 3rd instar larvae were arranged into 4groups; three of which fed on the survived aphid, which treated with sublethal doses of Actellic, Marshal and Capl-2. The 4th group were fed on non poisoned aphids and used as check. Sample of 50 alive larvae each for treatment were placed in clean jars and kept in freezer till analysis.

b- Biochemical analysis

The freezed samples of aphids and green lacewing were homogenized for 3 minuts in distilled water 5ml/sample. using a teflon homogenizer surrounded with a jacket of crushed ice. The homogenates

were centrifuged at 3500 r.p.m. For 10 minutes at 5°c. The supernatants were immediately assyed to determine total soluble protein, activities of glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), trehalase, amylase and invertase enzymes.

Coluorimetric determination of total soluble protein in supernatent of homogenized aphids and green lacewing were carried out as described by Henry (1964).

The activities of GOT and GPT were assesed colourimetrically according to the method of Reitman and Frankle (1957) using spectrophotometer at 520 n.m.

The methods used to determin the digestion of starch and sucrose by trehalase, amylase and invertase enzymes, respectively was similar to those of Ishaaya & Swiriski (1976).

Activity of control enzymes was considered as 100 % activity and the activity of the same enzymes existed in the pestisidal treated insects was compared to that of control.

RESULTS AND DISCUSSION

1- Carbobydrate hydrolyzing enzymes

Data given in Table (1) show the changes in activity of carbohydrate hydrolyzing enzymes which found in the supernatant of *A.gossypii* nymphs reared on cucumber, *B.brassicae* nymphs reared on differeent cruciferae hosts and the 3rd instar larvae of *C.carnea* reared on pesticidal treated nymphs of both species of aphids. Enzyme activity was measured after 48 hrs of pesticide exposure.

a-Trehalase enzyme

The results showed that the *B.brassicae* treated with Capl-2 and reared on cabbage and cauliflower tended to decrease trehalase activity, while no changes were recorded in the activity of this enzyme as compared with the control when

reared on radish, roquet and turnip. This compound had no effect on the same enzyme of *A.gossypii* when reared on cucumber. Marshal and Actellic caused an increase in trehalase activity in both species of aphids reared on the different treated hosts (Table 1).

Trehalase activity in *C.carnea* was increased when the predator fed on *A. gossypii* and *B. brassica* reared on treated plants treated with Actellic and Marshal. The rate of increase was more obvious for Actellic than for Marshal as compared to the control. Capl-2 slightly increased trehalase activity of *C.carnea* when fed on aphids poisoned by this compound.

b- Invertase Enzyme

Data presented in (Table 1) indicate the changes in invertase activity in aphid speices and green lacewing as influnced by the pesticidal treatment. In case of *A.gossypii* reared on cucumber plants, Actellic increased invertase activity by 31.2 % comparing with control while Capl- 2 and Marshal reduced its activity by 31.2 and 18.6 %, respectively.

Also, Actellic tended to increase invertase activity in *B.brassicae* reared on the different hosts of cruciferae plants. While the other two pesticides (Marshal and Capl –2) reduced invertase activity of this aphids irrespective of the tested host plant. The three tested compounds increased invertase activity in *C.cranea* reared on both species of poisoned aphids. Actellic caused the highest increase in invertase activity followed by Marshal and Capl-2, respectively.

C. Amylase enzyme

The obtained results recorded in Table (1) showed that changes in amylase activity as influnced by pesticides took the same trend which was observed before in case of invertase enzyme. Capl-2 and Marshal reduced amylase

activity in both aphid species reared on different host plants while Actellic increased the activity of this enzyme. The three tested pesticides increased the activity of amylase enzyme in insetiphagus *C.carnea* fed on the two aphid species treated with these pesticides. An exeption was recorded for *C.cranea* fed on *B. brassicae* treated with Capl-2, whereas the activity of enzyme not affected. Amylase activity in *B.brassicae* was influnced not only by the tested pesticides but also by the host plant of aphids Table (1). Activity of amylase enzyme in the predator was also affected by the type of prey as well as the type of pesticide used.

These results are in agreement with those obtained by Mead (2000) who reported that carbohydrate hydrolyzing enzymes of the cowbea aphid. *Aphis craccivora* was affected by treatment with KZ oil and Actellic as compared to control.

2- Transaminase enzymes

Data given in Table (2) represent the changes in activities of GOT and GPT detected in supernatant of homogenated aphid species and their predator. In case of cotton aphid, *Aphis gossypii* reared on cucumber plants it was found that Marshal and Actellic increased GOT activity by 14.5 and 18.8 %, respectively, as compared with control, while Capl-2 decreased GOT' activity by 81.8% of the control.

The same trend was also noticed for GOT activity in *B.brassicae* fed on different cruciferae host plants. Marshal and Actellic clearly increased the activity of this enzyme in aphids reared on the different hosts. Effect of Actellic was very obvious than that of Marshal on all hosts approximately. However activity of the enzyme was differed from one host to another Capl-2

reduced GOT activity in aphids reared on the different hosts.

As for the predator *C.carnae* all the tested compounds increased GOT activity in the 3rd instar larvae fed on *A.gossypii* or *B.brassicae* poisoned with these compounds comparing with the control. Actellic treatment recorded the highest percent of activity 55.6% followed by Capl-2 36.6% and Marshal 13.7 % when fed on *A.gossypii*, while the increase in activity was low when *C.carnea* fed on *B.brassicae*.

These results are in agreement with the results of Mead (2000) who indicated that Actellic increased GOT activity while KZ oil decreased it in *Aphis craccivora* nymphs. The effect of the tested pesticides on GPT activity was less than that on GOT. Marhsal and Actellic increased its activity while Capl-2 decreased it, irrespective of the type of host.

Increase or decrease of GPT activity as influnced by the pesticides. plant was differed also from one host to another.

In case of green lacewing *C.carnea* all the tested compounds incresed GPT activity when fed on the two aphid species poisoned with these compounds except individuals which fed on *B. brassicae* poisoned with Capl- 2.

GPT activity recorded the highest level when the predator was fed on *B.brassicae* treated with Actellic, while the lowest activity which in parallel with that of the control 100% recorded with *B.brassicae* treated with Capl-2.

These results are in agreement with those reported by Mead (2000) who indicated that the KZ oil decreased GPT activity in *Aphis craccivora*, while Actellic increased it. Also, the same trend aproximately was recorded by El-Sheakh *et al.* (1994) who showed that there were positive relations between GPT activity in *Aphis gossypii* and the

relations between GPT activity in *Aphis gossypii* and the treatment of cotton plants with insecticdes.

3- Total soluble protein

The total soluble protein in *B. brassicae* reared on the different cruciferous hosts was generally decreased by different percentages as a result of Marshal and Actellic treatment. Marshal was the most effective in reducing the total soluble protein followed by Actellic while Capl-2 slightly increased the total soluble protein. Total soluble protein differed also from host plant to another. In other words, host plant of aphid had an obvious role in the quantity of total soluble protein exsisted in the body of aphids. The same trend was also observed for *A.gossypii* reared on cucumber plants whereas Marshal and Actellic clearly decreased the total soluble protein while Capl-2 slightly increased it.

In case of *C.carnea* the total soluble protein tended to take the same trend showed before in the two aphid species. Total soluble protein increased when the predator fed on aphids. *A.gosypii* and *B.brasicae* treated with Capl-2 compared with control, while the total soluble protein slightly decrease when the predator fed on the two tested aphis treated with Marshal and Actellic. These results corroborates with those of Mohamdy (2000) who indicated that the convintional insecticides reduced total soluble protein level of cotton leaf worm *S.littoralis*. Mead (2000) showed decreasing total protein content in cowbea aphid treated with Actellic and no effect with KZ oil as compared to control.

Table (1) changes in activities of carbohydrate hydrolyzing enzymes (µg glucose / minute / ml) in *Brevicoryne brassicae*, *Aphis gossypii* and *Chrysoperla carnea* treated with Capl-2, Marshal and Actellic.

Insects	*Brevicoryne brassicae*															*Aphis gosspil*			*Chrysoperla Carnea*					
Parameter	Trehalase					Invertase					Amylase					trehalase	invertase	amylase	Trehalase		Invertase		Amylase	
Treatment	Radish	Cabbage	Baquet	Turnip	Cauliflower	Radish	Cabbage	Baquets	Turnip	Cauliflower	Radish	Cabbage	Baquets	Turnip	Cauliflower	Cucumber			A	B	A	B	A	b
Means Control	554.2	368.2	485.0	382.5	418.7	791.3	382.8	561.5	663.6	612.6	697.1	568.6	485.0	394.0	686.2	374.1	408.1	333.4	762.1	896.8	1352.8	1888.9	1364.8	1121.5
% activity	1.00	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Means Capl-2	554.2	221.7	485.0	332.5	277.1	587.1	255.2	382.8	433.9	381.0	686.2	394.0	436.8	383.1	491.1	374.1	288.7	272.0	831.4	900.7	1378.4	2042.1	1364.8	1182.1
% changes	0.00	-38.4	0.00	0.00	-33.3	-25.8	-33.3	-31.8	-34.6	-38.8	-13.8	-27.7	-9.9	-23.0	-18.9	100.0	-31.2	-18.1	+9.0	+1.5	+1.8	+8.1	0.00	+5.4
Means Marshal	595.8	429.5	540.4	415.7	637.4	678.6	331.8	485.6	536.5	516.5	650.3	509.1	391.8	369.0	515.3	471.1	331.8	303.1	983.8	99.7	1506.0	2271.8	1909.6	1394.3
% changes	+7.5	+19.2	+11.4	+25.8	+53.3	-41.2	-13.3	-13.6	-19.1	-16.6	-6.7	-6.6	-19.2	-6.3	-14.9	+25.9	-18.6	-9.0	+29.0	+12.5	+11.3	+20.2	+40.0	+24.3
Mean Actellic	1011.0	679.0	901.0	623.6	914.8	791.3	488.4	740.2	714.2	816.8	970.0	727.5	545.6	485.0	909.3	568.1	536.0	424.3	1247.1	1191.7	1633.6	2552.6	2364.3	1879.3
% changes	+82.4	+88.5	+85.7	+87.5	+20.0	100.0	+6.6	+31.8	+7.6	+33.3	+39.1	+33.3	+12.4	+23.5	+50.0	+51.8	+31.3	+63.6	+34.3	+34.3	+20.7	+35.1	+473.3	+67.5

A. *Brevicoryne brassicae*

B. *Aphis gossypii*

Table (2): Changes in activities of transaminase enzymes (GOT and GPT, µg/ L.) in *Brevicoryne brassicae*, *Aphis gossypii* and *Chrysoperla carnea* treated with Capl- 2 Marshal and Actellic.

Insects	*Brevicoryne brassicae*										*Aphis gossypii*		*Chrysoperla carnea*			
Parameter	Got					GPT					GOT	GPT	GOT		GPT	
Host plants / Treatment	Radish.	Cabbage	Roquet.	Turnip.	Cauliflower.	Radish.	Cabbage	Roquet.	Turnip.	Cauliflower.	Cucumber		A	B	A	B
Control Mean (µg/L)	16.1	25.2	28.0	32.55	23.1	9.12	10.4	9.6	12.8	9.6	19.25	7.84	112.7	89.25	38.4	28.8
Control % activity	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Capl-2 Mean (µg/L)	14.0	22.4	24.5	21.35	17.5	8.0	9.76	8.96	12.5	8.32	15.75	6.56	154.0	90.3	38.4	32.0
Capl-2 % changes	-13.5	-11.1	-12.5	-34.4	-24.2	-12.3	-6.1	-6.6	-13.3	-13.3	-18.1	-16.3	+36.6	+1.1	0.00	+11.1
Marshal Mean (µg/L)	25.2	28.0	52.5	38.5	29.75	10.56	12.0	11.52	15.2	12.8	22.05	11.68	128.1	94.15	49.6	35.2
Marshal % changes	+56.5	+11.1	+87.5	+18.2	+28.7	+15.8	+15.4	+28.0	+18.7	+33.3	+14.5	+48.9	+13.6	+5.4	+29.2	+22.2
Actellic Mean (µg/L)	38.5	52.5	71.75	66.5	40.25	12.0	14.08	13.6	18.4	15.2	35.0	14.72	175.3	108.5	67.2	48.0
Actellic % changes	+139.1	+108.3	+156.2	+104.3	+74.2	+31.5	+43.0	+41.6	+43.7	+58.3	+81.8	+87.7	+55.5	+21.5	+75.0	+66.6

A. *Brevicoryne brassicae*

B. *Aphis gossypii*

Table (3): Changes in total soluble protein (gr/ 100 ml) in *Brevicoryne brassicae* , *Aphis gossypii* and *Chrysoperla carnea* treated with Capl- 2, Marshal and Actellic.

Parameter	Total soluble protein															
Insects	*Brevicoryne brassicae*										*Aphis gossypii*		*Chrysoperla carnea*			
Host plants / Treatment	Radish		Cabbage		Roquet		Turnip		Cauliflower		Cucumber		A	B	A	b
	Mean g/100ml	% changes	Mean g/100ml	% changes	Mean g/100ml	% changes	Mean g/100ml	% changes	Mean g/100ml	% changes	Mean g/100ml	% changes	Mean g/100ml	% changes	Mean g/100ml	% changes
Control	2.9	100.0	6.38	100.0	2.7	100.0	2.12	100.0	5.41	100.0	3.29	100.0	8.70	100.0	7.74	100.0
Capl-2	3.1	+6.8	6.38	0.00	3.09	+14.4	2.51	+18.3	6.19	+14.4	3.48	+5.7	10.64	+22.2	8.51	+9.9
Marshal	1.35	-53.4	4.38	-24.2	1.74	-35.5	1.35	-36.3	2.51	-53.6	1.74	-47.1	7.74	-11.0	7.35	-5.0
Actellic	1.93	-33.4	5.41	-15.2	1.93	-28.5	1.54	-27.3	3.09	-42.8	2.12	-35.5	7.74	-11.0	7.54	-2.5

A. *Brevicoryne brassicae*

B. *Aphis gossypii*

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تأثير الاكتيليك والمارشال والزيت المعدنى كابل ٢ على نشاط بعض الأنزيمات لحشرة من القطن ، من الصليبيات والمفترس أسد المن.

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درست التغيرات فى نشاط بعض الأنزيمات لكل من (من القطن *Aphis gossypii* ومن الصليبيات *Brevicoryne brassicae* والمفترس أسد المن *Chrysoperla carnea*)والتى تأثرت بفعل الاكتيليك والمارشال والزيت المعدنى كابل ٢ وذلك تحت الظروف المعملية.

أوضحت النتائج ما يلى:-

(١) الاكتيليك سبب زيادة فى نشاط كل من (التريهاليز ، الانفرتيز ، الأميليز ، GPT, GOT) بينما أدى إلى نقص المحتوى الكلى للبروتين الذائب فى من الصليبيات التى أصابت بعض نباتات العوائل الصليبية ، ومن القطن المربى على الخيار وأسد المن الذى تم تغذيته على كل من (من الصليبيات ومن القطن المعامل بالمبيدات).

(٢) المارشال سبب زيادة فى نشاط (التريهاليز ، GPT, GOT) وقلل من نشاط (الانفرتيز – الاميليز – ونقص المحتوى الكلى للبروتين الذائب فى من الصليبيات التى أصابت بعض نباتات العوائل الصليبية ، ومن القطن المربى على الخيار وأسد المن الذى تم تغذيته على كل من (من الصليبيات ومن القطن).

(٣) الزيت المعدنى Capl-2 قلل نشاط (الانفرتيز – الاميليز – GOT ، GPT) وسبب زيادة فى المحتوى الكلى للبروتين الذائب بينما لم يؤثر على التريهاليز فى من الصليبيات الذى تربى على الفجل والجرجير واللفت وسبب نقص هذا الانزيم لنفس الحشرة والتى ربيت على الكرنب والقنبيط. وأيضا كان له نفس الأثر فى من القطن والذى تم تربيته على الخيار.

والخلاصة أن المبيدات المختبرة كان لها تأثير على النظم البيوكيميائية فى الحشرات المختبرة وقد اختلف هذا التأثير تبعا لنوع الحشرة والعائل النباتى لها ونوع الغذاء لمفترس أسد المن.