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Impact of the wild plant, *Fagonia bruguieri*, extracts on the transaminase activities in some tissues of *Schistocerca gregaria* (orthoptera: acrididae).

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ABSTRACT

Three organic solvents were used for extracting the wild plant *F. bruguieri*: methanol, petroleum ether and n-butanol. One of two concentration levels of each extract (7.5 and 3.7%; 30.0 and 15.0%; 30.0 and 15.0%, respectively) was given to the newly moulted penultimate instar nymphs of the desert locust *S. gregaria* through the fresh food plant. The influenced transaminase activities were investigated in the haemolymph and fat body of the last instar nymphs and newly emerged adults.

The affected GOT activity in haemolymph of the last instar nymphs depended on the age because *F. bruguieri* extracts exhibited considerable reducing effects on it in both the early- and mid-aged nymphs but promoted enzyme activity was estimated in the late-aged nymphs, irrespective of the solvent or the concentration level. On the other hand, the strongest enhancing effect of *F. bruguieri* on the enzyme activity in haemolymph of the newly emerged adults (173.3±35.5 vs. 85.0±17.3 U/ml of controls) was exhibited after treatment with the higher concentration level of n-butanolic extract. Also, a remarkable inducing action of *F. bruguieri* extracts on the GOT activity was observed in the fat body of both late-aged nymphs and newly emerged adults, regardless to the solvent or concentration level. Nymphal treatments with *F. bruguieri* extracts resulted in an inhibited activity of the enzyme, generally, in the fat body of early- and mid-aged nymphs.

The methanolic extract from *F. bruguieri* induced the GPT activity in haemolymph along the nymphal life while the petroleum ether and n-butanolic extracts induced such enzyme activity only at the mid- and late-ages of nymphs. With regard to the newly emerged adults, *F. bruguieri*, unexceptionally prohibited the enzyme activity in haemolymph, irrespective of the solvent and concentration level. A promoting effect of *F. bruguieri* extracts on the GPT activity was exhibited in the fat body of late-aged nymphs and newly emerged adults, regardless to the solvent or concentration level. Otherwise, the *F. bruguieri* extracts exhibited an inhibitory effect on the enzyme activity in the early- and mid-aged nymphs, after treatment with petroleum ether or n-butanol for.

KeyWords: *Fagonia bruguieri, Schistocerca gregaria*, nymph, adult, glutamic oxaloacetic transaminase, glutamic pyruvic transaminase, methanol , petroleum ether , n-butanol.

INTRODUCTION

Environmental and health problems associated with the use of synthetic insecticides led researchers to look for natural plant protection agents such as botanical insecticides. In the continuous search for new and safe pest control methods, plants are considered one of the most rich sources. Active substances extracted from plants may not only act as toxicants (Schoonhoven, 1978; Mariappan and Saxena, 1984), but also as repellents, synergists (Su and Harvot, 1981), insect growth regulators (Bowers *et al*., 1972) or phagodeterrents (Meisner *et al*., 1982). Among the

plant families studied, the Meliaceae, Asteraceae, Labiateae, Piperaceae and Annonaceae are most promising (Isman, 2006). Generally, botanicals are potentially useful substitutes for synthetic chemical insecticides (Bingaman and Christians, 1995) and useful in many pest management programs (Shekari *et al*., 2008).

Transamination has been demonstrated in a number of insect tissues, particularly that concerning glutamate, aspartate and alanine (Gilmour, 1961). The glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) are key enzymes in the formation of non-essential amino acids, in metabolism in the nitrogen waste, gluconeogenesis and correlated with protein anabolism and catabolism (Mordue and Goldworth, 1973). For some details, these transaminases are the important components of amino acid catabolism; which is mainly involved in transferring an amino group from one amino acid to another keto acid. The aspartate-aminotransferase and alanine-aminotransferase serve as a strategic like between the carbohydrate and protein metabolism and are known to be altered during various physiological and pathological conditions (Etebari *et al.,* 2005). The present work was conducted aiming to investigate the effects of different extracts from the wild plant *Fagonia bruguieri* (Zygophyllaceae) on the activities of GOT and GPT in some tissues of the economically dangerous insect *Schistocerca gregaria*.

MATERIALS AND METHODS

I) Experimental Insect:

The desert locust *Schistocerca gregaria* (Frosk.) (Orthoptera: Acrididae) was used as an experimental insect in the present study. The present culture was originated by a lot of gregarious nymphs obtained from Locust Research Division, Plant Protection Research Institute, Ministry of Agriculture, Doqqi, Giza. Insects were reared in wooden formed cages measuring: 60 cm length x 60 cm Width x 70 cm height. Three sides of the cage were made of wood and the fourth side was glass, with a wire gauze tope. The front side of the cage was provided with a small door to facilitate daily routine work and maintenance of the insects. The bottom was furnished with a sandy layer of 20 cm depth and with 10-15% humidity to be suitable for egg laying. An electric bulb (100 watt) was adjusted to maintain a continuous photoperiod of 12 L: 12 D in each cage as well as in order to maintain an ambient temperature of 32±2°C.

The insects were reared and handled under the crowded conditions outlined by Hunter–Jones (1961). Half hundred adults were placed in each cage for egg laying. The feces, dead locusts and food remains were removed daily before introducing the freshly food. Care was seriously taken to clean these cages at regular intervals and the sand was sterilized in drying oven (at 140°C for 24 hours) to avoid contamination with any pathogenic microorganisms. Fresh clean leaves of berseem *Medicago sativa*, in winter, and the leaves of leguminous plant *Sesbania aegyptiaca,* in summer, were used as a food for insects. On the other hand, the berseem leaves only were offered as food for insects during the experimental work.

II) Plant extracts:

Fagonia bruguieri var. *bruguieri* is a perennial wild herb distributed all deserts in Egypt but profusely spread in Sinai. It is, also, distributed in Arabia, Syria, Jordon, Iraq, Palestine, Iran, Pakistan, Afghanistan and North Africa. It systematically belongs to family Zygophyllaceae. The aerial parts of the plant (leaves, stems and flowers) were collected from the region of Santa Catherin (Sinai) during flowering stage, and kindly identified by Dr. Abdo marey, Faculty of Science, Al-Azhar University (Cairo). The collected samples were air-dried, powdered and kept in

tightly closed amber coloured glass containers for protecting from light, at low temperature.

Dried and pulverized powder of *F. bruguieri* (2 kg) was exhaustively separately extracted with methanol (1.7 Lx3). The combined alcohol extracts were concentrated to 400 ml, diluted with 400 ml of water and the next successively extracted with petroleum ether (5x400 ml) was concentrated to dryness under reduced pressure giving (80g), while n-butanol (5x400 ml) extracts were concentrated to dryness under reduced pressure giving (60 g).

III) Nymphal Treatments:

Tow concentration levels of the methanolic extract (7.5 and 3.7%) were used as well as 30.0 and 15.0% of the petroleum ether extract and n-butanolic extract were used.

The newly moulted 4^{th} (penultimate) instar nymphs of *S. gregaria* were fed on fresh leaves of *M. sativa* after dipping in different concentration levels of each extract. After dipping for three minutes, the treated leaves were allowed to dry before offering to the nymphs. A day after treatment, all nymphs (treated and control) were provided with untreated food plant. Ten replicates (one nymph/replicate) were used for each concentration. Each individual nymph was isolated in a glass vial provided with a thin layer of sterilized sand as a floor.

III) Enzymological Investigation:

(1) Enzyme preparation:

For the determination of the glutamate oxaloacetic transaminase (GOT) and glutamate pyruvic transaminase (GPT) activities in the fat body, samples of this tissue were collected from 5^{th} instar nymphs of different ages (early, mid and late) and early adults after treatment the early 4^{th} instar nymphs. The fat body was weighed and then homogenized in a saline solution (the fat body of one insect / 1 ml saline solution 0.7 %) using a fine electric homogenizer, tissue grinder for 2 min. Homogenates were centrifuged at 4000 r.p.m. for 15 min. The supernatant was used directly or frozen until the use for the enzymatic determination. Three replicates were used and the fat bodies from two individuals were avoided to be mixed.

For the determination of the GPT and GOT activities in the haemolymph was collected from 5^{th} (last) instar nymphs of the same ages and early emerged adults, after treatment the early 4^{th} (penultimate) instar nymphs. Haemolymph was drawn into Eppendorff Pipetman containing few milligrams of phenoloxidase inhibitor (phenylthiourea) to prevent tanning or darkening and then diluted 5× with saline solution 0.7%. For whole blood assays, the diluted haemolymph was frozen for 20s to rupture the haemocytes. The haemolymph samples were then centrifuged at 2000 r.p.m. for 5 min, and only the supernatant fractions were used for assay directly or frozen until use. Three replicates were used and the haemolymph of two individuals were never mixed.

(2) Transaminase Measurements:

The GOT activity was determined according to the method of (Harold, 1975) using a kit of Bioadwic. The enzyme was measured at wave length 546 nm by spectrophotometer. The GPT activity was determined according to the method of (Harold, 1975) using a kit of Bioadwic. The enzyme was measured at wave length 546 nm by spectrophotometer.

IV) Statistical Analysis of Data:

Data obtained were analyzed by the Student's *t*-distribution, and refined by Bessel correction (Moroney, 1956) for the test significance of difference between means.

RESULTS

1) Effects of *Fagonia bruguieri* extracts on the glutamic oxaloacetic transaminase activity in haemolymph of *Schistocerca gregaria*:

After feeding of penultimate instar nymphs of *Schistocerca gregaria* on different extracts from *Fagonia bruguieri*, the glutamic oxaloacetic transaminase (GOT) activity in the haemolymph of last instar nymphs and newly emerged adults was investigated. The obtained data are arranged in Table (1), in which the affected enzyme activity depended on the age because *F. bruguieri* extracts exhibited considerable reducing effects on it in both the early- and mid-aged nymphs but promoted enzyme activity was determined in the late-aged nymphs, irrespective of the solvent or the concentration level.

Table (1): Effects of Fagonia bruguieri extracts on the glutamic oxaloacetic transaminase activity (U/ml) in haemolymph of the desert locust Schistocerca gregaria.

Solvent	Conc. %		Last instar nymphs			Newly emerged adults
			Early-aged	Mid-aged	Late-aged	
Methanol	7.5	Mean ± SD	60.0 ± 8.7 a	60.0 ± 8.7 b	108.3 ± 13.1 c	135.0 ± 20.0 b
		Change %	-20.0	-38.0	+170.8	+58.8
	3.7	Mean ± SD	70.0 ± 8.7 a	55.0 ± 8.7 b	60.0 ± 8.7 b	108.3 ± 11.5 a
		Change %	- 6.7	- 43.1	+50.0	+27.4
Petrolium ether	30	Mean ± SD	33.3 ± 17.6 b	50.0 ± 15.0 b	128.3 ± 13.1 d	171.7 ± 14.4 c
		Change %	-55.6	-48.3	+220.8	+102.0
	15	Mean ± SD	45.0 ± 8.7 b	85.0 ± 8.7 a	80.0 ± 10.0 c	143.3 ± 13.3 c
		Change %	- 40.0	-12.1	+100.0	+ 68.6
n-butanol	30	Mean ± SD	50.0 ± 15.0 a	28.3 ± 11.5 c	85.0 ± 8.7 c	173.3 ± 35.5 b
		Change %	-33.3	-70.7	+112.5	+103.9
	15	Mean ± SD	65.0 ± 15.0 a	50.0 ± 15.0 b	45.0 ± 8.7 a	128.3 ± 11.5 b
		Change %	-13.3	-48.3	+12..5	+50.9
Controls		Mean ± SD	75.0 ± 8.7	96.7 ± 17.6	40.0 ± 8.7	85.0 ± 17.3

Conc.: Concentration, mean ± SD followed with the same letter (a): is not significantly different (P>0.05), (b): significantly different (P<0.05), (c): highly significantly different (P<0.01), (d): very highly significantly different (P<0.001).

Moreover, the most drastic inhibitory effect on GOT activity was observed in the haemolymph of mid-aged nymphs after treatment with the higher concentration level of n-butanolic extract (28.3±11.5 vs. 96.7±17.6 U/ml of control congeners) but the slightest inhibitory one was determined in early-aged nymphs after treatment with the lower concentration level of methanolic extract (70.0±8.7 vs. 75.0±8.7 U/ml of controls). As cited before, the late-aged nymphs appeared with significantly induced GOT activity in haemolymph. The most potent inducing effect was exhibited by the petroleum ether extract (Change % : +220.8 at the higher concentration level) while the minimal inducing one was expressed in Change % as +12.5 after treatment with the lower concentration level of n-butanolic extract.

As exiguously shown in the same table, such enhancing effect of *F. bruguieri* on GOT activity in the haemolymph extended to the newly emerged adults reaching its maximal potency (173.3±35.5 vs. 85.0±17.3 U/ml of control corresponding) after treatment with the higher concentration level of n-butanolic extract.

2-Effects of *F. bruguieri* extracts on the GOT activity in fat body of *S. gregaria*:

Just a look to data distributed in Table (2) clearly reveals a remarkable inducing effect of *F. bruguieri* extracts on the GOT activity in the fat body of both the late-aged nymphs and newly emerged adults, regardless to the solvent or concentration level . As unambiguously seen, the maximal promoting effect in fat body of the late-aged nymphs was recorded for petroleum ether extract (Change%:+22.8,at concentration level 30%) while the lowest promoting effect in the same nymphs was exhibited by the methanolic extract (Change %: +1.5, at concentration level 3.7%). The two extremes of the stimulatory effect on GOT activity in fat body of the newly emerged adults were measured by n-butanolic extract (Change%:+83.9at concentration level 15%) and petroleum ether extract (Change%:+0.7,at concentration level 15%), respectively.

Table (2): Effects of Fagonia bruguieri extracts on the glutamic oxaloacetic transaminase activity (U/ml) in fat bodies of the desert locust Schistocerca gregaria.

Solvent	Conc. %		Last instar nymphs			Newly emerged adults
			Early-aged	Mid-aged	Late-aged	
Methanol	7.5	Mean ± SD	276.3 ± 12.7 d	319.2 ± 12.5 b	212.3 ± 8.5 b	390.3 ± 18.3 d
		Change %	-32.5	+10.0	+13.2	+70.4
	3.7	Mean ± SD	309.2 ± 20.0 c	300.1 ± 12.1 a	190.4 ± 9.7 a	376.4 ± 15.7 d
		Change %	-24.5	+3.4	+1.5	+64.3
Petrolium ether	30	Mean ± SD	210.7 ± 16.7 d	187.7 ± 11.2 d	230.3 ± 12.0 c	231.3 ± 12.0 a
		Change %	-48.5	-35.3	+22.8	+1.0
	15	Mean ± SD	215.4 ± 8.5 d	195.2 ± 9.7 d	210.3 ± 10.1 b	230.6 ± 21.1 a
		Change %	-47.4	-32.8	+12.1	+0.7
n-butanol	30	Mean ± SD	152.3 ± 18.3 d	202.1 ± 8.5 d	215.3 ± 8.1 b	411.7 ± 24.8 d
		Change %	-62.8	-30.4	+14.8	+79.7
	15	Mean ± SD	231.0 ± 12.0 d	311.3 ± 15.9 a	207.1 ± 8.5 b	421.3 ± 18.8 d
		Change %	-43.6	+7.2	+10.4	+83.9
Controls		Mean ± SD	409.5 ± 17.4	290.3 ± 7.5	187.6 ± 7.7	229.1 ± 5.5

Conc., a, b, c, d: see footnote of Table (1).

3-Effects of *F. bruguieri* extracts on the glutamic pyruvic transaminase activity in haemolymph of *S. gregaria*:

In view of data listed in Table (3), the glutamic pyruvic transaminase (GPT) activity in the haemolymph on both nymphs and adults were considerably disturbed by the action of *F. bruguieri* extracts. The methanolic extract of *F. bruguieri* induced the enzyme activity along the nymphal life while the petroleum ether and n-butanolic extracts promoted such enzyme activity only at the mid- and late-ages of nymphs. The most potent reducing effect was exhibited in the early-aged nymphs by the higher concentration level of n-butanolic extract (Change %: - 61.8). On the other hand, the strongest enhancing effect on GPT activity in the haemolymph was exhibited in the late-aged nymphs (35.0±8.7 or 35.0±13.2 U/ml, at the higher concentration level of methanolic or n-butanolic extract, in comparison with 8.3±5.8 U/ml of control congeners). In addition, the least potent enhancing effect of *F. bruguieri* extracts was estimated as 26.7±5.8 U/ml (vs. 21.7±7.6 U/ml of controls) in the haemolymph of early-aged nymphs after treatment with lower concentration level of methanolic extract.

Table (3): Effects of Fagonia bruguieri extracts on the glutamic pyruvic transaminase activity (U/ml) in haemolymph of the desert locust Schistocerca gregaria.

Solvent	Conc. %		Last instar nymphs			Newly emerged adults
			Early-aged	Mid-aged	Late-aged	
Methanol	7.5	Mean ± SD	45.0 ± 8.7 b	38.3 ± 7.6 b	35.0 ± 8.7 b	68.3 ± 11.4 c
		Change %	+107.4	+129.3	+321.7	-33.9
	3.7	Mean ± SD	26.7 ± 5.8 a	25.0 ± 8.7 a	16.7 ± 2.9 a	78.3 ± 11.1 b
		Change %	+23.0	+49.7	+101.2	-24.2
Petrolium ether	30	Mean ± SD	11.7 ± 5.8 a	41.7 ± 2.9 d	26.7 ± 9.5 b	50.0 ± 8.7 d
		Change %	-46.1	+149.7	+221.7	-51.6
	15	Mean ± SD	13.3 ± 7.6 a	46.7 ± 5.8 c	25.0 ± 7.7 b	71.7 ± 12.6 b
		Change %	-38.7	+179.6	+201.2	-30.6
n-butanol	30	Mean ± SD	8.3 ± 5.8 a	50.0 ± 8.7 c	35.0 ± 13.2 b	48.3 ± 9.4 d
		Change %	-61.8	+199.4	+321.7	-53.2
	15	Mean ± SD	11.7 ± 8.8 a	25.0 ± 8.7 a	18.3 ± 2.9 a	66.7 ± 11.1 c
		Change %	-46.1	+49.7	+120.5	-35.4
Controls		Mean ± SD	21.7 ± 7.6	16.7 ± 2.9	8.3 ± 5.8	103.3 ± 5.8

Conc., a, b, c, d: see footnote of Table (1).

In respect to the newly emerged adults, *F. bruguieri* unexceptionally prohibited the GPT activity in haemolymph, irrespective of the solvent or the concentration level. The strongest prohibiting effect was exhibited by the n-butanolic extract (48.3±9.4 U/ml, at higher concentration level in comparison with 103.3±5.8 U/ml of control congeners).

4-Effects of *F. bruguieri* extracts on the GPT activity in fat body of *S. gregaria*:

As clearly shown by data of Table (4), the most attractive observation was the promoting effect of *F. bruguieri* extracts on the GPT activity in the fat body of late-aged nymphs and newly emerged adults, regardless to the solvent or concentration level. Such promoting effect on the enzyme activity in late-aged nymphs reached the maximum at the lower concentration level of n-butanolic extract (Change%: +26.1) while the minimally enhanced activity was measured at the lower concentration level of methanolic extract (Change%: +0.6) in the fat body of mid-aged nymphs. Regarding to the adults, the induction of enzyme activity reached its maximal value (Change %: +20.3) at the lower concentration level of n-butanolic extract but its minimum (Change %: + 0.7) was observed at the lower concentration level of petroleum ether extract. In addition, the methanolic extract exhibited an inducing effect on the GPT activity in the fat body along the nymphal instar as well as in the newly emerged adults.

The *F. bruguieri* extracts exerted an inhibitory effect after extraction with only petroleum ether or n-butanol for the early- and mid-aged nymphs. Depending on the obtained results, the strongest inhibitory effect was exhibited by petroleum ether extract but the least one was exerted by n-butanolic extract (129.2±10.0 U/ml in the fat body of mid-aged nymphs and 120.7±10.2 U/ml in early-aged nymphs , respectively, compared to 201.7±6.4 and 122.6±6.3 U/ml in the fat body of control congeners).

Table (4): Effects of Fagonia bruguieri extracts on the glutamic pyruvic transaminase activity (U/ml) in fat bodies of the desert locust Schistocerca gregaria.

Solvent	Conc. %		Last instar nymphs			Newly emerged adults
			Early-aged	Mid-aged	Late-aged	
Methanol	7.5	Mean ± SD	147.9 ± 10.1 b	204.0 ± 9.6 a	188.9 ± 9.5 b	240.6 ± 13..2 b
		Change %	+20.6	+1.1	+15.3	+12.4
	3.7	Mean ± SD	124.3 ± 8.5 a	202.9 ± 11.1 a	170.3 ± 6.5 a	220.1 ± 9.6 a
		Change %	+1.4	+0.6	+3.9	+2.9
Petrolium ether	30	Mean ± SD	101.1 ± 7.5 b	129.2 ± 10.0 d	195.2 ± 10.2 b	216.1 ± 12.0 a
		Change %	-17.5	-35.9	+19.1	+1.0
	15	Mean ± SD	106.3 ± 6.0 b	143.2 ± 9.6 d	186.5 ±10.0 b	215.6 ± 10.1 a
		Change %	-13.3	-29	+13.8	+0.7
n-butanol	30	Mean ± SD	104.2 ± 8.4 b	158.8 ± 10.2 c	185.7 ± 8.7 b	249.8 ± 14.1 b
		Change %	-15.0	-21.3	+13.3	+16.7
	15	Mean ± SD	120.7 ± 10.2 a	167.3 ±13.4 b	206.7 ± 9.1 c	257.4 ± 19.2 b
		Change %	-1.5	-17.1	+26.1	+20.3
Controls		Mean ± SD	122.6 ± 6.3	201.7 ± 6.4	163.9 ± 6.0	214.0 ± 7.2

Conc., a, b, c, d: see footnote of Table (1).

DISCUSSION

1) *Disturbed GOT Activity In Haemolymph And Fat Body:*

According to the available literature, the affected GOT activity depends not only on the insect species or its strain but also on its developmental stage, age, tissue, chemical nature of the compound, chemical components of the plant extract and method of treatment **(**e.g.: Saha *et al.,* 1986; Tabassum, 1994; Tabassum *et al.,* 1994, 1998; Zohry, 2006; Abdel-Ghaffar and Ghoneim, 2007; Al-Dali, 2008).

The affected GOT activity in haemolymph of the last instar nymphs of *S. gregaria*, in present study, depended on the age because *F. bruguieri* extracts exhibited considerable reducing effects on it in both the early- and mid-aged nymphs but promoted enzyme activity was estimated in the late-aged nymphs, irrespective of the solvent or the concentration level. Moreover, the most drastic inhibitory effect on the enzyme activity was observed in the mid-aged nymphs after treatment with the higher concentration level of n-butanolic extract (28.3±11.5 vs. 96.7±17.6 U/ml of control congeners). On the other hand, the maximal enhancing effect of *F. bruguieri* on the enzyme activity in haemolymph of the newly emerged adults (173.3±35.5 vs. 85.0±17.3 U/ml of control corresponding) was exerted after treatment with the higher concentration level of n-butanolic extract.

Also, a remarkable inducing action of *F. bruguieri* extracts on the GOT activity was observed in the fat body of both late-aged nymphs and newly emerged adults, regardless to the solvent or concentration level. Nymphal treatments with *F. bruguieri* extracts resulted in an inhibited activity of the enzyme, generally, in the fat body of early- and mid-aged nymphs. On the other hand, the strongest promoting effect in the late-aged nymphs was detected for petroleum ether extract (Change%: +22.8 at concentration level 30%). Also, a stimulatory effect on the enzyme activity in the newly emerged adults was exhibited by n-butanolic extract (Change %: +83.9 at concentration level 15%). In addition, the nymphal treatments with *F. bruguieri* extracts resulted in an inhibition in the enzyme activity in the fat body of early- and mid-aged nymphs.

Other plant extracts, or even insecticides and insect growth regulators (IGRs), exhibited similar effects on the activity of GOT in other insect species such as *Tribolium castaneum* by 10 and 20 ppm of cypermethrin (Saleem and Shakoori, 1986), *Spodoptera littoralis* by Margosan-0 (Mostafa, 1993), *S. littoralis* by *Melia azedarach* extracts (Hassan, 2002), *Musca domestica* by Margosan-0 and Jojoba oil (Ghoneim and Abdel-Ghaffar, 2007), *M. domestica* by the IGRs lufenuron and diofenolan (Al-Dali, 2008). The major inhibitory effect of the *F. bruguieri* extracts, in the present study, to a great extent, agrees with those effects reported for other insect species after treatment with different botanicals or IGRs, such as *T. castaneum* treated with RB-a (neem fruit seed extract) (Tabassum, 1994, Tabassum *et al.,* 1994), *Sitophilus oryzae* treated with RB-a (Azmi *et al.,* 1998), *Bombyx mori* treated with estradiol-17B (vertebrate female sex steroid hormone) (Keshan and Ray, 1998), *Alphitobium diaperinus* treated with the insecticide Danitol (Tufail, 1991) *Rhynchophorus ferrugineus* treated with azadirachtin (Azt.) (Bream, 2003), *Anophelus stephensi* treated with RB-b (Rajput, 2003).

The increasing GOT activity in haemolymph of *S. gregaria*, in the present study, generally after treatment with some of the *F. bruguieri* extracts suggests the mobilization of amino acids during the insecticidal stress exerted by certain toxic components in some of the present extracts to meet the energy demands (Zeba and Khan, 1995). In addition, the inhibitory effect of some *F. bruguieri* extracts on the GOT activity of *S. gregaria* may be due to difficulty in the formation of dissociable enzyme–inhibitor complexes, which reduce the specific enzyme activity (Dragomirescu *et al.*, 1979).

2***) Disturbed GPT Activity In Haemolymph And Fat Body:***

Inhibitory effects of several plant extracts, IGRs and insecticides on the GPT activity were reported for *Chrysocoris stolli* by an ecdysteroid (Saha *et al.,* 1985), *S. oryzae* by permethrin (+ bioallethrin) (Keshan and Ray, 1998), *S. littoralis* by Margosan-0 (Mostafa, 1993), *T. castaneum* by the neem extract RB-a (Tabassum *et al.,* 1994), *A. diaperinus* by Danitol (Tufail, 1991) and the neem formation RB-a + PBO +TX-100 (Tabassum *et al.,*1998), *S. littoralis* by *M. azedarach* extracts (Hassan, 2002), *Euprepocnemis plorans* by some neem limonoids (Abdel-Ghaffar and Ghoneim, 2007).

The methanolic extract from *F. bruguieri*, in the present study, induced the GPT activity in haemolymph of *S. gregaria* along the nymphal life while the petroleum ether and n-butanolic extracts induced such enzyme activity only at the mid- and late-ages of nymphs. With regard to the newly emerged adults, *F. bruguieri*, unexceptionally prohibited the enzyme activity in haemolymph, irrespective of the solvent and concentration level. Similar diversed effects of some other plant extracts on the GPT activity in different insect species, depending on the stage or age, were reported (Mc-Allan and Chefurka, 1961; Gilbert, 1967; Chen, 1966; Bakr *et al.,* 2002; Bream, 2003; Ghoneim and Abdel-Ghaffar, 2007). However, the varying effects of the present plant extracts on the GPT activity in decreasing or increasing levels may be due to the effect on the synthesis or functional levels of this enzyme directly or indirectly by altering the cytomorphology of the cells (Nath, 2000), or to the effect of certain effective components in the present botanical on the neurosecretory hormonal pattern (Salah *et al.,* 2002).

In the present study, also, a promoting effect of *F. bruguieri* extracts on the GPT activity was exhibited in the fat body of late-aged nymphs and newly emerged adults of *S. gregaria*, regardless to the solvent or concentration level. Otherwise, the *F. bruguieri* extracts exhibited an inhibitory effect on the enzyme activity in the early- and mid-aged nymphs, after treatment with petroleum ether or n-butanol for. Such inhibited GPT activity was possibly because pyruvate is the precursors of Krebs cycle

compounds, concerned with the mitochondrial oxidation phenomenon and ATP production **(**Azmi *et al.*, 1998).

REFERENCES

Abdel-Ghaffar, A. A. and Ghoneim, K. S. (2007). Transaminase activity in the grasshopper *Euprepocnemis plorans* (Orthoptera: Acrididae) as affected by certain neem limonoids. J. Biol. Pharm. Sci., 5(1):21-30.

Al-Dali, A. G. (2008). Transaminase activity in *Musca domestica* (Diptera: Muscidae) as affected by some insect growth regulators. 18th Inter. Conf. Egypt. Ger. Soc. Zool., 1-5 March, 56(A): 1-19.

Azmi, M. A.; Naqvi, S. N. H.; Khan, M. F.; Kahkashan, A. and Khan, F. Y. (1998). Comparative toxicological studies of RB-a (Neem Extract) and Coopex (Permethrin+Bioallethrin) against *Sitophilus oryzae* with reference to their effects on oxygen consumption and GOT, GPT activity. Turk J. Zool., 22: 307 – 310.

Bakr, F. R.; El-bermawy, S.; Emara, S.; Abulyazid, I. and Abdlwwahab, H. (2002). Biochemical studies on *Spodoptera littoralis* developmental stages after larval treatment with different botanicals extracts. Proc. 2nd Int. Conf. Plant Prot. Res. Inst., Cairo, Egypt, 1: 888 – 893.

Bingaman, B. R. and Christians, N. E. (1995). Greenhouse screening of corn gluten meal as a natural control product for broadleaf and grass weeds. HortScience 30(6): 1256-1259.

Bowers, W S.; Ohta, T.; Cleere, J. S. and Marsella, P. A. (1972). Discovery of insect antijuvenile hormones in plants yield a potential fourth generation insecticides, Science 193: 542–547.

Bream, A. S. (2003). Effect of Azadirachtin on phosphatases and transaminases activities in pupae of the red palm weevil, *Rhyncophorus ferrugineus* (Coleoptera: Curculionidae). Proc. Int. Conf. on Date Palm, 16 -19 Sep.

Chen, P. S. (1966). Amino acid and protein metabolism in insect development. Adv. Ins. Physiol., Academic Press, NewYork.

Dragomirescu, A.; Raileanu, L. and Ababei, L. (1979). The effect of carbetox on glycolysis and the activity of some enzymes in carbohydrate metabolism in the fish and rat liver. *Water*. Res., 9: 205.

Etebari, K.; Mirhoseini, S. Z. and Matindoost L. (2005). A study on intraspecific biodiversity of eight groups of silkworm (Bombyx mori) by biochemical markers, Insect. Sci., 12: 87 – 94.

Ghoneim, K. S. and Abdel-Ghaffar, A. A. (2007). Effectiveness of certain plant extracts in transaminase activities of the house fly *Musca domestica* (Diptera: Muscidae). J. Biol. Pharm. Sci., 5(1): 1-12.

Gilbert, L. I. (1967). Biochemical correlation in insect metamorphosis. Comp. Biochem., 28: 199 – 252.

Gilmour, D. (1961). The biochemistry of insects. New York: Academic Press.

Harold, V. (1975). Practical Clinical Biochemistry. 4th ed; p. 294.

Hassan, H. A. (2002). Biological and biochemical studies on the effects of some botanical extracts on cotton leafwom *Spodoptera littoralis* (Boisd.) (Lepidoptera: Noctuidae). Unpublished M. Sc. Thesis, Fac. Sci., Ain Shams Univ., Egypt.

Hunter-Jones, P. (1961). Rearing and breeding locusts in the laboratory. Bull. Anti-locust Res. Center London, 12 pp.

Ismann, M. B. (2006). Botanical insecticides, deterrents and repellents in modern agricultural and an increasingly regulated world. Annu. Rev. Entomol., 51: 45 – 56.

Keshan, B. and Ray, A. K. (1998). Estradiol-17β in *Bombyx mori*: possible significance and its effect on silk production. J. Insect Physiol., 46(6): 1061- 1068.

Mariappan, V. and Sexena, R. C. (1984). Effect of mixture of custard apple oil and neem oil on survival of Nephotettix. virescens (Homoptera:Cicadellidae) and on rice tungro virus transmission, J. Econ. Entomol. 7: 519-521.

McAllan, J. W. and Chefurka, W. (1961). Some physiological aspects of glutamate asparate transamination in insects. Comp. Biochem. Physiol., 2: 290 - 301.

Meisner, J. Fleischerand, A. and C. Elzick, C. (1982). Phagodeterrency induced by Carvon in the larvae of *Spodoptera littoralis* (Boisd), J. Econ. Entomol. 75: 462- 466.

Mordue, W. and Goldworthy, G. J. (1973). Transaminase levels and uric acid production in adult locusts. Insect Biochem., 3: 419 – 427.

Moroney, M. J. (1956). Facts from figures (3rd ed.). Penguin Books Ltd., Harmondsworth. Middle Sex.

Mostafa, S. A. (1993). Biochemical effect of some chemical compounds on *Spodoptera littoralis* (Boisd.). Unpublished Ph.D. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.

Nath, B. S. (2000). Changes in carbohydrate metabolism in hemolymph and fat body of the silkworm, *Bombyx mori* L., exposed to organophosphorus insecticides. Pestic. Biochem. Physiol., 68: 127–137.

Rajput, M. T. (2003). Potential of different neem products for the control of *Anopheles stephensi* and their effect on morpho;ogy and enzyme pattern. Unpublished Ph. D. Thesis, Univ. Karachi, Pakistan.

Saha L. ; Mandal S. and Choudhuri D. K. (1986). Role of corpora-allata and brain of adult female *Lohita grandis* Gray. Acta Physiol. Hung., 67(1):13 - 25.

Saha L. M.; Mandal S. and Choudhuri D. K. (1985). Biochemical changes in testis and ovary of *Chrysocoris stolli* Wolf. after the application of juvenoid and ecdysterone. Rev. Esp. Fisiol., 41(2): 249 - 58.

Salah, K. h.; El-Bermawy, S. M. and Abul-Yazid, I. (2002). Biochemical studies on the pupal stage of Mediterranean fruit fly *Ceratitis capitata* (Wied) after irradiation of egg stage with chronic gamma dosages. Academy Sci. Res., (in press).

Saleem, M. A. and Shakoori, A. R. (1986). Biochemical Effects of sublethal doses of Cypermethrin on the sixth-lnstar larvae of *Tribolium castaneum* (Herbst.). Arch. Insect. Biochem. Physiol., 3: 447 – 455.

Schoonhoven, L. M. (1978). Use of vegetable oils to protect stored beans from Bruchid attack, J. Econ. Entomol. 71: 254–256.

Shekari, M.; Sendi, J. J.; Etebari, K.; Zibaee, A. and Shadparvar, A. (2008). Effects of *Artemisia annua* L. (Asteracea) on nutritional physiology and enzyme activities of elm leaf beetle, *Xanthogaleruca luteola* Mull. (Coleoptera: Chrysomellidae). Pestic. Biochem. Physiol., 91: 66 - 74.

Su, H. C. F. and Harvort, R. (1981). Isolation identification and insecticidal properties of *Piper nigrum amides*, J. Agric. Food. Chem. 29: 115-118.

Tabassum, R. (1994). Toxicity and residual effect of some neem compounds (nimocinoloetc) in comparison with IGR (Dimilin) against stored grain pests. Unpublished Ph. D. Thesis, Dept. Zool., Univ. Karachi, Pakistan.

Tabassum, R.; Jahan, M. and Naqvi, S. N. H. (1994). Determination of toxicity of Sisthion and RB–a formulation (neem extract) against *Tribolium castaneum* (Herbst.) adults and their effect on transaminases. Neem. Newsletter. (India), 11 (1): 7–9.

Tabassum, R.; Naqvi, S. N. H.; Jahan, M.; Nurulain, S. M.; Khan, M. F. and Azmi, M. A. (1998). Determination of the toxicities of fenpropathrin (pyrethroid) and neem formulation (RB–a+PBO+Tx–100) against *Alphitobius diaperinus* adults and their effects on transaminases. Turk J. Zool., 22: 319 – 322.

Tufail, N. (1991). Biochemical toxicology of synthetic pyrethroids in red flour beetle *Tribolium castaneum* (Herbest.) (Coleoptera: Tenebrionidae). Ph. D. Thesis, Univ. of Punjab, Lahore.

Zeba and Khan, M. A. (1995). Effect of fenvalerate on protein and amino acid contents and enzyme activities in the Ostracod, *Chrissica halyi*. Pestic. Sci., 45: 279 – 282.

Zohry, N. M. H. (2006). Aberration of some insecticides on some biological aspects of the cotton leafworm *Spodoptera littoralis* (Lepidoptera: Noctuidae). Unpublished Ph.D. Thesis, Fac. Sci., South Valley Univ., Egypt.

ARABIC SUMMARY

تأثير مستخلصات النبات البري *فاجونيا بروجيري* في أنشطة الإنزيمات الترانسأمينية في بعض أنسجة الجراد الصحراوي *شيستوسركا جريجاريا* (مستقيمات الأجنحة: الجراديات).

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تمّ استعمال ثلاثة مذيبات عضوية لاستخلاص النبات البري *فاجونيا بروجيري* ، هى: ميثانول، إثير بترولي، ن- بيوتانول. ثم أعطى أحد تركيزين من كل مستخلص (٧,٥، ٣,٧% ؛ ٣٠,٠، ١٥,٠% ؛ ٣٠,٠، ١٥,٠%، على الترتيب) لحوريات الدور قبل الأخير من الجراد الصحراوي *شيستوسركا جريجاريا*، عن طريق الغذاء . وبعده، تمّ بحث التأثيرات الحاصلة في أنشطة الإنزيمات الترانسأمينية في الهيموليمف والأجسام الدهنية لحوريات الدور الأخير وكذلك لليافعات حديثة البزوغ.

اعتمد التأثير المسجّل في نشاط الإنزيم الترانسأميني الجلوتامي الأوكسالوأسيتي (ت ج ك) على أعمار الحوريات، إذ أبدت مستخلصات النبات الحالي تأثيرا اختزاليا في نشاطه بكل من الحوريات حديثة العمر والحوريات متوسطة العمر، لكنها أبدت تأثيرا تشجيعيا فيه بالحوريات متأخرة العمر، بصرف النظر عن المذيب المستخدم أو التركيز المستعمل من مستخلصه. ومن ناحية أخرى، فلقد لوحظ أقوى تأثير تحفيزي للنبات الحالي في نشاط الإنزيم (١٧٣,٣±٣٥,٥ مقابل ٨٥,٠±١٧,٣ وحدة/ل للحوريات الضابطة) بعد معاملة الحوريات بأعلى تركيز من المستخلص البيوتانولي. وسجّلت النتائج، أيضا، فعلا تحفيزيا ملحوظا لمستخلصات النبات الحالي في نشاط إنزيم (ت ج ك) في الجسم الدهني لكل من الحوريات متأخرة العمر واليافعات حديثة البزوغ، بغض النظر عن المذيب المستخدم أو التركيز المستعمل. وأدّت معاملة الحوريات بمستخلصات النبات الحالي إلى حدوث تثبيط لنشاط الإنزيم بصفة عامة في الحوريات حديثة العمر والحوريات متوسطة العمر.

حفز المستخلص الميثانولي نشاط الإنزيم الترانسأميني الجلوتامي البيروفي (ت ح ب) في هيموليمف الحوريات بكل أعمارها، ولكن مستخلصات الإثير البترولي والبيوتانولي حفزت نشاط الإنزيم فقط في كل من الحوريات متوسطة العمر والحوريات متأخرة العمر. وفيما يخص اليافعات حديثة البزوغ، فلقد سببت مستخلصات النبات الحالي انخفاضا ملحوظا في نشاط الإنزيم بالهيموليمف، أيا كان المذيب المستخدم أو التركيز المستعمل. كما سجلت نتائج البحث الحالي تأثيرا تحفيزيا لمستخلصات *فاجونيا بروجيري* في نشاط إنزيم (ت ج ب) في الجسم الدهني لكل من الحوريات متأخرة العمر واليافعات حديثة البزوغ، أيّا كان المذيب أو التركيز. ومع ذلك، فلقد أبدت مستخلصات النبات الحالي تأثيرا تثبيطيا في نشاط هذا الإنزيم بعد استعمال الإثير البترولي والبيوتانول، وذلك في كل من الحوريات حديثة العمر والحوريات متوسطة العمر.