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Original Article

Effect of biosal®, deltamethrin and lambda-cyhalothrin on the activity of GOT, GPT and total protein contents in two fodder pests *Hermolaus modestus* and *Hermolaus ocimumi*

Efeito do biosal®, deltametrina e lambda-cialotrina na atividade do GOT, GPT e conteúdo de proteína total em duas pragas forrageiras *Hermolaus modestus* e *Hermolaus ocimumi*

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Abstract

The assessment of the comparative effect of biosal (phytopesticide), deltamethrin, and lambda-cyhalothrin (pyrethroids) were made against two fodder pests, *Hermolaus modestus* and *Hermolaus ocimumi* by filter paper impregnation method. The activity of total protein contents, GPT (glutamic-pyruvic transaminase) and GOT (glutamic oxaloacetate transaminase) were affected in *Hermolaus modestus* and *Hermolaus ocimumi* against biosal, deltamethrin, and lambda cyhalothrin. The activity of total protein contents in *H. modestus* was 31.053%, 4.607%, and 24.575%, against biosal, deltamethrin, and lambda-cyhalothrin, respectively. The activity of total protein contents was observed as 24.202%, 15.25%, and 56.036% against deltamethrin, lambda-cyhalothrin, and biosal, respectively in *H. ocimumi*. The activity of GOT was observed as 98.675% for biosal 33.95% for deltamethrin and 83.619% for lambda-cyhalothrin in *H. modestus*. The GOT activity was estimated in *H. ocimumi* as 78.831%, 47.645%, and 71.287% against biosal, deltamethrin, and lambda-cyhalothrin, respectively. The efficacy of GPT enzyme against biosal, deltamethrin, and lambda-cyhalothrin was calculated as 89.26%, 73.07%, and 47.58%, respectively in *H. modestus*. The *H. ocimumi* showed GPT activity as 77.58% for biosal, 68.84% for deltamethrin, and 52.67% for lambda-cyhalothrin, respectively.

Keywords: *Hermolaus modestus*, *Hermolaus ocimumi*, phytopesticide, glutamic-pyruvic transaminase, glutamic oxaloacetate transaminase.

Resumo

A avaliação do efeito comparativo do biosal (fitopesticida), deltametrina e lambda-cialotrina (piretróides) foi feita contra duas pragas forrageiras, Hermolaus modestus e *Hermolaus ocimumi*, pelo método de impregnação com papel de filtro. A atividade do conteúdo de proteína total, GPT (transaminase glutâmico-pirúvica) e GOT (oxaloacetato transaminase glutâmico) foram afetados em *Hermolaus modestus* e *Hermolaus ocimumi* contra biosal, deltametrina e lambda cialotrina. A atividade do conteúdo de proteína total em H. modestus foi 31.053%, 4.607% e 24.575%, contra biosal, deltametrina e lambda-cialotrina, respectivamente. A atividade do conteúdo de proteína total foi observada como 24.202%, 15.25% e 56,036% contra deltametrina, lambda-cialotrina e biosal, respectivamente em H. ocimumi. A atividade do GOT foi observada em 98.675% para o biosal, 33,95% para a deltametrina e 83.619% para a lambda-cialotrina em H. modestus. A atividade do GOT foi estimada em H. ocimumi como 78.831%, 47.645% e 71.287% contra biosal, deltametrina e lambda-cialotrina, respectivamente. A eficácia da enzima GPT contra biosal, deltametrina e lambda-cialotrina foi calculada como 89.26%, 73.07% e 47.58%, respectivamente em *H. modestus.* A *H. ocimumi* apresentou atividade GPT de 77.58% para biosal, 68.84% para deltametrina e 52.67% para lambda-cialotrina, respectivamente.

Palavras-chave: *Hermolaus modestus*, *Hermolaus ocimumi*, fitopesticida, transaminase glutâmico-pirúvica, glutamic oxaloacetate transaminase.

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1. Introduction

Livestock animals are normally fed on green food, hay, and fodder crops. In Pakistan, two types of fodder crops named temporary and permanent crops are being used. The continuous use of land for the cultivation of fodder crops or appetizing forage crops is stated as a permanent type. Temporary fodder crops are grown and harvested like any other major crop. For enormous cultivation, it was necessary to protect our main and fodder crops from their pests. The materials or chemicals belong to pesticides were selected and applied for the huge quantity and good quality of crops. The traditional insecticides may interrupt our environment and health. It is required to use alternate suitable strategies for pest control. Different plant extractions have been isolated from different herbal medicinal products including flavonoids, phenols, alkaloids, and terpenoids. These remedial products play a vital role to prevent vulnerable organisms (Adjaye-Gbewonyo et al., 2010; Iqbal et al., 2015; Joshi et al., 2011). In past, agricultural pest management used *Nicotinia tabacum* extract (nicotine) and other plant abstracts to kill different pests (El-Wakeil, 2013; Lengai et al., 2020) Biosal is one of the most famous commercial products, extracted from neem plant and its member of the family *Meliaceae*. The neem (*Azadirachta indica*) is an indigenous plant in India (Hashmat et al., 2012). Biosal is an effective phyto-pesticide and used to control the different agricultural pests (Maithani et al., 2011). The previous study shows the residual and natural impact of neem oil against cotton mealybug (*Phenacoccus solenopsis*) by utilizing leaf and surface treatment method. The various concentrations of neem oil affected the fertility, mortality, and life span of cotton mealybug (Mamoon-ur-Rashid et al., 2012). The cowpea seeds extract, protected flower, and B125 has been applied against *Callosobruchus maculatus*. The high mortality rate of *Callosobruchus maculatus* showed with *V. rosea* and the low mortality rate was found with *C. papaya* (Louise et. al., 2018). Researchers worked on cowpea pest *Callosobruchus maculatus* (F.) and found the mortality rate after 24, 48, and 72 h of Castor and Hazelnut oil exposure (Haghtalab et. al., 2009).

Pyrethroids are synthetic pesticides and may cause hazards to agricultural plants. Different pyrethroid groups play an important role in pest management. Deltamethrin is a non-cumulative synthetic pesticide and acts as a fast-neurotoxic agent and easily available in Pakistan (Arif et al., 2012). Lambda-cyhalothrin is the synthetic pyrethroid, insect inhibitor and having insecticidal active ingredient, investigated the inhibition effect of biosal, deltamethrin, and lambda-cyhalothrin in *Hermolaus modestus* (Hussain and Zahid, 2016). The leaf plunge bioassay method reported in detail describes that pyrethroid (cypermethrin) was harmful to the environment and may cause problems (Foster et al., 2002).

Chandrasena et al. (2011) were found high susceptibility of soybean aphid against chlorpyrifos, lambda-cyhalothrin, esfenvalerate, and dimethoate but aphids showed less vulnerability after 48 h to neonicotinoid imidacloprid. The level of human enzymes GPT, GOT and ALP was increased when exposed to deltamethrin, cypermethrin, polytrin-C, diazinon, monocrotophos, DDT, and DDE pesticides (Azmi et al., 2006). Ambreen and Javed (2015) used a mixture of pesticides including chlorpyrifos, endosulfan, and bifenthrin against *Cyprinus carpio* and *Ctenopharyngodon idella*. This mixture was found very dangerous to fishes and habitats.

This work aims to compare the effect of natural and synthetic pesticides on the two different fodder pests, which may be harmful to main crops. Fodder crops are important for livestock animals, moreover, recent increases in industrialization and urbanization create stress on agriculture and the environment, so there is a need to prevent the unnecessary loss and degradation of crops and the environment by the proper use of suitable pesticide. Therefore, this effort will provide an approach to understand the phyto and synthetic pesticides to control fodder and main crop pests.

2. Materials and Methods

2.1. Collection and rearing of pests

Both species *Hermolaus modestus* and *Hermolaus ocimumi* were collected on *Ocimum basilicum L* and *Medicago sativa (L)* from the different areas of Karachi, Pakistan. The adults of both collected pests were kept separately in 9cm washed Petri dishes in the laboratory for experiment.

2.2. Preparation of pesticides concentration

Five different concentrations of three pesticides were prepared for the treatment of adult *Hermolaus modestus* and *Hermolaus ocimumi*. Charles's formula was used for the preparation of different concentrations (Equation 1).

$$C_1V_1 = C_2V_2 \quad (1)$$

The different concentrations of biosal, deltamethrin, and lambda-cyhalothrin were prepared separately in distilled water after some preliminary experiments, the already prepared concentrations of biosal 4, 5, 6, 7, and 8 percent used for the treatment of *Hermolaus modestus* and 3.5%, 4.0%, 4.5%, 5.0%, 5.5%, and 6.0% applied on the *Hermolaus ocimumi* One percent stock solution of deltamethrin were used to prepare for various concentrations of deltamethrin. After a few trial tests chosen doses of deltamethrin as 0.0002%, 0.0004%, 0.0009%, 0.0018%, and 0.0037% for the treatment of *H. modestus* and 0.015625%, 0.03125%, 0.0625%, 0.125%, 0.25% and 0.5% concentrations of deltamethrin were prepared for the treatment of *H. ocimumi*. Five different concentrations of lambda cyhalothrin were prepared from 1% stock solution for the treatment of both species. The prepared concentrations of lambda-cyhalothrin were 0.125%, 0.25%, 0.375%, 0.5% and 0.625% for the treatment of *H. modestus* and prepared concentrations were 0.1625%, 0.175%, 0.1875%, 0.2%, 0.2125% and 0.225% for the treatment of *H. ocimumi*.

2.3. Process of treatment

The experiment was conducted in eighteen sets of 9 cm washed Petri dishes by filter paper impregnation method for the treatment of *Hermolaus modestus* and *Hermolaus ocimumi*. One set of three Petri dishes were marked as untreated (controlled) and five sets for each pesticide's concentration were labeled as dilutions. Each set of Petri dishes were lined with the same size filter paper and prepared concentrations of biosal, deltamethrin, and lambda-cyhalothrin were pipetted out in Petri dishes separately. The same-sized of twenty adults of *H. modestus and H. ocimumi* were transferred in each petri dish separately for the experiment. The mortalities were observed in treated and untreated Petri dishes after twenty-four hours of tested compounds, biosal, deltamethrin, and lambda-cyhalothrin.

2.4. Preparation of homogenous compound by dry weight extraction method

Homogenous was prepared by the dry weight extraction method. In this method untreated (control) and pesticides treated insects of both species were dried up in a desiccator until the weight was constant. Sartorius model CP 224S was used to measure the weight (0.5 gm.) of both species. The desiccated and measured specimens of both species were crushed in 4 ml distilled cooled water separately and then homogenized in ULTRA – TURRAX – T25 (JANKE $ KUNKEL- Homogenizer). Heraeus model (Multifuge- 3 S-R) used for centrifugation at 3000 rpm for 25 minutes at a temperature of 4 °C. This supernatant was kept in different test tubes and labeled with pesticides and species names.

2.5. Estimation of total protein contents

The total protein contents were estimated by Modular P analyzer: ACN, 402 (Roche/Hitachi Cobas® analyzer). The Roche Diagnostic protein assay is based on the method described by Iwata and Nishikaze (1979) later modified by Luxton et al. (1989) and Thomas et al. (2005).

In this method, protein reacts with benzethonium chloride. This action carries out in the basic medium for producing the turbidity that is more stable and uniformly dispersed than that observed with the sulfosalicylic acid (SSA) or trichloroacetic acid (TCA) techniques. This assessment shows an under-recovery of Y-globulin compared to albumin of about 30%, and without the involvement of magnesium ions (Mg^{2+}) due to the addition of ethylene diamine tetra acetic acid (EDTA).

2.5.1. Test principle

The alkaline solution was used for pre-incubation of sample and EDTA (Ethylene diamine tetra acetic acid) compound which reconstructed the protein and then removes interference from (Mg^{2+}) magnesium ions. After the addition of benzethonium chloride, turbidity is produced and then read at 505 nm. Reagent (R_1) used as Sodium hydroxide: (530 mmol L^{-1}); EDTA – Na: (74 mmol. L^{-1}) and reagent (R_2) Benzethonium chloride: (32 mmol L^{-1}). The analyzed concentration of each sample is automatically calculated by the analyzer.

2.6. Estimation of glutamate oxaloacetate transaminase (GOT)

Roche/Hitachi 912 analyzer: ACN 143 was used for GOT estimation. The chemical reagents were used, R1: TRIS buffer: (100 mmol. L^{-1}), PH 7.8; L-aspartate: (300 mmol. L^{-1}); NADH (yeast): (0.23 mmol. L^{-1}); MDH ≥ 0.53 U mL^{-1} 8.83 µKat /L; LDH ≥ 0.75 U. mL^{-1} (12.5 µKat/L); preservative. R2: α – Ketoglutarate: (75 mmol. L^{-1}); preservative.

2.6.1. Test principle

This experiment was performed in a specified standardized method. Reagents R1 and R2 were added to the sample then chemical reactions started. Glutamate oxaloacetate transaminase (GOT) catalyzed the interconversion of α – Keto acid and amino acid by transfer of amino groups.

$$\Rightarrow \alpha - Ketoglutarate + L - aspartate \overset{(AST)}{\rightleftharpoons} L - glutamate + oxaloacetate$$

This equilibrium reaction catalyzed by AST

$$\Rightarrow Oxaloacetate + NADH + H^{+} \overset{(LDH)}{\rightleftharpoons} L - malate + NAD^{+}$$

NADH oxidized to NAD^{+}.

2.7. Estimation of glutamate pyruvate transaminase (GPT)

The evaluation of Glutamate pyruvate transaminase (GPT) was accomplished by CAN – 098: 912 analyzers (Roche/Hitachi). The standardization method for GPT determination is proposed by the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) (Schumann et al., 2002). In current study used the reference method of the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) (Charuruks et al., 2005).

2.7.1. Test principle

In this principle method sample was mixed with reagent R1 and then added reagent R2.

R1: TRIS buffer: (125 mmol L^{-1}), PH 7.3; L-alanine: (625 mmol. L^{-1}); NADH (yeast): (0.23 mmol. L^{-1}); LDH ≥ 1.5 U. mL^{-1} (25.0 µKat/L); preservative.

R2: α – Ketoglutarate: (94 mmol. L^{-1}); preservative.

$$\Rightarrow \alpha - Ketoglutarate + L - alanine \overset{(ALT)}{\rightleftharpoons} L - glutamate + Pyruvate$$

(Above reaction catalyzed by ALT enzyme)

$$\Rightarrow Pyruvate + NADH + H^{+} \overset{(LDH)}{\rightleftharpoons} L - lactate + NAD^{+}$$

(Pyruvate catalyzed by lactate dehydrogenase)

3. Results

The present findings showed the activity of total protein contents after twenty-four hrs of treatment against biosal, deltamethrin, and lambda-cyhalothrin in adults of *H. modestus* and *H. ocimumi* (Table 1). The activity of total protein contents was observed as 31.053%, 4.607%, and 24.575% at the mean values of 0.182 g. dL^{-1} for biosal,

0.027 g. dL^{-1} for deltamethrin, and 0.144 g. dL^{-1} for lambda-cyhalothrin respectively in *H. modestus*. The activity of total protein contents in *H. ocimumi* was estimated after 24 hrs of treatment of biosal, deltamethrin, and lambda-cyhalothrin as 56.036%, 24.202%, and 15.25% at 0.947 g. dL^{-1}, 0.409 g. dL^{-1} and 0.257 g. dL^{-1} respectively. The maximum decline in the activity of total protein contents was observed as 4.607% by deltamethrin in *H. modestus* and 15.25% in *H. ocimumi* by lambda-cyhalothrin (Figure 1).

The GOT activity was evaluated in adult *H. modestus* as 98.675%, 33.95%, and 83.619% against biosal, deltamethrin, and lambda-cyhalothrin (24 h treatment) at 694.53 U. L^{-1}, 239.0 U. $L^{-1,}$ and 588.56 U. L^{-1} respectively and the GOT value was also observed in adult *H. ocimumi* against same pesticides as 78.831%, 47.645% and 71.287% at 399.18 U. L^{-1}, 241.26 U. L^{-1} and 360.98 U. L^{-1} respectively (Table 2). All these values are presented in (Figure 2). The maximum GOT activity was observed as 98.675% in *H. modestus* and 78.831% in *H. ocimumi* by biosal.

The efficacy of the GPT enzyme in adult *H. modestus* was observed as 89.26%, 73.07%, and 47.58%, after 24 hrs of treatment, against biosal, deltamethrin, and lambda-cyhalothrin at the mean values of 72.16 U. L^{-1}, 47.61 U. $L^{-1,}$ and 31.00 U. L^{-1} respectively (Table 3). The maximum activity of GPT was noted as 89.26% by biosal in adult *H. modestus* and estimated data can be presented in Figure 3. The activity of the GPT enzyme was observed as 77.58%, 68.84%, and 52.67% at the mean values of 64.1 U. L^{-1}, 56.88 U. L^{-1}, and 43.52 U. L^{-1} in the adult of *H. ocimumi* after 24 hrs of treatment of biosal, deltamethrin and lambda-cyhalothrin respectively (Table 3). The maximum activity of the GPT

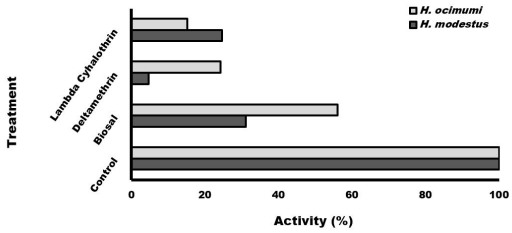

Figure 1. Comparison of % activity of total protein contents in adult of *H. modestus* and *H. ocimumi*.

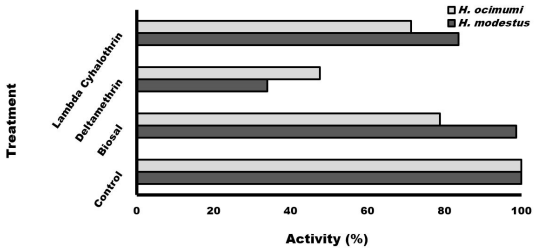

Figure 2. GOT enzyme % activity comparison in adult of *H. modestus* and *H. ocimumi*.

Table 1. Activity of total protein contents in adult of *H. modestus* and *H. ocimumi* after twenty four hours of treatment of biosal, deltamethrin, and ƛ-cyhalothrin at 95% of confidence limit.

No.	Pesticides	*H. modestus*			*H. ocimumi*		
		Mean ± SE g. dL^{-1}	Confidence limit at 95%	Activity	Mean ± SE g. dL^{-1}	Confidence limit at 95%	Activity
1	Control	0.586 ± 0.021	0.5455-0.6265	100	1.69 ± 0.1	1.4991-1.8809	100
2	Biosal	0.182 ± 0.013	0.155-0.205	31.053	0.947 ± 0.1	0.751-1.143	56.036
3	Deltamethrin	0.027 ± 0.005	0.0168-0.0371	4.607	0.409 ± 0.09	0.2321-0.5859	24.202
4	Lambda-Cyhalothrin	0.144 ± 0.011	0.1230-0.1649	24.575	0.257 ± 0.06	0.1375-0.376	15.25

SE = Standard Error.

Table 2. Activity of enzyme GOT in adult of *H. modestus* and *H. ocimumi* after 24 hours of treatment of biosal, deltamethrin, and ƛ-cyhalothrin at 95% of confidence limit.

No.	Pesticides	*H. modestus*			*H. ocimumi*		
		Mean ± SE UL^{-1}	Confidence limit at 95%	Activity	Mean ± SE UL^{-1}	Confidence limit at 95%	Activity
1	Control	703.86 ± 472.2	221.65-1629.37	100	506.38 ± 2.2	502.07-510.68	100
2	Biosal	694.53 ± 2.762	689.11-699.94	98.675	399.18 ± 1.9	395.46-402.89	78.831
3	Deltamethrin	239 ± 0.258	238.4-239.5	33.95	241.26 ± 1.69	237.95-244.56	47.645
4	Lambda-Cyhalothrin	588.56 ± 0.856	246.4-249.77	83.619	360.98 ± 3.62	353.88-368.07	71.287

SE = Standard Error.

Table 3. Activity of enzyme GPT in adult of *H. modestus* and *H. ocimumi* after 24 hours of treatment of biosal, deltamethrin, and λ-cyhalothrin at 95% of confidence limit.

No.	Pesticides	*H. modestus*			*H. ocimumi*		
		Mean ± SE UL^{-1}	Confidence limit at 95%	Activity	Mean ± SE UL^{-1}	Confidence limit at 95%	Activity
1	Control	65.16 ± 1.241	62.728-67.59	100	82.63 ± 1.24	80.206-85.054	100
2	Biosal	72.16 ± 1.137	69.931-74.38	89.26	64.1 ± 1.03	62.076-66.124	77.58
3	Deltamethrin	47.61 ± 1.552	44.56-50.65	73.07	56.88 ± 1.17	54.581-59.179	68.84
4	Lambda-Cyhalothrin	31 ± 1.114	28.81-33.18	47.58	43.52 ± 0.85	41.862-45.178	52.67

SE = Standard Error.

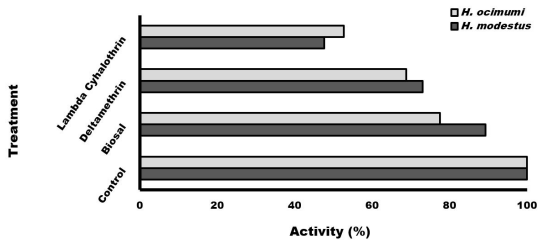

Figure 3. GPT enzyme % activity comparison in adult of *H. modestus* and *H. ocimumi*.

enzyme was observed as 77.58% by biosal in *H. ocimumi*. All observed GPT activity values are mentioned in Figure 3.

4. Discussion

In the current study comparative effect of biosal, deltamethrin and lambda-cyhalothrin were tested against two fodder pests, *Hermolaus modestus and Hermolaus ocimumi*. Filter paper impregnation method was chosen for the determination of the activity of total protein contents, GOT, and GPT enzymes in both fodder pests in laboratory conditions. The filter paper impregnation method was also used by Zafar et al. (2010) for evaluation of resistance in *Sitophilus oryzae* (Rice weevil) in susceptible strain, Karachi strain, and Lahore stains against biosal, cypermethrin, and phosphine. They found KS and LS were more resistant to Cypermethrin and Phosphine. In this work, the total protein contents were found in declined in adults of *H. modestus* as 31.053%, 4.607%, and 24.575% against biosal, deltamethrin, and lambda-cyhalothrin respectively. The maximum effect on the activity of total protein contents in *H. modestus* was reported by Deltamethrin as 4.607% and the minimum effect on the activity of total protein contents was determined as 31.053% by biosal. The decreased value of total protein contents was observed as 56.036%, 24.202%, and 15.25% against biosal, deltamethrin, and lambda-cyhalothrin respectively in *H. ocimumi*. Lambda cyhalothrin has a maximum effect of 15.25% on the activity of total protein contents and biosal showed a minimum effect of 56.036% on the activity of total protein contents. In both species, synthetic pesticides were found more toxic than biosal. This study showed a decrease value of protein contents due to degradation in metabolic activities of insects. Nikhat et al. (2010) found biosal was much safe and better than a synthetic pesticide when they tested biosal and cypermethrin against larvae of *Papilio demoleus* (L.) and mentioned the decreased value of protein contents up to 31.28% with biosal and 36.44% with cypermethrin. Ahsan et al. (2005) estimated the total protein contents in rice weevil (*Sitophilus oryzae*) against *Acorus calamus*, danitol, cypermethrin, methoprene, and neem extract. Danitol showed a comparatively highest toxicity rate than neem formulation and *Acorns calamus* extract in *Sitophilus oryzae*. Ogunleye and Adefemi (2007) studied the methanol extract and dust of *Garcinia kolae* against *Sitophilus zaemais* and *Callosobruchus maculatus*. The natural pesticide extraction of methanol was found very significant and effective for both species. Wakil et al. (2012) applied some plant essential oils against adults of *Tribolium casatneum*, *Rhyzopertha dominica*, *Cryptolestes ferrugineus,* and *Liposcelis paeta.* They found plant extract was very significant for all pests and the mortality rate increased with time exposure and type of plant. So, plants extract is an environment-friendly pesticide than manmade insecticides. Foster et al. (2002) reported the leaf dip bioassay method of pyrethroid (cypermethrin) was found to be unfriendly to the environment and caused the problems. The toxicity of various pesticides was observed more effective for the central nervous system of insects due to their nature and structure. The toxicity of pyrethroid paresthesia central and local have also been defined by Wilks (2000). Vassena et al. (2000) observed pesticides, lambda-cyhalothrin, deltamethrin, β-cyfluthrin, cypermethrin, and β-cypermethrin against *Triatoma infestans* (Klug) and *Rhodnius prolixus* Sta◦l (Hemiptera: Ruduviidae) by the topical method. They found different vulnerability ratio for all pesticides against both species. Ajayi and Olonisakin (2011) assessed the bio-activity of edible essential oil extract against *Tribolium castaneum* (Herbest).

In the current investigation, the activity of GOT (glutamic oxaloacetate transaminase) was observed in *H. modestus* as 98.67%, 33.95%, and 83.61% against of biosal, deltamethrin, and λ-cyhalothrin respectively. The GOT value was observed in *H. ocimumi* as 78.831%, 47.645%, and 71.287% when treated with biosal, deltamethrin,

and lambda-cyhalothrin respectively. The maximum GOT activity was noted as 98.67% in *H. modestus* and 78.831% in *H. ocimumi* for biosal. The minimum value of GOT was recorded as 33.95% in *H. modestus* and 47.645% in *H. ocimumi* for deltamethrin.

The activity of GPT (glutamic-pyruvic transaminase) was determined as 89.26% for biosal, 73.07% for deltamethrin, and 47.58% for lambda-cyhalothrin in *H. modestus,* and GPT activity was observed as 77.58%, 68.84%, and 52.67% in *H. ocimumi* after the treatment of biosal, deltamethrin and λ-cyhalothrin respectively. The high value of GPT activity was observed as 89.26% against biosal and low as 47.58% against lambda-cyhalothrin in *H. modestus*. Maximum and minimum GPT activities were observed in *H. ocimumi* as 77.58% for biosal and 52.67% for lambda-cyhalothrin. This result is near to other research work. Tabassum et al. (2006) treated neem compound, NC and Nfc (phytopesticide) and dimilin (pyrethroid) for 24 h against *C. analis* by filter paper impregnation method. The activities of GOT and GPT were observed as 84.85%, 88.14% respectively in NC treated insects and 67.50%, 51.71% in Nfc treated specimens. The dimilin treated insects showed the activity of GOT and GPT as 90.68% and 91.11% respectively. The comparative effect of deltamethrin and Aloe gel against *Sitophilus oryzae* (L.) by using filter paper impregnation method and identified that natural extract is better for the environment than deltamethrin (Sultan et al., 2015). Arif et al. (2012) tested *Acorus calamus* essential oil, biosal®, and deltamethrin against *Callosobruchus analis*. They found a significant value of fecundity with variation by (DAM) in control and treated insects. The eggs of cowpea beetle, *Callosobruchus maculatus* (Coleoptera: Bruchidae) showed better susceptibility than eggs of *Dinarmus basalis* to the Jatropha oil and adults of *D. basalis* found comparatively more susceptible than adults of *C. maculatus* (Boateng and Kusi, 2008). Jayakumar (2010) studied the effect of some plant's aqueous extract on *Callosobruchus maculatus* and found a maximum decreased in oviposition of *Callosobruchus maculatus* against *Cassia siamea Citrus aurantium* peel. The reduced numbers of adult emergence of *C. maculatus* were observed maximum against *Percularia daemia*. Hussain et al. (2015) studied the toxicological effect of biosal and deltamethrin against *Eysarcoris modestus* (Distant) by the FIM method. They observed deltamethrin was comparatively more effective than biosal for protein and GOT activity. Plant-based pesticides safe and stand at high among other pesticides. Plants extract are not only kills the insects but also has no side effect on the environment (Zia-ul-Haq et al., 2014; Shikder and Shahjahan, 2011).

5. Conclusion

This effort shows that both fodder pests are very vulnerable and can damage crops and animal food. The application of biosal, deltamethrin, and lambda-cyhalothrin against *Hermolaus modestus* and *Hermolaus ocimumi* on the activity of total protein contents, GOT and GPT was demonstrated that synthetic pesticides are more acutely toxic to fodder pests than phytopesticide. Although synthetic pesticides are constructed to destroy undesirable living organisms, but continuous use of synthetic pesticides is fabricating enormous unwanted impact on our ecosystem. The above-mentioned results show that lambda-cyhalothrin and deltamethrin (synthetic pesticides) are highly toxic and venomous than biosal (phytopesticide). The impact of pesticide toxicity can be shown as (Deltamethrin> Lambda cyhalothrin> Biosal). So, biosal was recognized as a friendly environment phytopesticide and also very effective to control the vulnerable species. The overall conclusion was suggested that phytopesticides are very effective and destructive for pests but mild toxic for our crops and agricultural fields.

References

ADJAYE-GBEWONYO, D., QUAYE, E.C. and WUBAH, D.A., 2010. The effects of extracts of *Piper guineense* seeds on insect pest damage to cowpea plants. *Journal of Young Investigators*, vol. 20, no. 1, pp. 264-256.

AHSAN, T., AHMAD, I., YASMEEN, N., TABASSUM, R., AZMI, A. and SHOAIB, M., 2005. Effectiveness of cypermethrin 10 EC and *Acorus calamus* extract incomparison with danitol, methoprene, and neem extract and their effect on totalprotein contents of *Sitophilus oryzae* L. *International Journal of Biology and Biotechnology*, vol. 2, no. 4, pp. 951-954.

AJAYI, F.A. and OLONISAKIN, A., 2011. Bio-activity of three essential oils extracted from edible seeds on the rust-red flour beetle, *Tribolium castaneum* (Herbst.) infesting stored pearl millet. *Trakia Journal of Sciences*, vol. 9, no. 1, pp. 28-36.

AMBREEN, F. and JAVED, M., 2015. Assessment of acute toxicity of pesticides mixtures for *Cyprinus carpio* and *Ctenopharyngodon idella*. *Pakistan Journal of Zoology*, vol. 47, no. 1, pp. 133-139.

ARIF, S., NAQVI, S.N.H., RAJPUT, T., YOUNUS, M.F. and ARIF, I., 2012. Effect of acorus calamus, biosal® and deltamethrin on fecundity of *Callosobruchus analis*. *FUUAST Journal of Biology*, vol. 2, no. 1, pp. 131-133.

AZMI, M.A., NAQVI, S.N.H., AZMI, M.A. and ASLAM, M., 2006. Effect of pesticide residues on health and different enzyme levels in the blood of farm workers from Gadap (rural area) Karachi: pakistan. *Chemosphere*, vol. 64, no. 10, pp. 1739-1744. http://dx.doi.org/10.1016/j.chemosphere.2006.01.016. PMid:16487989.

BOATENG, B.A. and KUSI, F., 2008. Toxicity of Jatropha seed oil to *Callosobruchus maculatus* (Coleoptera: Bruchidae) and its parasitoid, *Dinarmus basalis* (Hymenoptera: Pteromalidae). *Journal of Applied Sciences Research*, vol. 4, no. 8, pp. 945-951.

CHANDRASENA, D., DIFONZO, C. and BYRNE, A., 2011. An aphid-dip bioassay to evaluate susceptibility of soybean aphid (Hemiptera: Aphididae) to pyrethroid, organophosphate, and neonicotinoid insecticides. *Journal of Economic Entomology*, vol. 104, no. 4, pp. 1357-1363. http://dx.doi.org/10.1603/EC10414. PMid:21882704.

CHARURUKS, N., MILINTAGAS, A., WATANABOONYOUNGCHAROEN, P. and ARIYABOONSIRI, C., 2005. Determination of reference intervals of HbA1C (DCCT/NGSP) and HbA1C (IFCC) in adult. *Journal of the Medical Association of Thailand*, vol. 88, no. 6, pp. 810-816. PMid:16083221.

EL-WAKEIL, N.E., 2013. Retracted article: botanical pesticides and their mode of action. *Gesunde Pflanzen*, vol. 65, no. 4, pp. 125-149. http://dx.doi.org/10.1007/s10343-013-0308-3.

FOSTER, S.P., DENHOLM, I. and THOMPSON, R., 2002. Bioassay and field-simulator studies of the efficacy of pymetrozine against peach-potato aphids, *Myzus persicae* (Hemiptera: Aphididae), possessing different mechanisms of insecticide resistance. *Pest*

Management Science, vol. 58, no. 8, pp. 805-810. http://dx.doi.org/10.1002/ps.529. PMid:12192905.

HAGHTALAB, N., SHAYESTEH, N. and ARAMIDEH, S., 2009. Insecticidal efficacy of castor and hazelnut oils in stored cowpea against *Callosobruchus maculatus* (F.) (Coleoptera: bruchidae). *The Journal of Biological Sciences*, vol. 9, no. 2, pp. 175-179. http://dx.doi.org/10.3923/jbs.2009.175.179.

HASHMAT, I., AZAD, H. and AHMED, A., 2012. Neem (*Azadirachta indica* A. Juss): a nature's drugstore: an overview. *International Research Journal of Biological Sciences*, vol. 1, no. 6, pp. 76-79.

HUSSAIN, S.I. and ZAHID, M., 2016. Comparative effect of Biosal® and pyrethroids (deltamethrin and lambda cyhalothrin) on enzymatic activity and total protein contents in *Hermolaus modestus*. *FUUAST Journal of Biology*, vol. 6, no. 2, pp. 241-246.

HUSSAIN, S.I., ZAHID, M. and AHMAD, I., 2015. Toxicity of deltamethrin and biosal® against eysarcoris modestus (distant) by filter paper impregnation method. *FUUAST Journal of Biology*, vol. 5, no. 2, pp. 209-211.

IQBAL, E., SALIM, K.A. and LIM, L.B., 2015. Phytochemical screening, total phenolics and antioxidant activities of bark and leaf extracts of *Goniothalamus velutinus* (Airy Shaw) from Brunei Darussalam. *Journal of King Saud University-Science*, vol. 27, no. 3, pp. 224-232. http://dx.doi.org/10.1016/j.jksus.2015.02.003.

IWATA, J. and NISHIKAZE, O., 1979. New micro-turbidimetric method for determination of protein in cerebrospinal fluid and urine. *Clinical Chemistry*, vol. 25, no. 7, pp. 1317-1319. http://dx.doi.org/10.1093/clinchem/25.7.1317. PMid:88281.

JAYAKUMAR, M., 2010. Oviposition deterrent and adult emergence activities of some plant aqueous extracts against *Callosobruchus maculatus* F. (Coleoptera: bruchidae). *Journal of Biopesticides*, vol. 3, no. spe, pp. 325.

JOSHI, B., SAH, G.P., BASNET, B.B., BHATT, M.R., SHARMA, D., SUBEDI, K., JANARDHAN, P. and MALLA, R., 2011. Phytochemical extraction and antimicrobial properties of different medicinal plants: *Ocimum sanctum* (Tulsi), *Eugenia caryophyllata* (Clove), *Achyranthes bidentata* (Datiwan) and *Azadirachta indica* (Neem). *Journal of Microbiology and Antimicrobials*, vol. 3, no. 1, pp. 1-7. http://dx.doi.org/10.5897/JMA.9000046.

LENGAI, G.M., MUTHOMI, J.W. and MBEGA, E.R., 2020. Phytochemical activity and role of botanical pesticides in pest management for sustainable agricultural crop production. *Scientific American*, vol. 7, e00239. http://dx.doi.org/10.1016/j.sciaf.2019.e00239.

LOUISE, K.M., HABIBA, K., SIDONIE, F.T. and TCHUENGUEM FOHOUO, F.N., 2018. Management of *Callosobruchus maculatus* F. (Coleoptera: Bruchidae) using methanol extracts of *Carica papaya*, *Carissa edulis*, *Securidaca longepedonculata* and *Vinca rosea* and impact of insect pollinators on cowpea types in the Far-North region of Cameroon. *Journal of Entomology and Zoology Studies*, vol. 6, no. 2, pp. 1017-1027.

LUXTON, R.W., PATEL, P., KEIR, G. and THOMPSON, E.J., 1989. A micro-method for measuring total protein in cerebrospinal fluid by using benzethonium chloride in microtiter plate wells. *Clinical Chemistry*, vol. 35, no. 8, pp. 1731-1734. http://dx.doi.org/10.1093/clinchem/35.8.1731. PMid:2474389.

MAITHANI, A., PARCHA, V., PANT, G., DHULIA, I. and KUMAR, D., 2011. *Azadirachta indica* (neem) leaf: a review. *Journal of Pharmacy Research*, vol. 4, pp. 1824-1827.

MAMOON-UR-RASHID, M., KHATTAK, M.K. and ABDULLAH, K., 2012. Residual toxicity and biological effects of neem (*Azadirachta indica*) oil against cotton mealybug, *Phenacoccus solenopsis* Tinsley (Sternorrhyncha: pseudococcidae). *Pakistan Journal of Zoology*, vol. 44, no. 3, pp. 837-843.

NIKHAT, Y., NAQVI, S.N.H., KHAN, M.F., ARSHAD, M. and TARIQ, R.M., 2010. Role of neem product (Biosal®) and its impact on cholinesterase and protein contents in larvae of *Papilio demoleus* L. in comparison with cypermethrin. *Journal of Experimental Zoology India*, vol. 13, no. 2, pp. 541-544.

OGUNLEYE, R.F. and ADEFEMI, S.O., 2007. Evaluation of the dust and methanol extracts of *Garcinia kolae* for the control of *Callosobruchus maculatus* (F.) and Sitophilus zeamais (Mots). *Journal of Zhejiang University. Science. B.*, vol. 8, no. 12, pp. 912-916. http://dx.doi.org/10.1631/jzus.2007.B0912. PMid:18257127.

SCHUMANN, G., BONORA, R., CERIOTTI, F., FÉRARD, G., FERRERO, C.A., FRANCK, P.F., GELLA, F.J., HOELZEL, W., JØRGENSEN, P.J., KANNO, T., KESSNER, A., KLAUKE, R., KRISTIANSEN, N., LESSINGER, J.M., LINSINGER, T.P., MISAKI, H., PANTEGHINI, M., PAUWELS, J., SCHIELE, F., SCHIMMEL, H.G., WEIDEMANN, G. and SIEKMANN, L.., 2002. IFCC primary reference procedures for the measurement of catalytic activity concentrations of enzymes at 37 C. Part 5. Reference procedure for the measurement of catalytic concentration of alanine aminotransferase. *Clinical Chemistry and Laboratory Medicine*, vol. 40, no. 7, pp. 725-733. http://dx.doi.org/10.1515/CCLM.2002.125. PMid:12241022.

SHIKDER, S. and SHAHJAHAN, M., 2011. Effect of plant extract on the fecundity of grenaryweevil. *Eco-Friendly Agriculture Journal*, vol. 4, no. 1, pp. 512-514.

SULTAN, S., TAHIR, S. and ANWAR, T., 2015. Comparative toxicity of crude extract of plant and synthetic insecticide against rice weevil *Sitophilus oryzae* L. (Coleoptera: curculinoidae). *The Entomological Society of Karachi*, vol. 30, no. 2, pp. 153-158.

TABASSUM, R., NAQVI, S.N.H. and AHMAD, I., 2006. Effect of neem extract nimolicine and dimilin on the enzymatic activities of pulse beetle *Callosobruchus analis* F. *The Journal of Experimental Zoology*, vol. 9, no. 1, pp. 197-202.

THOMAS, L., MÜLLER, M., SCHUMANN, G., WEIDEMANN, G., KLEIN, G., LUNAU, S., PICK, K.H. and SONNTAG, O., 2005. Consensus of DGKL and VDGH for interim reference intervals on enzymes in serum Konsensus von DGKL und VDGH zu vorläufigen Referenzbereichen für Serumenzyme. *Laboratoriumsmedizin*, vol. 29, no. 5, pp. 301-308. http://dx.doi.org/10.1515/JLM.2005.041.

VASSENA, C.V., PICOLLO, M.I. and ZERBA, E.N., 2000. Insecticide resistance in Brazilian *Triatoma infestans* and Venezuelan *Rhodnius prolixus*. *Medical and Veterinary Entomology*, vol. 14, no. 1, pp. 51-55. http://dx.doi.org/10.1046/j.1365-2915.2000.00203.x. PMid:10759312.

WAKIL, W., RIASAT, T., SAEED, N., ASHRAF, M. and YASIN, M., 2012. Fumigant activity of some essential oils against four major insect pests of stored grains. In: *Proceedings of the 9th International Conference on Controlled Atmosphere and Fumigation in Stored Products*, 2012, Antalya, Turkey. Turkey: ARBER Professional Congress Services, vol. 9, pp. 389-395.

WILKS, M.F., 2000. Pyrethroid-induced paresthesia: a central or local toxic effect? *Journal of Toxicology. Clinical Toxicology*, vol. 38, no. 2, pp. 103-105. http://dx.doi.org/10.1081/CLT-100100923. PMid:10778905.

ZAFAR, S.M.N., TARIQ, R.M., ASLAM, M., BREUER, M., NAQVI, S.N.H. and PERVEEN, R., 2010. Study of resistance in *Sitophilus oryzae* against biosal, cypermethrin and phosphine on the basis of toxicity values. *Pakistan Journal of Entomology*, vol. 23, no. 1-2, pp. 19-26.

ZIA-UL-HAQ, M., AFZAL, M., KHAN, A.A., RAZA, A.M., IRFANULLAH, M., KHAN, A.M. and KAMRAN, M., 2014. Impact of phytopesticides on *Trogodermagranarium* Everts (Coleoptera: Dermestidae) in stored wheat. *World Applied Sciences Journal*, vol. 31, no. 10, pp. 1722-1733. http://dx.doi.org/10.5829/idosi.wasj.2014.31.10.351.