International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 12-11-2021, Accepted: 26-11-2021, Published: 13-12-2021
Volume 6, Issue 6, 2021, Page No. 219-224

Impact of zoopesticide pygidial secretion on enzymological changes in certain selected tissues of the adult male insect *S. rusticum* in relation to reproduction

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Abstract
The dynamic nature of an increase in GDH activity is dertermined in the treated tissues than the control. These changes suggest that the glutamate can be applied for the conversion of α-keto glutamate to meet an additional energy demand during the stress period. On the basis of these observations made within the present examine it is obvious that the inhibition of SDH and LDH activities and inspiration of MDH and GDH activities in all the target tissues reveals that metabolic pathway has shifted in the direction of anerobic side effect than aerobic side to effect the increase in energy demand throughout the pygidial secretion intoxication.

Keywords: enzymes activity fat body in control and treated male insect *S. rusticum*

Introduction

Enzymes are attractive as indicator because they are more easily quantified than the opposite pointer. Metabolic under pressure reflecting the changes for enzyme activities. Glycolysis is known to yield pyruate and glycophosphate. Pyruvate aside from being of amino acids such as serine, alanine and cysteine. A-ketoglutarate is found as a preferred energy substrate for the spermatozoa and as an accelerator for sperm respiration in insects. In addition, energy metabolism of reproduction of male insects has no longer been an awful lot studied. Investigations have been made on the TCA enzymes, SDH, GDH, LDH and MDH inside the fats frame and the accessory reproductive gland of *Odontopus varicornis* earlier than and after mating by means of Ambika (2011) [3]. A take a look at of oxidative enzymes will screen whether pyruvate is being applied to supply strength or from other pathways.

The Zoopesticide pygidial secretion acts as enzyme inhibitors, leading to hyperexcitability of the nervous systems. It can also purpose numerous side consequences, e.g. change in DNA structure (Griffin and Hill, 1978) [18], reason sperm malformations (Mathew *et al*., 1992) [24], generate reactive oxygen species (Bagchi *et al*., 1995) [6], and act as inducers of warmth shock protein (Bagchi *et al*., 1996) [6]. *Zoopesticide pygidial* secretion and different xenobiotics may also growth the extent of free radicals (Freeman and Crapo, 1982) and impact (mobilise) an antioxidant defence machine in tissues and cells. Antioxidants can so other neurotoxic results of insecticides (Bagchi *et al*., 1993, 1996) [1, 6].

However, cytochrome P450 mediated detoxification of xenobiotics outcomes in stronger free radical content of cells. *Zoopesticide pygidial* secretion can be broken down in specific ways, that may cause distinct merchandise of a better or decrease toxicity than the mom compound (Brattsten *et al*., 1986, Chambers *et al*., 1994) [9, 13]. On interest of superoxide dismutase (SOD) and catalase (CAT), i.E. Vital enzymes, which protect cells in opposition to loose radicals. Lactate dehydrogenase (LDH) is an important glycolytic enzyme being present in really all tissues (Kaplan and Pesce, 1996) [21]; it's also concerned in carbohydrate metabolism and has been used as an indicative criterion of exposure to chemical strain (Wu and Lam, 1997; Carvalho *et al*., 2020) [40, 11], even though, additionally it is used as an index of anaerobic metabolism (Chamberlin and King, 1998) [12]. To display correlation between a few enzyme interest and non-enzymatic compounds, the amount of glucose and protein turned into measured. Lactate dehydrogenase catalyzes the final step in glycolysis, as it reduces pyruvate to lactate. Succinic dehydrogenase is the energetic regulatory enzyme of the Tricarboxylic acid cycle.

Several studies have shown that metal trace elements are, at the cellular level, often involved in oxidative stress, which results from the production of reactive oxygen species (ROS). ROS includes the superoxide radical (•O2−), hydrogen peroxide (H2O2), and the hydroxyl radical (•OH), all of which affect mainly lipids, proteins, carbohydrates, and nucleic acids (Damien *et al*., 2004) [15]. The importance of antioxidant enzymes is generally emphasized in the prevention of oxidative stresses by scavenging of ROS.

The antioxidant system comprises several enzymes including superoxide dismutase (SOD), catalase (CAT), and guaiacol peroxidase (GPx). Superoxide radicals that are generated are converted to H2O2 by the action of SOD, and the accumulation of H2O2 is prevented in the cell by CAT and GPx. It has been established that the activities of SOD, CAT, and GPx are induced both in plant species (Skorzynska-Polit *et al*., 2004 [35]; and in animal species (Sarkar *et al*., 1998) by some external factors, but less is known about the activity of antioxidant enzymes in insects.

Superoxide radicals that are generated are converted to H2O2 by using the action of SOD, and the accumulate of H2O2 is avoided within the cellular with the aid of CAT and GPx. It has been established that the activities of SOD, CAT, and GPx are induce each in plant species (Lee and Shin, 2003) [34] and in animal species (Rashed, 2001) [31]

through some outside factors, however much less is known about the activity of antioxidant enzymes in insects.

Glutathione peroxidase (GPx) an enzyme with selenium inside the shape of seleno cyseteine at its catalytic site catalyses the reduction of hydrogen peroxides and hydroperoxides to non poisonous merchandise. The lowering equal of glutathione is used as a substrate to form oxidized glutathione (Bruce *et al*., 2012) [10].

Phosphatases had been include inside the listing of detoxifying enzymes of pesticides; normally of organophosphorus but, fenvalerate and cypermethrin resistant larvae of *Helicoverpa armigera* (Hubner) confirmed better activities of esterases, phosphatases and methyl paraoxon hydrolase compared with prone larvae. Ahmed *et al*., (2004) [2] have additionally said the adjustments within the level of phosphatases in moths of *Pectinophora gossypiella* (Saund.) at some point of the route of heavy steel poisoning. There are instances in which phosphatases were now not handiest detected in pink flour beetle, Tribolium castaneum, however additionally modifications in stage of those enzymes upon publicity to cypermethrin and bifenthrin insecticides have been mentioned (Tufail *et al*., 2014) [39].

Material and Methods

Selection of insect

Sphaerodema rusticum a freshwater hemipteran insect is chosen in the present investigation for the following reasons. It acts as an effective indicator to assess the extent of pollution in the aquatic environment. This species is available in large numbers almost throughout the year in the vicinity of Annamalainagar, Tamil Nadu. Sample of this species are easily reared and maintained under laboratory conditions. The size of the insect is suitable for dissection, experimental and biochemical studies. It perhaps feeds on mosquito larvae and controls mosquito population to some extent. So, proper population of this species is necessary. These insects are beneficial and also harmful to some aquatic organisms. It has a short life cycle, hence facilities the study of the development of insects.

Enzyme studies

Lactate dehydrogenase (LDH)

Lactate dehydrogenase (L-lactate: NAD + oxido reductase). The enzyme LDH changed into assayed by using the approach of King (1965) [22].

Succinate dehydrogenase (SDH)

Assay method

The enzyme SDH was assayed by Bernath and Singer (1962) [7] method.

Glutamate dehydrogenase (GDH)

L-Glutamate, NAD+ oxidereductase deamination.

The enzyme activity was assayed by the method of Stretcker (1965) [36].

Results

LDH, SDH, MDH and GDH activities in the fat body of control and treated insect *S. rusticum*

The MDH and GDH sports activities within the fats body of zoopesticide, pygidial secretion dealt with with bugs were located to be progressed notably than that of manage insects. In contrast, the LDH and SDH activities in the fat body of dealt with with bugs have reduced drastically than that of manage bugs. The LDH pastime within the fats frame of manage and treated insects of approximately 0.90 ± zero.056 to 0.12 ± 0.01 µmoles/mg/protein. The SDH activity in the fats frame of control and handled bugs of approximately 18.Eighty two ±0.Eighty two to 4.25 ± zero.60 µmoles/mg/protein; The MDH and GDH pastime within the fats frame of manipulate and handled with bugs of approximately 17.04 ± zero.11 to twenty-eight.38 ± zero.34; 7.29 ± zero.23 to fourteen.42 ± 0.34 µmoles/mg/protein, respectively. The LDH, SDH, MDH and GDH activities in the fat body of control and treated insects are presented in Table 1 and Fig 1. The MDH and GDH activities the fat body of zoopesticide, pygidial secretion treated with insects have been observed to be improved extensively than that of control insects. In comparison, the LDH and SDH activities in the fat body of treated with insects have reduced considerably than that of control insects. The LDH activity inside the fats body of control and treated insects of about 0.80 ± 0.04 to 0.16 ± 0.06 µmoles/mg/protein. The SDH activity within the fat body of control and treated insects of about 19.73 ±0.59 to 5.25 ± 0.15 µmoles/mg/protein; The MDH and GDH activity inside the fat body of control and treated with insects of about 17.02 ± 0.51 to 27.33 ± 0.54; 8.26 ± 0.33 to 15.42 ± 0.46 µmoles/mg/protein, respectively. The suggest LDH, SDH, MDH and GDH content material of the fats body of manipulate and treated with insects are compared for significance of difference and that the t-values 32.80, 34.37, -74.44, 66.53 and -43.49 are substantial at 0.05% ranges. Therefore, it can be concluded that the LDH, SDH, MDH and GDH in fat body of control and treated insects were increased considerably. Similarly, the LDH and SDH 128 activities inside the fat body of treated with insects have decreased significantly. But in the MDH and GDH activities within the fats body of treated insects had been accelerated considerably than that of control insect, *S. rusticum*.

Table 1: Enzymes activity fat body in control and treated male insect *S. rusticum*

Fat Body	Control (µmoles/mg/protein	Treated	Percentage over control	't' value
LDH	0.80±0.04	0.16±0.06	-85.80	32.80*
SDH	19.73±0.59	5.25±0.15	-74.44	34.37*
MDH	17.02±0.51	27.33±0.54	66.53	-75.54*
GDH	8.26±0.33	15.42±0.46	97.74	-43.49*

Data represent values are mean ± S.D (n=6). *Significant at 0.05% level.

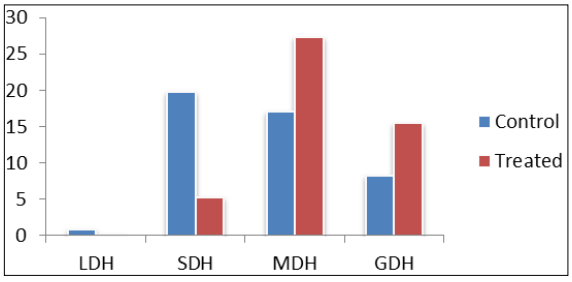

Fig 1: Enzymes activity fat body in control and treated male insect *S. rusticum*

LDH, SDH, MDH and GDH activities in the testis of control and treated insect, *S. rusticum*

The LDH, SDH, MDH and GDH activities in the testis of

control and treated insects are presented in (Table 2 and Fig. 2). The LDH and SDH in the testis of treated insects were found to be comparatively less than that of the control insects. But the MDH and GDH activities in the treated insects were found to be comparatively more than that of control insects. The LDH activities in the testes of control and treated insects were 3.90 ± 0.07 to 1.40 ± 0.07 µmoles/mg/protein. The SDH activities in the control and treated insects were 13.31 ±0.26 to 9.83 ± 0.19 µmoles/mg/protein. The MDH activities in the control and treated insects were 10.70 ± 0.39 to 14.19 ± 0.42 µmoles/mg/protein. The GDH activities in the control and treated insects of about 16.16 ± 0.32 to 18.27 ± 0.54 µmoles/mg/protein, respectively.

The mean LDH, SDH, MDH, and GDH activities in the testis of control and treated insects were compared for significance of difference. It is clear that the t-values, 26.97, 20.16, -14.38 and -12.35 were significant at 0.05% level. Therefore, it may be concluded that the LDH, SDH, MDH and GDH activities differ significantly in the testis of control and treated insect, *S. rusticum*.

Table 2: Enzymes activity on testes in control and treated adult male insect, *S. rusticum*

Testes	Control (µmoles/mg/protein)	Treated (µmoles/mg/protein)	Percentage over control	't' value
LDH	3.90 ± 0.07	1.40 ± 0.07	-56.47	26.97*
SDH	13.21 ± 0.26	9.83 ± 0.19	-23.71	20.16*
MDH	10.70 ± 0.39	14.19 ± 0.42	42.93	-14.38*
GDH	16.16 ± 0.32	18.27 ± 0.54	20.35	-12.35*

Data represent values are mean ± S.D (n=6).
*Significant at 0.05% level.

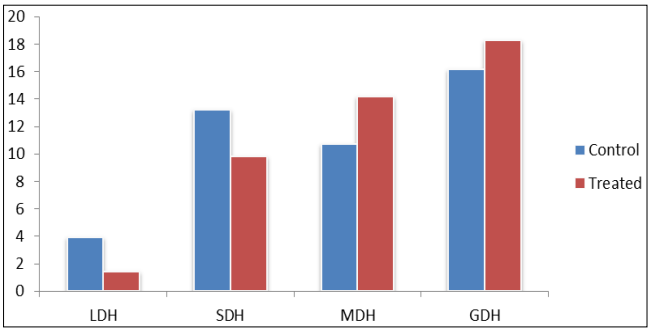

Fig 2: Enzymes activity on testes in control and treated adult male insect, *S. rusticum*

LDH, SDH, MDH and GDH activities in the vas deferens of control and treated insects, *S. rusticum*

The LDH, SDH, MDH and GDH activities in the vas deferens of control and treated insects are presented in Table 3 and Fig. 3. The MDH and GDH activities in the seminal vesicle of treated insects were increased considerably than the control insects. The LDH and SDH activities in the seminal vesicle of treated insects were found to be decreased than that of the control insects. The LDH, SDH, MDH, and GDH activities in the seminal vesicle of control and treated insects of about, 1.91 ± 0.05 to 1.32 ± 0.12; 12.07 ± 0.31 to 8.48 ± 0.38 and 1.02 ± 0.0.02 to 1.79 ± 0.04 and 0.96 ± 0.02 to 1.60 ± 0.04 µmoles/mg/protein, respectively.

The MDH and GDH activities in the vas deferens treated insects have increased significantly than that of control insects.

The LDH and SDH activities in the vas deferens of treated insects have decreased significantly than the control insects. It is clear from the table that the t-values of vas deferens are significant at 0.05% level. Therefore, it may be concluded that the LDH, SDH, MDH and GDH activities in the vas deferens of control and treated insects have been range considerably.

Table 3: Enzymes activity on vas deferens in control and treated adult male insect *S.rusticum*

Vas deferens	Control (µmoles/mg/protein)	Treated (µmoles/mg/protein)	Percentage over control	't' value
LDH	1.98 ± 0.05	1.32 ± 0.12	-32.87	11.96*
SDH	12.07 ± 0.31	8.48 ± 0.38	-30.97	17.14*
MDH	1.02 ± 0.02	1.79 ± 0.04	64.76	-35.35*
GDH	0.96 ± 0.02	1.60 ± 0.04	80.04	-36.94*

Data represent values are mean ± S.D (n=6).
*Significant at 0.05% level.

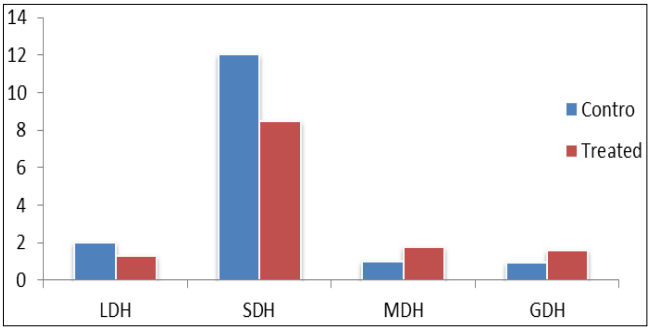

Fig 3: Enzymes activity on vas deferens in control and treated adult male insect *S.rusticum*

LDH, SDH, MDH and GDH activities in the seminal vesicle of control and treated insect, *S. rusticum*

The LDH, SDH, MDH and GDH activities in the seminal vesicle of control and treated insects are presented in (Table 4 and Fig. 4).

The MDH and GDH activities in the seminal vesicle of treated insects were increased considerably than the control insects. The LDH and SDH activities in the seminal vesicle of treated insects were found to be decreased than that of the control insects. The LDH, SDH, MDH, and GDH activities in the seminal vesicle of control and treated insects of about, 1.61 ± 0.22 to 0.78 ± 0.02; 9.33 ± 0.46 to 6.66 ± 0.26 and 8.02 ± 0.16 to 12.20 ± 0.58 and 14.14 ± 0.27 to 18.02 ± 0.36 µmoles/mg/protein, respectively. From the Table, it is clear that the t were significant at 0.05% level. Therefore, it can be LDH, SDH, MDH and GDH activities in the seminal vesicle of control and treated insects have been range significantly.

Table 4: Enzymes activity on seminal vesicle in control and treated adult male insect, *S. rusticum*

Seminal vesicle	Control (µmoles/mg/protein)	Treated (µmoles/mg/protein)	Percentage over control	't' value
LDH	1.61 ± 0.22	0.78 ± 0.02	-52.61	8.36*
SDH	9.33 ± 0.46	6.66 ± 0.26	-29.68	14.57*
MDH	8.02 ± 0.36	12.20 ± 0.24	45.58	-14.04*
GDH	16.10 ± 0.32	18.02 ± 0.36	29.59	-12.93*

Data represent values are mean ± S.D (n=6).
*Significant at 0.05% level.

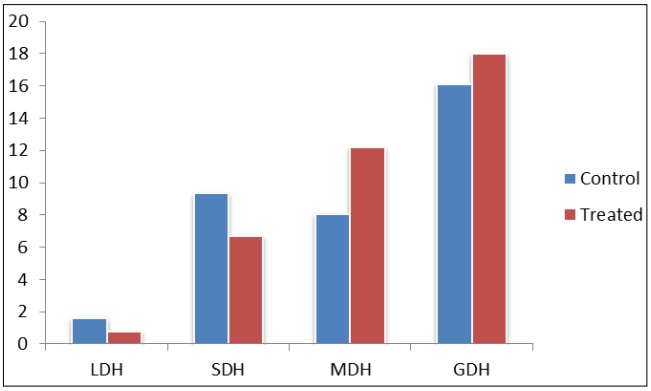

Fig 4: Enzymes activity on seminal vesicle in control and treated adult male insect, *S. Rusticum*

Discussion

The ectensive use of zoopesticide pygidial secretion has amounted the biochemical and physiological changes which can be of adaptive importance to the lifestyles of an animal. Among that modification alteration in xenobiotics metabolizing enzymes has dominated the toxicological literature. Enzyme is a biocatalyst which speed organic reactions. However the concept of biocatalyst is a totally wide basis of enzymes used common in plant and animal cells. Animal enzymes which might be used presently are lipases, tripsin, rennin, and energy is derived from the three most important assets particularly carbohydrates, proteins and fats while they may be oxidized (Gilmour, 1965) [17]. Natural molecules principally by means of oxidation. Biologically such electricity yielding oxidations are over through the removal of hydrogen and electrons from the substrates and their transfer to different acceptors within the cellular (Gilmour, 1965) [17].

In the present investigation, the activity of, MDH and GDH inside the fat frame of dealt with insects were multiplied than the control bugs. In comparison, the interest of LDH and SDH within the take a look at tissues of treated insects had been decreased than the manipulate insects. This remark is in conformity with Jayanthi, (2001) [19] for *Macrobrachium malcolmsonii*, Sumathi, (2018) [38] for *Gryllotalpa africana* when uncovered to endosulfan; Rajathi, (2004) for *Sphaerodema rusticum* exposed to heavy metallic mercury; Rameshkumar, (2015) [29] for *Laccotrephus ruber* exposed to zinc. This is supported through the observations, indicating the formation of latest protein inside the gland at some point of pressure. Thus, S. rusticum not only depends on glycolytic pathway to release energy but also derives its energy for the transfer of sperms to the female by other path ways.

Based on those findings, it is suggested that in this insects, energy may additionally probable be supplemented via the oxidation of α-ketoglutarate because it has been shown for other insects which include *Apis mellifera* (Blum, 1962) [8]; *Plebiogryllus guttiventries* and *Chrysocoris purpureaus* (Ranganathan, 1970) [30]; *Aspongopus janus* (Padmanabhan, 1992) [28] *Odontopus varicornis* (Kumar, 2014) [23].

Lactate dehydrogenase (LDH) is an critical glycolytic enzyme being present virtually in all tissues (Kaplan and Pesce, 1996) [21]; it is also involved in carbohydrate metabolism and has been used as an indicative criterion of exposure to chemical pressure (Diamantino *et al*., 2001) [16] and it's miles used as an index of anaerobic metabolism (Chamberlin and King, 1998) [12]. Activity level of lactate dehydrogenase in *Culex* after treatment with DDT, malathion and cyfluthrin decreased 58.88%, 33.33% and sixty six.66%, respectively Nathan *et al*., (2005) [26] have confirmed that feeding of *Spodoptera litura* on *Ricinus communis* L. Dealt with with azadirachtin and nucleopolyhedrovirus decreases the quantity of this enzyme in midgut that demonstrates low nutritional performance of the larvae. Similar outcomes have been also discovered on effectiveness of *Melia azedarach* on rice leaf folder (Nathan, 2006) [26]. Hence, using chemical compounds may additionally lower pastime degree of LDH.

In the present study, the activity of LDH in the fat body, testis, vas deferens and seminal vesicle of treated insects were lower than the control insects. From these findings, it may be suggested that the decreased LDH activity is probably for the conversion of lactate to pyruvate. It is inferred from the present study, that the LDH activity in certain reproductive tissues, perhaps due to treatment with the zoopesticide pygidial secretion suggested that these changes might be due to the occurrence of more amount of pyruvate and less amount of lactate in their tissues. It is known that during intoxication, there could be oxygen dept and accumulation of lactate in the muscle but not in other organs; the pyruvate unutilized may be perhaps converted into lactate during energy demand. Further, the enhanced LDH in certain tissues with concomitant reduction of pyruvate indicates the conversion of pyruvate to lactate.

In the present study, it has been observed that the SDH activity levels showed inhibition in all the reproductive tissues during treatment with the zoopesticide, pygidial secretion than the control insects, suggesting that the decreased amount of glycogen and increased level of glucose signified their utilization for the energy requirement during the period of stress.

Inhibition of oxidation of succinate or succinate dehydrogenase by insecticides and heavy metals are well known. DDT and other non-toxic DDT analogues inhibit the succinate oxidation in housefly (Anderson *et al*., 1954) [4]. Melathion inhibits succinate and pyruvate oxidation O'Brien, (1956) [27] has also reported a decreased succinate dehydrogenase activity levels in the scorpion *Heterometrus falvipus* after cyanide treatment.

In the present investigation, the decreased degree of SDH has been determined in all the tissues of intoxicated insects. It is thought that each cellular is based on several enzyme catalysed to maintain its metabolism. As SDH is a key enzyme inside the TCA cycle, it is logical to anticipate that the inhibition of SDH interest, the metabolic pathway might switch over from aerobic to anaerobic to meet the increase energy demand for the duration of toxicity.

The SDH activity showed a decrease in the fat body which indicates disturb in enzyme synthesis. The zoopesticide pygidial secretion perhaps disturbs the mitochondrial membrane of the fat body and all the reproductive tissues. This rupture leads to a decrease in the activity of membrane bound SDH. It is also suggested from the present study that along with decreased activity of SDH, the oxygen carrying capacity may be responsible for the decrease in the aerobic respiration. These results are in concomitant with the works of Sumathi, (2002) [37] who has reported for inhibition of the activity of the dehydrogenase which may be due to the activity of changes in the mitochondrial membrane function in *Gryllotalpa africana* treated with the endosulfan.

Succinate dehydrogenase belongs to complex-II of

respiratory chain and is present in inner mitochondrial membrane. In the present study, the activity of succinate dehydrogenase also decreased with 2,4-D treatment. Similar decline in the succinate dehydrogenase activity with dimilin, batex and K-othrine was observed in *Diplonychus indicus* (Raja and Venkatesan, 2001); in 2,4-D herbicide in *Lipophis erysimi* (Sohal *et al*., 2008; Rup *et al*., 2006). The inhibition of SDH activity in *S. rusticum* may be followed due to the reduction in O2 consumption level, suggesting that the zoopesticide affects the TCA cycle, which leads to disturbances in the respiratory metabolism of these insects. In insects, two kinds of MDH cytosolic and mitochondrial are well known (Sacktor, 1975). Cytosolic MDH is oxidized into oxaloacetate by the action of cytosolic MDH, to yield malate. The malate enters into the mitochondria via a carrier and is oxidized there into oxaloacetate by the action of mitochondrial MDH. It is evident that the gland is assured to supply energy by the TCA cycle during energy demand when insects are intoxicated with the zoopesticide pygidial secretion. This suggested that more of the substrate either malate to oxaloacetate is combusted to sustain the TCA cycle.

In the current study it has been observed that the sample of pastime of the respiratory enzyme, MDH is just like the other respiratory enzyme SDH, that is found extended in all the reproductive handled tissues than the control tissues. This adjustment is probably due to the deliver of strength by way of the TCA cycle for the handled insect which requires energy at some stage in zoopesticide intoxication.

Similar results have been found by way of Sumathi, (2002) [37] for *Gryllotalpa africana* while exposed to endosulfan; Rajathi, (2004) for *Sphaerodema rustium* exposed to heavy steel mercury; Rameshkumar, (2004) for *Laccotrephus ruber* while uncovered to zinc. Further, the results had been extensively reduced in the activity stages of SDH and MDH, within the fat body and different reproductive tissues and a discount within the fee of oxidative metabolism on the mitochondrial stage, because the heavy metals are acknowledged to block the breathing centre of the tissues main to a condition much like asphyxia (Rao *et al*., 1980).

Vijay Joseph and Jayantha Rao, (1991) have stated that SDH, MDH and LDH inhibited consequently on exposure to sublethal concentration of aldrin enhanced activities of LDH. Glutamate is the only amino acid for which specific and highly active dehydrogenase exists. This occurs principally through the amino transferases completed with the action of GDH (Smith *et al*., 1985). Schaefer, (1967) [33] has reported that the formation of α-ketoglutarate from glutamate in the flight muscles of house fly. Deamination of amino acids by GDH is the major route of protein metabolism.

In general, those are most important pathway for the conversion of a-ammo acids to the corresponding L-keto acids through the formation of different acids by using the enzymes L-amino acid dehydrogenase. Glutamate can be transformed into a-ketoglutarate by way of the transmission with other keto acids. It is also regarded that deamination of glutarate brought about the motion of GDH (NAD+based) yields ammonia and α-ketoglutarate, Osanai *et al*. (1986) have tested the similar metabolic pathway for power supply to spermatozoa into spermatophore for *Bombyx mori*.

In the present study, it has been shown that the dynamic nature of an increase in GDH activity in all the tissues of treated insects suggesting that the glutamate may be utilized for the conversion of α-ketoglutarate to meet out an extra energy demand by *S. rusticum* during zoopesticide intoxication. Similar results have been reported for *Melanoplus sanguinipes* (Chesseman *et al*., 1990); Glutamate dehydrogenase is an enzyme that, in addition to its role in the energy metabolism in mitochondria, is involved in neuromuscular transmission for *Drosophila melanogaster*. On the basis of the observations made in the present study, it is evident that the inhibition of SDH and LDH activities and stimulation of MDH and GDH activities in all the target tissues of the reproductive system of *S. rusticum* when intoxicated with zoopesticide pygidial secretion. The metabolic pathway of this insect has shifted towards anaerobic side rather than aerobic side to meet the increase in energy demands during zoopesticide treatment.

Conclusion

Therefore it is competent to be concluded that the LDH, SDH, MDH and GDH in fat body of control and treated insects has been range considerably. Similarly the LDH and SDH 128 activity inside the fat body of treated insects have decreased significantly. But within the MDH and GDH control in the fat body of treated with insects has been multiplied significantly than that of control insect *S.rusticum*.

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