



Received on 19 April 2014; received in revised form, 22 June 2014; accepted, 28 June 2014; published 01 July 2014

EFFECTIVITY OF STARVATION ON DIGESTIVE ENZYME OF FEMALE *HOLOTRICHIA SERRATA* (FAB) (COLEOPTERA: SCARABAEIDAE)

S. V. Theurkar

Department of Zoology, Hutatma Rajguru Mahavidyalaya, University of Pune, Rajgurunagar - 410505, Maharashtra, India.

Keywords:

Starvation, enzymes, *Holotrichia serrata*, Coleoptera: Scarabaeidae

Correspondence to Author:

Theurkar Sagar Vasant

Senior Research Fellow (SRF),
Department of Zoology, Hutatma
Rajguru Mahavidyalaya, University
of Pune, Rajgurunagar - 410505,
Maharashtra, India.

E-mail: svtheurkar@yahoo.co.in

ABSTRACT: The effect of starvation on the digestive enzymes of female *Holotrichia serrata* (Fab) shows that there are considerable general reductions in enzymatic activities except in a lipase in both gut sections; however there are considerable increases of soluble proteins, both the gut section homogenates of the starved female. The maximum reduction of protease is 83% in a hindgut and 86% in the midgut followed by invertase which is 59% in a midgut and 50% in the hindgut and trehalase 62% hindgut and 51% in the midgut. The lipase is 80% reduction in a hindgut and 41% in the midgut in a starved female. In the starved female, Lipase showing the significant decrease in activity of 11% in a hindgut and 5% increase in the midgut.

INTRODUCTION: Insects have been used only to a minimal degree in a study and stress reaction¹. The role starvation as an aspect of nutritional diseases and predisposing factor for infectious diseases has been considered^{2, 3}. In silkworm *Bombyx mori* the cell breakdown resulting from starvation may significantly increase enzyme activity lipase is said to increase markedly on the second day of starvation of the decrease gradually⁴. Amylase activity did not increase. It seems likely that ingested food serves as a stimulus to enzyme secretion.

MATERIALS AND METHODS: The freshly emerged unfed female adults were collected from their natural habitat and mentioned in the laboratory in the wet earthen pot without giving food.

Scarabaeidae adults were collected from leaves of host plants like Neem, Babhul, Khair, Ber, etc. the *Holotrichia serrata* (Fab) is most abundant species found in Khed Taluka which is part of Northern Western Ghats (MS), India⁵. The earthen pots were placed in each cage, filled with sandy loam soil slips during monsoon season⁶.

Soil temperature and moisture were maintained daily into the experimental time. Another lot of beetles collected from the same field on the same day similarly mentioned in the laboratory, but the tender leaves of neem were supplied to them as food. To study the effect of starvation on digestive enzymes like amylase, invertase, trehalase, protease and lipase, 15 days starved and well fed individual male *Holotrichia serrata* (Fab) having approximately similar weights were considered. The adult was dissected in cold solution and separated their midgut and hindgut. The homogenates of pooled tissue were prepared in 0.9% chilled NaCl, centrifuged for 15 min at 10000 rpm. The aliquots of supernatants were used as enzymes amylase invertase, trehalase was determined by using 3-5 dinitrosalicylic acid (DNSA)

	<p>QUICK RESPONSE CODE</p>
	<p>DOI: 10.13040/IJPSR.0975-8232.IJP.1(7).454-56</p>
<p>Article can be accessed online on: www.ijpjournal.com</p>	
<p>DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.1(7).454-56</p>	

reagent ⁷. Protease the procedure is used for the determination of the protease activity ⁸. The absorbance of the reaction mixture was read using UV spectrophotometer at 280 nm against control. Lipase activity was measured ⁹.

RESULTS AND DISCUSSION: The present study investigates that, there is in considerable general reduction of digestive enzymes activity in both gut section, excepting lipase which is least affected by the starvation. It showed a slight increase in the midgut section and a slight reduction in hindgut. In case of amylase, reduction is a maximum in hindgut as compared to midgut, in case of invertase decreasing activity in midgut than hindgut. The trehalase reduction of activity due to starvation is more or less in both gut section. The reduction of protease is 83% in a hindgut and 86% in midgut followed by invertase which is 59% in a midgut and 50% in the hindgut and trehalose 62%

hindgut and 51% in midgut. The lipase is 80% reduction in a hindgut and 41% in midgut in a starved female. In the starved female, Lipase showing the significant decrease in activity of 11% in a hindgut and 5% increase in the midgut.

The protease is about 80% reduction was noted in both gut section starvation is the one type of environmental stress that insect is likely to exposed during their growth and development ^{10, 11}. The role of starvation as an aspect of nutritional disease predisposing factor for infectious disease has been considered ^{2, 3}. In the literature of insect, digestion tract has been consider as per secretion of digestive enzymes. It has been reported ^{10, 11} in reaches *Blutella* and *Periplaneta* that the numbers of cytoplasmic globules were increased in hindgut due to starvation, but this was not correlated with the corresponding increase of the digestive enzyme activity.

TABLE 1: EFFECT OF STARVATION ON DIGESTIVE ENZYMES OF *HOLOTRICHIA SERRATA* (FAB) FEMALE ADULT

S. no.	Enzymes	Control female Midgut	Starved female Midgut	Control female Hindgut	Starved female Hindgut
1	Amylase mg Maltose/ mg Protein/ hr	26400 ± 1235.5	13217 ± 1290	62857 ± 2353.3	12373 ± 346.6
2	Invertase mg Glucose/ mg Protein/ hr	363.00 ± 30.58	146.92 ± 10.47	282.85 ± 21.99	140.80 ± 14.84
3	Trehalase mg Glucose/ mg Protein/ hr	369.00 ± 16.5	192.83 ± 10.82	188.57 ± 30.92	70.40 ± 14.24
4	Protease mg Tyrosin/ mg Protein/ hr	13219.19 ± 151.60	2235.13 ± 58.74	5315.65 ± 217.80	739.83 ± 39.83
5	Lipase mg Palmatic acid/ mg Protein/ hr	324 ± 28.12	340.52 ± 40.18	888.68 ± 79.51	783.3 ± 88.11

CONCLUSION: There was a considerable reduction of digestive enzymes level of amylase invertase and protease is 15 days starvation with the result of earlier workers. There was in the considerable general reduction of digestive enzyme level in both gut section except lipase which is least affected by 15 days starvation which is showed a slight increase in the midgut.

The most affected enzyme was protease followed by amylase, invertase, and trehalase in both midgut and hindgut respectively.

ACKNOWLEDGEMENT: The author is thankful to the Chairmen, the Secretary K.T.S.P. Mandal's, Principal of Hutatma Rajguru Mahavidyalaya, Rajgurunagar and Head of the Department of Zoology, Hutatma Rajguru Mahavidyalaya, Rajgurunagar. The author is also thankful to the

authorities of Pune University, Pune for providing necessary laboratory and facilities to complete this research work.

CONFLICT OF INTEREST: Nil

REFERENCES:

- Scharrer E and Scharrer B: Stress in neuroendocrinology P. 167-173 Columbia University Press New York 1963; 284.
- House HI: Nutritional Diseases, 133- 66. Inch Smith (ed) insect Colonization and mass reproduction Academic Press, New York 1963; 618.
- Jacques RP: Biological control of *Cylas* spp. In K.V. Raman (Ed.) Sweet Potato Pest Management: A Global Perspective. Journal of Insect Physiology 1962, 4: 1-22.
- Yamafuji I and Yanezawa Y: Effect of digestive enzymes after starvation of insects, Journal of agricultural Chem Soc Japan 1935; 11: 16-21.
- Theurkar SV, Patil SB, Ghadage MK, Zaware YB and Madan SS: Occurrence of white grubs in groundnut growing area of Khed Taluka, part of Northern Western

- Ghats (MS), India. International Research Journal of Recent Sciences 2013; 2: 1-3.
6. Theurkar SV, Patil SB, Ghadage MK, Zaware YB and Madan SS: New culture method for White Grubs, India. International Research Journal of Biological Sciences 2012; 1(7): 1-6.
 7. Bergenfield P: Amylase A and B in the method of enzymology, Academic press New York 1955; 1.
 8. Ishaayatal A, Ascher K and Shuval G: Study of enzymes in the digestive system of insects, Pesti biochem and physiol academic press 1971, 4: 14-23.
 9. Hayashi K and Tappel A: The physiology of insect Reproduction. Journal of Biological Chemistry 1970; 245: 169.
 10. Borror DJ, Delong DM and Triplehorn CA: An introduction to the study of insects (4th ed.), Chicago, Holt, Rinehart and Wilston 1975; 36-49.
 11. Day V and Powering K: In insect physiology (K.D. Roeder, Ed.) Willey, New York 1953; 273-330.

How to cite this article:

Theurkar SV: Digestive. Effectivity of starvation on enzyme of female *Holotrichia serrata* (Fab) (Coleoptera: Scarabaeidae). Int J Pharmacognosy 2014; 1(7): 454-56. doi: 10.13040/IJPSR.0975-8232.1(7).454-56.

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