Biospectra : ISSN : 0973-7057, Vol. 15(1), March, 2020, pp.367-370
An International Biannual Refereed Journal of Life Sciences

46(AS).
Animal Science

ISSN : 0973-7057

Int. Database Index: 663 www.mjl.clarivate.com

Effect on histochemical localization of alkaline and acid phosphates in the alimentary canal of Khapra beetle, *Trogoderma granarium* (Evert) due to some environmental pollutants

Rajesh Kumar Suman[a], Surabhi Saloni[a] & Lakshman Sah[b]*

[a]P.G. Department of Zoology, Magadh University, Bodh-Gaya, Bihar, India

[b]Department of Zoology, R.K.D College Patna, Patliputra University, Patna, Bihar, India

Received : 8th February, 2020 ; Revised : 24th February, 2020

Abstract : This paper represents the distribution of enzymes alkaline and acid phosphatases, were studied in the alimentary canal of Khapra beetle. It is observed that these enzymes were localized only in the midgut region. Both foregut and hind gut showed negative reaction. In the lower part of the midgut, a very high concentration of alkaline phosphatases was observed, whereas, the upper part of midgut showed relatively lesser concentration of these enzymes. A moderate reaction was observed throughout the midgut region of acid phosphatases which was found to be localized mainly towards lumen and peripheral sides but no effect of environmental pollutants on the gut of *Trogoderma granarium* (Evert).

Key words: Khapra beetle, insect, alimentary canal, enzyme, maize

INTRODUCTION

The distribution of alkaline and acid phosphatases in the alimentary canal of various insects has been studied by Gomari (1946)[1], Frankel (1964)[2], Srivastava and Saxena (1967)[3], Asharfi *et al.* (1969)[4], Naqvi *et al.*(1969)[5], Sharan and Sinha (1975)[6], Srivastava and Sharan (1981)[7], Anon (2005)[8]. Many fold functions of both alkaline and acid phosphatases are well known. These enzymes are chiefly concerned with the energy transfer, enzymatic synthesis and hydrolysis of ester linkages. These functions are involved in the digestion and absorption of food in the alimentary canal. Considering the importance of these enzymes, an attempt has been made in the present investigation to study the localization of alkaline and acid phosphatases in the alimentary canal of *Trogoderma granarium* (Evert).

*Corresponding author :
Phone : 9931022602, 7004642268
E-mail : lakshmansah011958@gmail.com

MATERIALAND METHODS

Laboratory cultures of the insects were raised on maize (*Zea mays*) at 30 ± 2ºC temperature and 70 ± 5% R.H. only newly emerged adult insects were used in the experiment. The insects were fixed in Gomori's cold absolute acetone at 4ºC for 24 hours. Since the size of the insect is very small, hence for fixation, they were kept intact. Only elytra and legs were cut with the help of sharp blade. After fixation, materials were washed in three changes of absolute acetone and then embedded in paraffin wax (58ºC). Blocks were prepared by routine procedure.

The paraffin sections were cut on 8 microns. The Calcium cobalt method (Gomori,1956[9], after Pearse,1968[10]) and modified lead nitrate method were used for determining the sites of activities of alkaline and acid phosphatases respectively. The results were confirmed by preparing control slides.

OBSERVATIONS

Tests for alkaline and acid phosphatases gave positive results in the midgut region only. The cells of foregut and hindgut showed negative reaction for both the enzymes. An intense positive reaction was observed throughout the midgut for alkaline phosphatase which was scattered all over the cells. However, the pattern of intensity was not the same for the entire midgut region. In the upper part of the midgut, the black precipitate which is indirective of this enzyme was found relatively in slightly lesser concentration while in the lower part of the midgut, a very strong concentration of this enzyme appeared. (Fig 1,2).

A positive and moderate reaction for acid phosphatase was observed throughout the midgut region. But this was found to be concentrated mainly towards lumen and peripheral sides. (Fig 3).

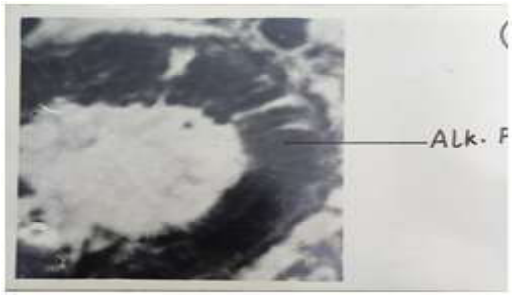

Fig. 1. T.S. of upper part of midgut showing intense reaction for alkaline phosphatase

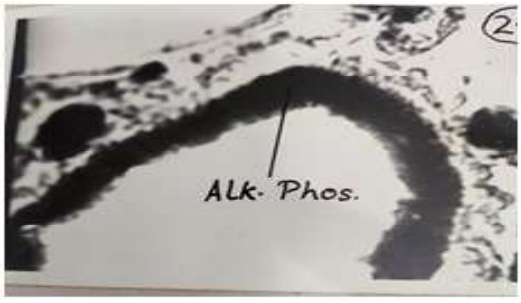

Fig. 2. T.S. of lower part of midgut showing very intense reaction for alkaline phosphatase

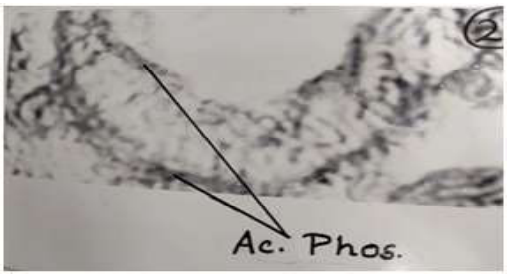

Fig. 3. T.S. of midgut showing moderate reaction for acid phosphatase

DISCUSSION

Alkaline phosphatase activity indicates an increased phosphate transfer, whereas, acid phosphatase activity indicates hydrolysis of phosphate esters.[10] According to Srivastava and Saxena (1967)[3], phosphatase is mainly responsible for dephosphorylation of hexose phosphate in the formation of glycogen. Asharfi *et al.* (1969)[4], has correlated enzyme alkaline phosphatase with the secretory activity of the digestive system of *Schistocera gregaria*. Sharan and Sinha (1975)[6], has suggested that the activity of alkaline phosphatase was confirmed to midgut region in *Gryllus testaceus*. In the present investigation, the higher concentration of alkaline phosphatase in the lower part of the midgut indicated an increased activity of secretion and absorption of metabolites in this part of the midgut. Similar results has been obtained by Srivastava and Sharan (1981)[7], for alkaline phosphatase activities in the midgut of *Tribolium castaneum*. Positive reaction of acid throughout the midgut region confirmed the hydrolysis of the ester linkages in phosphate esterase.

REFERENCES

1. **Gamori, G. 1946.** "The study of enzymes in the tissue section", *American journal of clinical pathology*, **16:**347.
2. **Frankel, H.H. 1964.** "A modified calcium cobalt method for the demonstration of alkaline phosphatase". *Amer. J. Clinical Pathology*, **42:**342.
3. **Srivastava J.P. and Saxena, S.C. 1967.** *Appl. Ent. Zool.*, **2:**85-92.
4. **Ashrafi, S.H. Naqvi, S.N.H and Quadri , M.A.H. 1969.** *Ohio. J. Sci.,* **69:**183-193.
5. **Naqvi, S.N.H., Siddiqui, H.R and Yasmin, F. 1969.** *Pak. F. Zool.*, **1:**27-34.

6. **Sharan, R.K. and Sinha, A. 1975.** *Indian F. Zool*., **16(1):**7-10.

7. **Srivastava, S.K. and Sharan, R.K. 1981.** F. *Ent. Res*. **5(2):**175-176.

8. **Anon. 2005.** Description, Biology and control of Khapra Beetle. Promotional website (https://www. Pest products.com/khapra beetles. html).

9. **Gomori, G. 1956.** "Histochemical methods for acid phosphatase". *J. Histochem and Cytochem*, **4:**453.

10. **Pearse, A.G. E. 1968.** In: Histochemistry, Theoretical and Applied. 3rd ED., Vol.1. Little, Brown & Co., Boston 426 pp.

ADDITIONAL REFERENCES

1. **Ackerman, G.A. 1958.** "A combined alkaline phosphatase – PA/s staining method". *Stain Technology*, **33:**269-275.

2. **French, S. and R.C. Venitte. 2005.** Mini risk assessment Khapra beetle.

3. **Szito, A. 2006.** *Trogoderma granerium*. Global invasive http://www. issg. org/ database.

4. **Wilbur, Donald, A. and Mills Robert, B. 1978.** "Stored grain insects". Fundamental of Applied Entomology 3rd Edition. Chapter -17, Macmillan Pub, New York.

***