LIPASE ACTIVITY IN THE FAT BODY OF DEVELOPING LARVA OF LEUCINODES ORBONALIS (GUENEE)

GEJAGE, R. M.¹ AND AWATE MANISHA, R. A.² ²

¹K.R.P. Kanya Mahavidyalaya, Islampur 415 409. ²Department of Zoology, Shivaji University, Kolhapur 416 004. E.mail: manisha.r.awate@gmail.com

Received: April 24, 2009; Accepted: June 20, 2009

Abstract: The brinjal fruit borer, Leucinodes orbonalis (Guenee) is an important pest of eggplant in South Asia. Properties and activity of triacylglycerol lipase from the fat body of an insect, L. orbonalis have been studied. The larval fat body lipase revealed optimum pH 7.9, incubation time 30 minutes, temperature 37°C, enzyme concentration 1% and substrate concentration 5%. The gradual increase in fat body lipase activity was observed from 6-day old larvae to 8-day old larvae and gradual fall from 8-day old larvae to 11-day old larvae. The maximum lipase activity was observed in 8-day old larvae. The physiological role of lipase in the fat body during larval development of L. orbonalis has been reported in the present paper.

Key words: Triacylglycerol lipase, Leucinodes orbonalis (Guenee)

INTRODUCTION

Brinjal shoot and fruit borer, Leucinodes orbonalis (Guenee) is the most destructive pest of brinjal. The triacylglycerol lipase is an enzyme which is responsible for hydrolysis of triglycerides that in turn release energy for larval growth. Notable workers have investigated in detail the various aspects of larval triacylglycerol lipase in a few insect species [1-5]. However, the information about this enzyme in the fat bodies of developing larvae of L. orbonalis is not available. The present study fulfills this lacuna.

MATERIALS AND METHODS

The culture of L. orbonalis was maintained in the laboratory on natural food of brinjal fruit as discussed earlier [6]. The larval developmental stages from 6th day to 11th day were taken for study of lipolytic activity. The fat bodies of each stage were isolated, repeatedly washed in distilled water, weighed and homogenized in cold double distilled water using a ground glass mortar and pestle. The homogenate was diluted with cold double distilled water so as to get 1 % (wt/vol) concentration and used for the assay of lipolytic activity. The lipase was assayed by the method of Hayase and Tapple [7]. The assay system contained 0.25 ml of 5% substrate dispersed in gum acacia; 1.0 ml of 0.1 M tris-maleate buffer pH 7.9 and 0.25 ml of 1% (wt/vol) tissue homogenate in a total volume of 1.5 ml. The incubation was carried out in a Shaker with a continuous shaking for 30 minutes in glass stoppered vessels at 37°C. The colour was developed by the addition of 1 ml of 0.5% solution of mixture of diphenyl carbazone and diphenylcarbazid (5 : 95 w/w) in methanol. At the end of incubation the liberated fatty acids were measured colorimetrically [8].

RESULTS AND DISCUSSION

The developmental period of larvae of L. orbonalis is 11 days. Changes in lipase activity in the fat bodies during their development is shown in figure 1. The optimum activity of lipase in larval fat body is noticed at optimum pH 7.9, incubation time 30 minutes, temperature 37°C, enzyme concentration 1% and substrate concentration 5%. The study shows gradual increase of lipase activity in fat body from 6th to 8th days and thereafter the enzyme decreases slowly.
from 8<sup>th</sup> to 11<sup>th</sup> days (Fig. 1). Thus on 8<sup>th</sup> day there is maximum activity of the enzyme. Literature revealed optimum activity of lipase at different pH in the fat bodies of different insect larvae. As for example, Price [1] noticed optimum activity of lipage in the fat bodies of 7<sup>th</sup> day blowfly larvae at pH range 7.5 to 8.0. The lipase activity in fat body of <i>Chrysomyia rufifacies</i> during larval growth and metamorphosis was maximum at the broad pH range 8.5 to 9.0 [9]. However, the larval fat body lipase of <i>Chilo partellus</i> showed maximum activity at pH 8.0 [10]. In the present work the larval fat body of <i>L. orbonalis</i> showed maximum lipase activity at pH 7.9. This condition is similar to Errese and Wells [11] observation who also found the maximum activity of enzyme in the larval fat body of <i>Manduca sexta</i> at optimum pH 7.9. Nevertheless, in all cases optimum activity is noticed at alkaline pH.

Arrese et al. [12] found that main triglyceride-lipase in the fat body of <i>Manduca sexta</i> is a homolog of <i>Drosophila melanogaster</i> CG855. The hydrolysis of triglycerides by larval fat body homogenate of <i>L. orbonalis</i> indicates the presence of triacylglycerol lipase (EC 3.1.1.3). Similar observations were also made in larvae of armyworm, <i>Mythimma separata</i> by Pol and Salunkhe [5], in larval blowfly, <i>Chrysomia rufifacies</i> by Pol and Sawant [3] and in larvae of <i>Chilo partellus</i> by Pol and Sakate [4].

The gradual increase in fat body lipase activity, as observed from 6 to 8 day larval age, indicates that this period of larval development is most active and requires maximum energy for its active life which may be supplied through triacylglycerol catabolism. A gradual fall of enzyme from 8 to 11 days old larvae suggested the later feeding period of larval development was slow as compared to early active feeding period and accumulation of lipid which was utilized during metamorphosis. The maximum enzyme activity observed in 8 day larval fat body indicated most active larval stage that require more energy for the structural components and larval growth.

**ACKNOWLEDGEMENTS**

The authors are grateful to Shivaji University, Kolhapur for providing required facilities.

**REFERENCES**