insect as a crop pest are from Canton, infesting cape gooseberry (*Physalis peruviana*), red pepper (*Capsicum* sp.), egg plant (*Solanum melongena*) and squash (*Cucurbita maxima*)[2] from Malaysia infesting plants belonging to Salanaceae and Convolvulaceae[3]. The adult is dark brown in colour measuring 1·4 cm in length and 5 mm in width. It feeds on tender mango fruits by piercing the outer rind and sucking the juice from inside. Exudations ooze out through the feeding points and the skin around these points become dark in colour; secondary infection by microbes leads to rotting of the fruits which ultimately fall.

The insect breeds on *Ipomea carnea* Jacq. The seed-like eggs are laid in batches of 18 to 20 on leaves and vines. The nymphs are reddish in colour in the beginning turning greenish and brownish subsequently. They are gregarious in their habits and feed on the vines. The nymphal period lasts from 70 to 75 days in October–November. Detailed studies on the biology are being undertaken.

Thanks are due to Dr. N. C. Pant, Director, Commonwealth Institute of Entomology, London, for kindly identifying the insect.

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CIRCADIAN RHYTHMIC ACTIVITY OF LIPASE IN THE SCORPION, *HETEROMETRUS FULVIPES* (C. KOCH)

DIURNAL rhythms in various activities like rate of heart beat, cholinesterase activity in the heart muscle[1], spontaneous electrical activity in the ventral nerve cord and segmental nerves[2], have been reported to occur in the scorpion, *Hererometrus fulvipes*. Similar rhythms have also been shown to occur in the levels of metabolites like blood glucose, and hepatopancreatic glycogen[3]. The rhythmic changes in the activities of succinate dehydrogenase[4], isocitrate dehydrogenase[5], phosphorylase[6] and alkaline phosphatase[7] in the scorpion, *Heterometrus fulvipes*, were correlated with the locomotor activity of these animals. In view of the existence of diurnal variations in the scorpion, it is of interest to find whether such changes would also occur in the activity of lipase, an enzyme that catalyzes the breakdown of high molecular weight esters, into fatty acids and glycerol. Hence, an attempt has been made to study the activity of lipase in different tissues of the scorpion.

The details of collection, maintenance of scorpions and sampling of tissues were described earlier[3]. The activity of lapase was estimated by the method of Cherry and Crandall[8] which was slightly modified as follows: The enzyme was incubated with an olive oil emulsion and the fatty acids produced were titrated against sodium hydroxide. The tissues after isolation were homogenized (10% W/V) in ice cold water, and centrifuged. The supernatant was used as the enzyme source. The enzyme source (2·0 ml : 200 mg tissue equivalent) was taken in a test tube and 0·5 ml of phosphate buffer was added to the tube followed by the addition of 2·0 ml of olive oil emulsion. The tube was shaken well and the contents were incubated at 37° C for one hour. At the end of this incubation period, 3 ml of 95% alcohol and 2 drops of phenolphthalein (1%) were added. The contents of the tube were titrated against sodium hydroxide (0·05 N) until the appearance of permanent pink colour. A zero time control was prepared which included the enzyme source, buffer and substrate but 95% alcohol (3 ml) was added prior to the addition of enzyme source. Lipase activity was calculated from the difference between the control and experimental titre value and expressed as lipase units/g wet weight of the tissue.

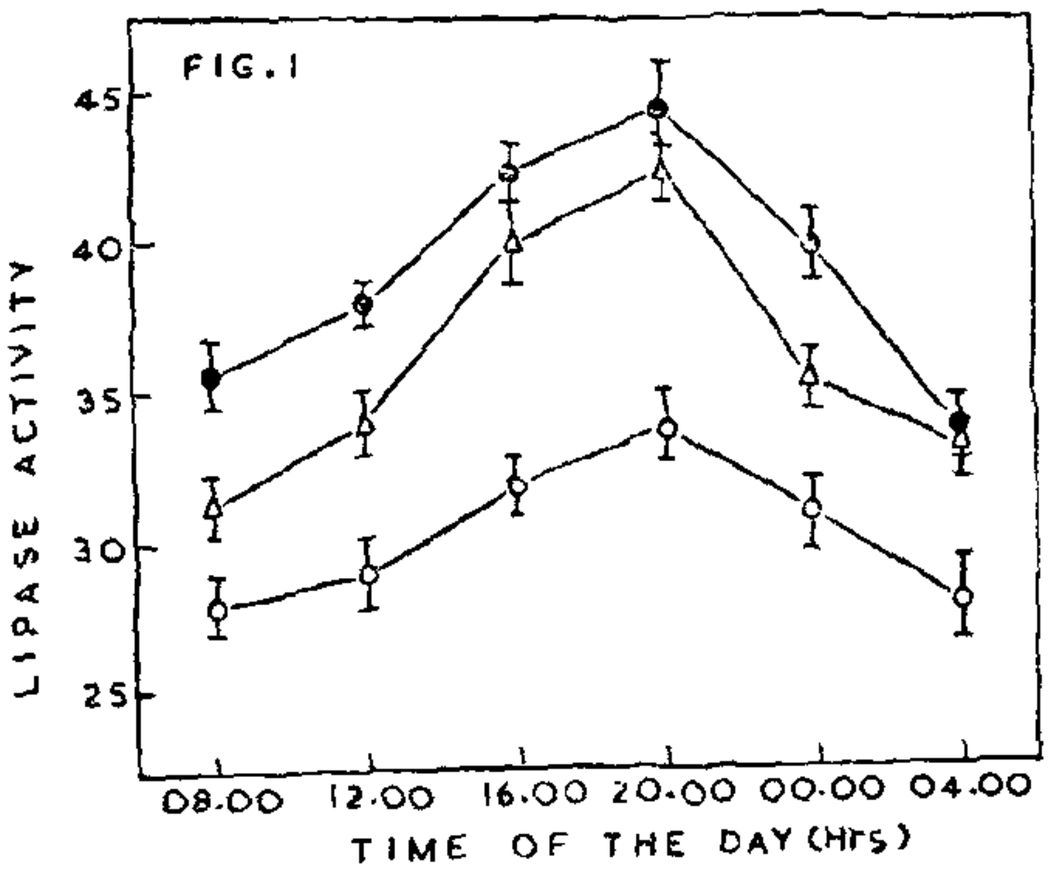

FIG. 1. Diurnal rhythmic activity of lipase under LD (normal) condition, at temperature 30 ± 1° C in the nervous tissue (●—●), hepatopancreas (Δ—Δ) and pedipalpal muscle (○—○). (Values, expressed as units/gram weight of the tissue, are mean ± S.D. of 6 observations.)

The results presented in Fig. 1 indicate that, in general, the enzymatic activity of the tissues followed the order nervous tissue > hepatopancreas > pedipalpal muscle. Lipase activity was maximal at 20·00 h and minimal at 08·00 h in the hepatopancreas and showed cyclic variations. The average level of the enzyme was higher during the period 16·00 h to 20·00 h than during 04·00 to 08·00 hrs. Similar changes were reported in the activities of isocitrate dehydrogenase[5], phosphorylase[6] and alkaline phosphatase[7]. Hepatopancreas is known to be the main organ of storage of nutrients. Synthesis and break down of these nutrients in hepatopancreas are related to the general metabolic needs of the animal. The result in the present investigation reflects the possibility of utilisation of lipids to sustain the energy needs of the animal during that period. Further, the higher level of activity of lipase around 20·0 h in the pedipalpal muscle also suggests the possibility of providing necessary high energy metabolites for the increased locomotor activity[3]. This is further supported by the observation that the Krebs cycle enzymes, like isocitrate dehydrogenase[5] and SDH[4] have been shown to be higher at those peak hours.

Lipase is a hydrolyzing enzyme which hydrolyzes esters of high molecular weight into fatty acids and glycerol. The higher activity of lipase in all the tissues around 20·00 h may be due to the increased shunting of glycerol and fatty acids into the metabolic flow (Krebs cycle) to sustain the energy needs of the animal.

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EFFECT OF INFESTATION OF *RAGMUS IMPORTUNITAS* DISTANT (HEMIPTERA: MIRIDAE) ON RESPIRATION, TRANSPIRATION, MOISTURE CONTENT AND OXIDATIVE ENZYMES ACTIVITY IN SUNN-HEMP PLANTS (*CROTALARIA JUNCEA* L.)

THE feeding of *Ragmus importunitas* D. results in severe phytotoxemic effects on sunn-hemp plants, *Crotalaria juncea* L. The infested leaves turn chlorotic and a retardation in growth is manifested[1]. The bugs cause considerable amount of mechanical damage during feeding[2], in addition to injection of salivary enzymes[3]. The damage also results in the loss of pods and seeds[4]. Studies have been made to assess the altered physiology of the host plant following infestation by different population levels of the bugs and the changes in the respiratory and transpiratory rate, moisture content and oxidative enzymes activity in infested plants are reported in this paper.

Different population levels of the bugs, *viz.*, low population (10 bugs/plant), moderate population (20 bugs/plant) and high population (50 bugs/plant) were confined on 20 day old Sunn-hemp plants of uniform vigour. Suitable control without bugs was also maintained. The treatments consisted of single plants and there were four treatments each replicated five times. Analyses were done on the leaves 25 days after infestation. The respiratory rate of the leaves was measured using Warburg's manometers with single side-armed reaction vessels by the direct method[5]. Transpiration rate of the leaves was assessed by the method described by Yarwood *et al.*[6] The moisture content of the leaf samples was determined by drying a weighed quantity of fresh tissue at 105° C for 24 h in a hot-air oven until a constant weight was obtained[7]. For assessing the oxidative enzymes activity the enzyme extract from the sunn-hemp leaves was prepared as per the method described by Maxwell and Bateman[8]. The cytochrome oxidase was assessed as per the method of Smith[9] while catalase, peroxidase and ascorbic acid oxidase activities were assessed as per the method of Beers and Sizer[10], Mudd *et al.*,[11] and Oberbaucher and Vines,[12] respectively.

The respiratory rates of healthy and infested leaves of sunn-hemp are presented in Table I. The respiratory rate increased significantly due to infestation. However, maximum respiratory rate was shown by leaves *infested with low level of population* of the bugs. The respiratory quotient (RQ) also varied in the different treatments. The higher RQ in the highly infested leaves indicates a deranged metabolism in the host plant. Increased respiration in plants affected