lapping in the mutant (Fig. 2). The primary branches, number of capsules and seed yield per plant were markedly higher in *TL*–2 than in *Neelum*. However the weight of 1000 seeds in *TL*–2 and *Neelum* was 8·1 and 8·7 g, respectively. There was no marked difference between the mutant and the parent with

FIG. 2. Flowers of (A) *Neelum* and (B) *TL*–2. The flowers are significantly small and the petals are not overlapping in *TL*–2.

regard to the number of seeds per capsule. The oil content in *Neelum* and *TL*–2 was 36·7% and 40·5%, respectively. The oil had a light colour in *TL*–2 as compared with the oil from *Neelum*. In a preliminary trial during 1977 *rabi* season, *TL*–2 and *Neelum* yielded 1180 kg/ha and 890 kg/ha seeds, respectively. The mutant plants are compact and non-lodging which are of agronomic importance. By increasing plant population per unit area, the seed and oil yield can considerably be increased in *TL*–2. Hybridization between the induced mutants *TL*–1 and *TL*–2 is in progress.

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INCIDENCE OF *RHIZOCTONIA SOLANI* ON *AZOLLA PINNATA*

IN our efforts for boosting rice production in the country, emphasis is given to the use of fast growing and free floating fern *Azolla*, occurring in symbiotic association with the nitrogen fixing blue-green alga *Anabaena azollae*, as a bio-fertiliser. A disease affecting *Azolla pinnata* Lam. was noticed in the rice fields at the Rice Research Station, Kayamkulam, Kerala State.

The first visible symptom of the disease was the appearance of light brown coloured patches in the fern growth. The infection spread rapidly to larger areas which turned dark brown to almost black in colour. Decay and rotting set in shortly and the complete fern growth sank to the bottom. It was noticed that the diseased fern could not survive well and produce its characteristic felt-like cushiony growth.

The pathogen was isolated in pure culture and was identified as *Rhizoctonia solani* Kuhn. Artificial inoculations proved its pathogenicity to *Azolla pinnata* (Fig. 1). Culture of the fungus has been deposited at the Commonwealth Mycological Institute, London (IMI No. 227936).

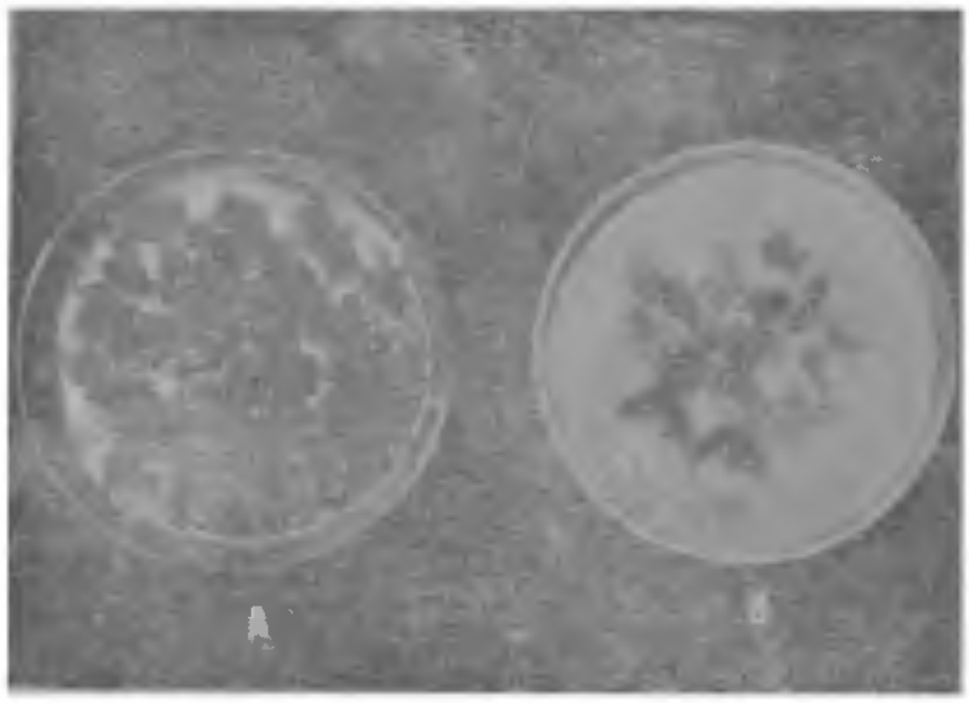

FIG. 1. *Azolla pinnata* infected with *Rhizoctonia solani*. A—Healthy; B—Infected.

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RHYTHMIC VARIATIONS IN THE LIPASE ACTIVITY IN THE SLUG, *LAEVICAULIS ALTE* (FERUSSAC, 1821)

RHYTHMIC changes in the activities of phosphorylase[1,2], alkaline and acid phosphalases[3] have been reported to occur in the slug, *Laevicaulis alte*. Similar rhythms have also been shown to occur in the levels of metabolites like blood glucose and hepatopancreatic glycogen in the same species[1,4]. The present work concerns with the study of lipase activity in different tissues of slug, *Laevicaulis alte* as a function of time of the day. The pattern of activity of this enzyme which plays a vital role in the break down of the high molecular weight esters into fatty acids and glycerol, reveal the pattern of utilization of lipid energy sources for various activities during the course of a 24 h period.

The details of collection, maintenance of slugs and sampling of tissues were described earlier[3]. The activity of lipase (Glycerol ester hydrolase EC 3.1.1.3) was estimated by the method of Cherry and Crandall[5], which was slightly modified as follows : The enzyme was incubated with an olive oil emulsion and the fatty acids produced were titrated against sodium hydroxidie. The tissues after isolation were homogenized (10% w/v) in ice cold distilled water and centrifuged at 2500 rpm for 10 min. The supernatart 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, pH 7·4 was added to the tube followed by the addition of 2·0 ml of olive oil emulsion. The tube was shaken well and its contents were incubated at 37° C for one hour. At the end of incubating 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 control was prepared as above but 3 ml of 95% alcohol was added prior to the addition of enzyme. 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. The experiment was repeated for 3 consecutive days to see whether the pattern of activity remained the same. The data were subjected to statistical analysis according to standard procedures (Pillai and Sinha)[6].

The results presented in Fig. 1 show that the activity of lipase was greater in hepatopancreas than in foot muscle. The higher activity of the enzyme in hepatopancreas probably reflects its higher metabolic role over foot muscle. A similar trend was reported for lipase activity in the scorpion[7].

It can be seen from Fig. 1 that lipase activity was maximal at 00·00 h and minimal at 12·00 h in both the tissues and showed cyclic variations. In both the tissues the difference between maximal (00·00 h) and minimal (12·00 h) was statistically significant ($P < 0·001$ for both the tissues). But the pattern of rise and fall in lipase activity is different in the two tissues studied. In both the tissues, eventhough the peak enzyme activity is found at 00·00 h, the average level of the enzyme was relatively high between 20·00 h and 00·40 h than between 12·00 h and 16·00 h. Similar changes were reported in the activities of phosphorylase[1,2], alkaline and acid phosphatases[3]. Further, hepatopancreas is known to be the main organ of storage of nutrients. Synthesis and break down of these nutrients in hepatopancreas are related to general metabolic needs of the animal. The results in the present investigation reflect the possibility of utilization of lipids to provide additional energy for various physiological activities of the animal at that peak period. Based on this it may be suggested that diurnal rhythmicity observed in lipase activity might be due to the corresponding variations in the physiology of the slug during different periods of the day.

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

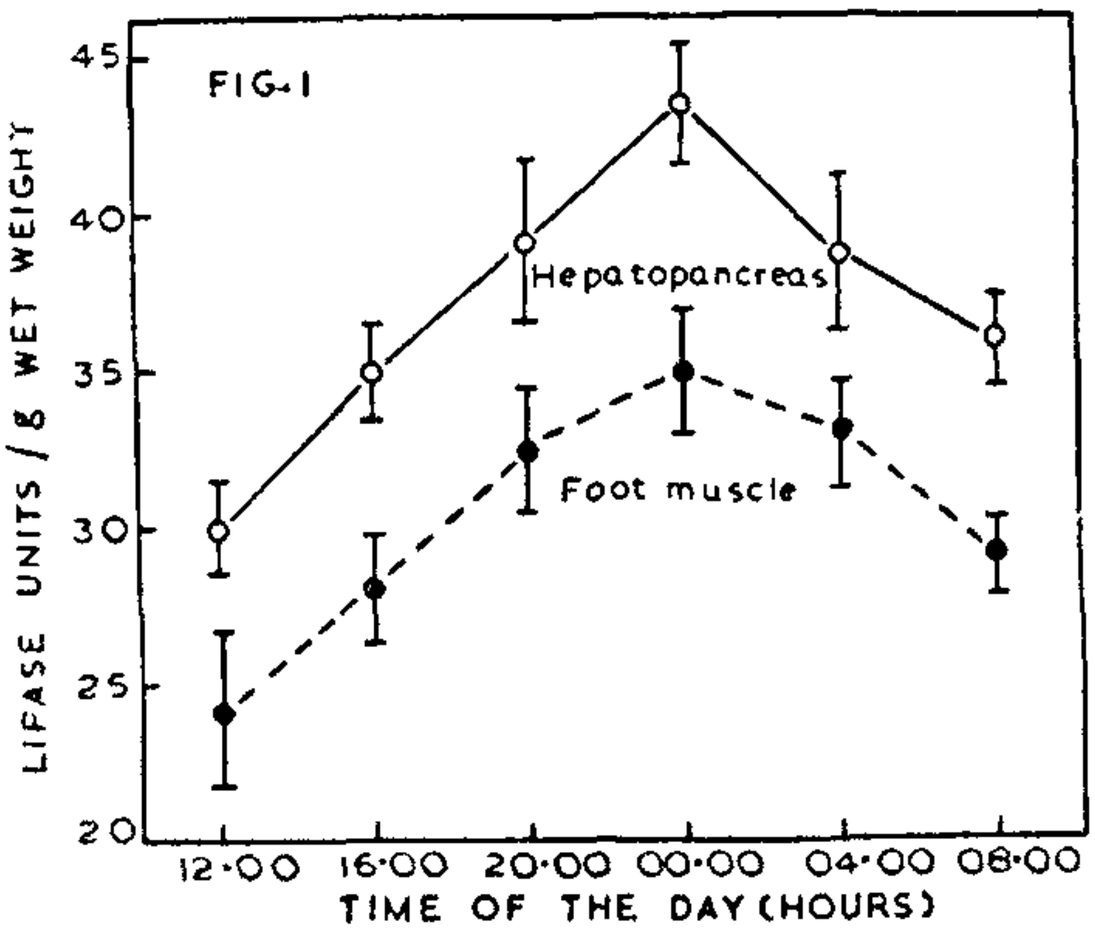

FIG. 1. Rhythmic variations in the activity of lipase in the slug *Laevicaulis alte* as a function of time of the day. Each point represents the mean of 6 estimations ± S.D.

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