

The disease was found to be prevalent in other fields of the locality also. Later, the disease was observed in the ginger plantations of the Forest Development Corporation of Kerala in Trivandrum District.

#### Symptomatology

The initial symptoms of the disease appeared as loss of turgidity of the leaves. Soon the leaves started rolling accompanied by wilting (Fig. 1). The leaves of the infected plants become orange yellow at the margins with a band of green area on either sides of the midrib. The yellowing progressed and the shoots got detached from the rhizome. The basal portions of the shoots and the rhizomes were involved in a soft-rot. On splitting the shoot longitudinally, vascular discoloration was noticed in the internal tissues. The entire plant died in 2-3 weeks' time (Fig. 1).



FIG. 1

#### Etiology of the Disease and Identity of the Pathogen

The bacterium was isolated on potato-dextrose agar medium. The colonies appeared small, circular, white, smooth and slimy. On tetrazolium-chloride medium pink centred colonies were observed. The bacterium appeared as short gram-negative rods, reduced nitrates and did not hydrolyze starch. It was catalase positive. It did not produce hydrogen sulphide and indole but produced ammonia in traces. Milk was slightly curdled with production of acid. The organism utilized sucrose, dextrose and glucose. Arginine hydrolase activity was negative and the growth was slightly inhibited with 2% sodium chloride. From the above bacteriological properties and pathogenicity trial on ginger plants, the bacterium causing ginger wilt was identified as *Pseudomonas solanacearum* E. F. Smith. This is supported by the fact that Buchanan and Gibbons<sup>1</sup> have reported that the organism is pathogenic on ginger. Further Ishii and Aragaki<sup>2</sup> reported ginger wilt caused by *Pseudomonas solanacearum* E. F. Smith from Hawaii. Subsequently Hayward *et al.*<sup>3</sup> reported this disease

on ginger due to *Pseudomonas solanacearum* from Queensland. Later Zehr<sup>4</sup> reported its occurrence from Philippines.

#### Epidemiological Factors

This disease was reported during the monsoon months of July-August. High rainfall and relative humidity conditions play a definite role in disease development and spread. Infected seed rhizomes can serve as the source of primary inoculum. The disease was found to be severe on the ginger variety "Rio-de-Geniro". Detailed studies on the disease, its pathogen and control have already been initiated in this laboratory.

This is the first authentic report of occurrence of ginger wilt incited by *Pseudomonas solanacearum* E. F. Smith from India.

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#### EMS-INDUCED HIGH YIELDING, EARLY MUTANT IN LINSEED (*LINUM USITATISSIMUM* L.)

AN early dwarf mutant, TL-1, induced in linseed cv. *Neelum*, was assessed for its agronomic performance and yield potential<sup>1,2</sup>. A promising new mutant was recovered in the same cultivar following treatment of the seeds with ethylmethane sulphate (EMS). The possible use of this mutant for commercial cultivation is reported in this paper.

Dry seeds of linseed var. *Neelum* were treated with 0.05 to 0.20% EMS solution for 16 hrs. After treatment, the seeds were thoroughly washed in running water and were sown in the field. Seeds of 20 M<sub>1</sub> plants, selected at random, were individually collected from each treatment including the untreated control, and the seeds of the remaining plants were bulked

treatment-wise. Plants were raised in separate lines from seeds of the individual selections and bulk harvest. One plant in the  $M_2$  progeny of an  $M_1$  selection (R7/4-1971) from 0.05% EMS treatment was found to be short in height, 18 days early in flowering and had greater number of primary branches and capsules as compared with the control. This mutant was found to breed true in subsequent generations. The mutant is designated as *Trombay Linseed-2* (TL-2) and it was in the  $M_6$  generation in 1976-77 rabi season. The new mutant, TL-2, is markedly different from the parent variety.

The mean flowering time was calculated by taking the date of flowering of every plant in the parent variety and the mutant. The data on plant height, number of primary branches, number of capsules, weight of seeds, etc., were collected from ten plants, selected at random, and the mean values were calculated. Flower size (diameter) was measured from ten randomly selected fresh flowers of *Neelum* and TL-2. Oil content of the seeds was determined by soxhlet extraction using petroleum ether as the solvent. The agronomic characters of *Neelum* and TL-2 are given in Table I.

It can be seen from Table I that the mutant, TL-2, was significantly early flowering and short as compared with the parent, *Neelum* (Fig. 1). The flower size was significantly small and the petals were not over-



FIG. 1. Plant type and flowering in (A) *Neelum* and (B) TL-2. The mutant is short, highly branched and early flowering.

TABLE I  
Agronomic characters of *Neelum* and the mutant TL-2 ( $M_6$ -1976 generation)

Cultivar	Number of days to flower	Flower size (cm. dia.)	Mean $\pm$ S.E.				
			Height at first flowering (cm)	Height at maturity (cm)	No. of primary branches	No. of capsules	Weight of seeds (gm)
<i>Neelum</i>	61.4 $\pm$ 1.0	3.02 $\pm$ 0.04	57.7 $\pm$ 2.0	74.8 $\pm$ 3.2	6.2 $\pm$ 1.6	85.6 $\pm$ 14.6	5.3 $\pm$ 1.7
TL-2	47.7* $\pm$ 1.2	2.27* $\pm$ 0.05	40.0* $\pm$ 1.6	53.2* $\pm$ 2.8	10.5 $\pm$ 1.9	125.2 $\pm$ 16.3	7.7 $\pm$ 1.8

\* Significant at 5 per cent level.

TABLE I (Contd.)

Cultivar	Weight of 1000 seeds (gm)	No. of seeds per capsule	Mean $\pm$ S.E.	
			Oil Content (%)	Oil Colour
<i>Neelum</i>	8.7 $\pm$ 0.3	9.0 $\pm$ 0.04	36.70 $\pm$ 0.5	Dark coloured
TL-2	8.1 $\pm$ 0.2	8.8 $\pm$ 0.05	40.51* $\pm$ 0.5	Light coloured

\* Significant at 5% level.



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).

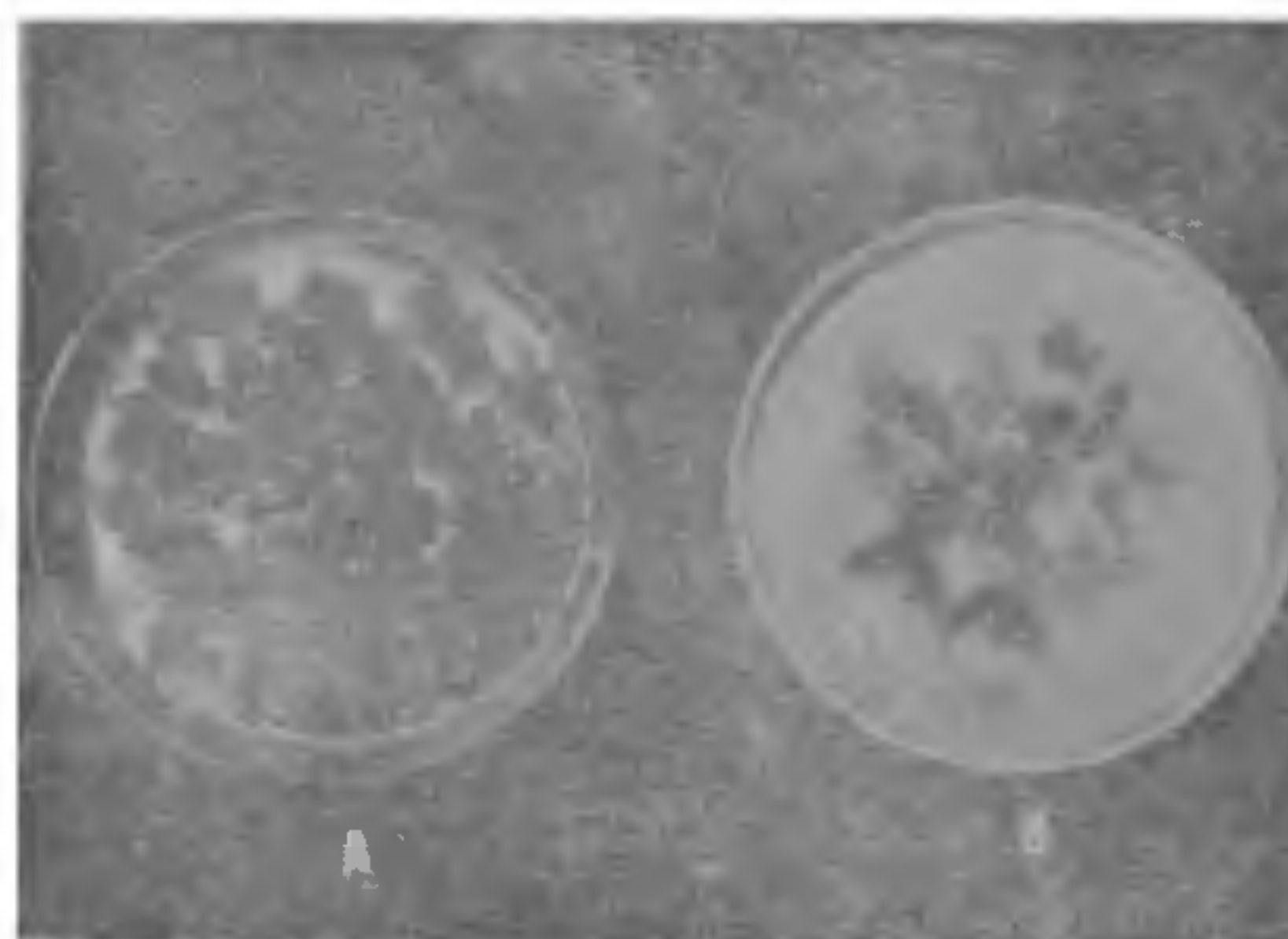


FIG. 1. *Azolla pinnata* infected with *Rhizoctonia solani*. A—Healthy; B—Infected.

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

RHYTHMIC changes in the activities of phosphorylase<sup>1,2</sup>, alkaline and acid phosphatases<sup>3</sup> 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<sup>1,4</sup>. 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<sup>1</sup>, reveal the pattern of utilization of lipid energy sources for various activities during the course of a 24 h period.