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TABLE 2—FREQUENCY OF ISOLATION OF L-ASPARAGINASE PRODUCING FUNGI FROM VARIOUS SOURCES

Source	No. of isolates screened	L-Asparaginase producing strains	Groups*			Mean activity (units)
			<i>Aspergillus</i>	<i>Mucor</i>	Unidentified	
Molluscs						
Mantle	12	7	7/9	0/1	0/2	0.226
Shell surface	19	8	6/11	1/3	1/5	0.24
Gut	13	6	5/10	nil	1/3	0.44
Sediments	34	9	6/22	1/4	2/8	1.16
Water sample	7	3	3/7	nil	nil	0.52
Rhizosphere	12	6	6/9	0/1	0/2	0.33

\*Active cultures/number of isolates screened.

Unit of activity is expressed as the amount of enzyme which liberates 1  $\mu$ mole of ammonia in 30 min at 37°C under the experimental conditions.

A total of 97 fungal isolates were screened for the production of asparaginase (Table 1). Thirty nine out of 97 (40.2%) isolates showed detectable quantities of asparaginase. Activity of most of the isolates ranged from 0.15 to 0.8 units. Only 2 isolates (GBN 16 and 28) showed comparatively higher activity. Thirty-three out of 68 (48.5%) isolates belonging to the genus *Aspergillus* exhibited asparaginase activity. This is contrary to the observation of Arima *et al.*<sup>7</sup>, who recorded a low percentage of active cultures among *Aspergillus* species. In the present study 2 isolates belonging to the class Phycmycetes exhibited asparaginase activity. But none of the phycmycetes examined by Imada *et al.*<sup>8</sup> produced this enzyme.

The frequency of asparaginase producing fungi was higher among the isolates obtained from molluscs, estuarine water and rhizosphere samples than from the sediment (Table 2). Asparaginase activity (mean activity) of the fungal isolates obtained from sediment samples was higher than the cultures from the other sources. This suggests that marine sediments may be a good source for active asparaginase producing fungi. The present study indicates that the fungi isolated from the marine environment at Porto Novo exhibit low asparaginase activity and their activity was mainly restricted to the members of the Genus *Aspergillus*.

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Degradation of Hydrocarbons by Fungus, *Fusarium* sp.

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No appreciable increase was noticed in the growth of *Fusarium* sp., isolated from tar balls accumulated on Goa beaches, in varying concentration of glucose. In media containing different concentrations of petroleum hydrocarbons (kerosene and petrol), the growth was enhanced. Optimum concentration for both kerosene and petrol was 4%. Growth declined at higher concentrations of petroleum hydrocarbons. Relatively, kerosene was a better substrate for growth than petrol.

THE role of microorganisms in the formation and subsequent degradation of petroleum hydrocarbons has been reported<sup>1-7</sup>. While investigating microbial populations associated with tar balls (products of oil pollution) of Goa beaches<sup>8</sup> a fungus, *Fusarium* sp., has been isolated. The fungus has been shown to utilize pure *n*-alkanes<sup>9</sup> and not

*n*-alkanes and other hydrocarbons present in kerosene or petrol. In the present communication, results of the studies on utilization of petroleum hydrocarbons including *n*-alkanes of kerosene and petrol as a source of carbon, by *Fusarium* sp., are presented.

*Fusarium* sp. isolated from tar balls suspended in autoclaved sea water was subsequently transferred in sea water medium containing (%) glucose, 0.1; yeast 0.01 and kerosene, 1. Purified fungus was maintained in the same medium containing 2% agar. Actively growing mycelial discs were used as inoculum. Cultures for studying the effects of different concentrations of glucose, kerosene and petrol were incubated for different intervals

of time on a rotary shaker (2 in. throw and 200/260 rpm) at  $28 \pm 2^\circ\text{C}$ . Growth was expressed in terms of milligrams dry cell weight.

While studying the effects of glucose, 1% kerosene was added to the medium (sea water + 0.01% yeast) since the isolate was from a hydrocarbon source. Similarly while studying effects of kerosene and petrol, 0.1% glucose was added as a booster to the medium (sea water + 0.01% yeast).

*Effect of glucose*—There was no appreciable increase in the growth of the fungus with increase in concentrations of glucose (Fig. 1) although growth was slightly better in 0.5% conc. (91 mg) compared to 0.1 or 1% levels. Peak growth in all concentrations was attained on the 4th day of incubation.

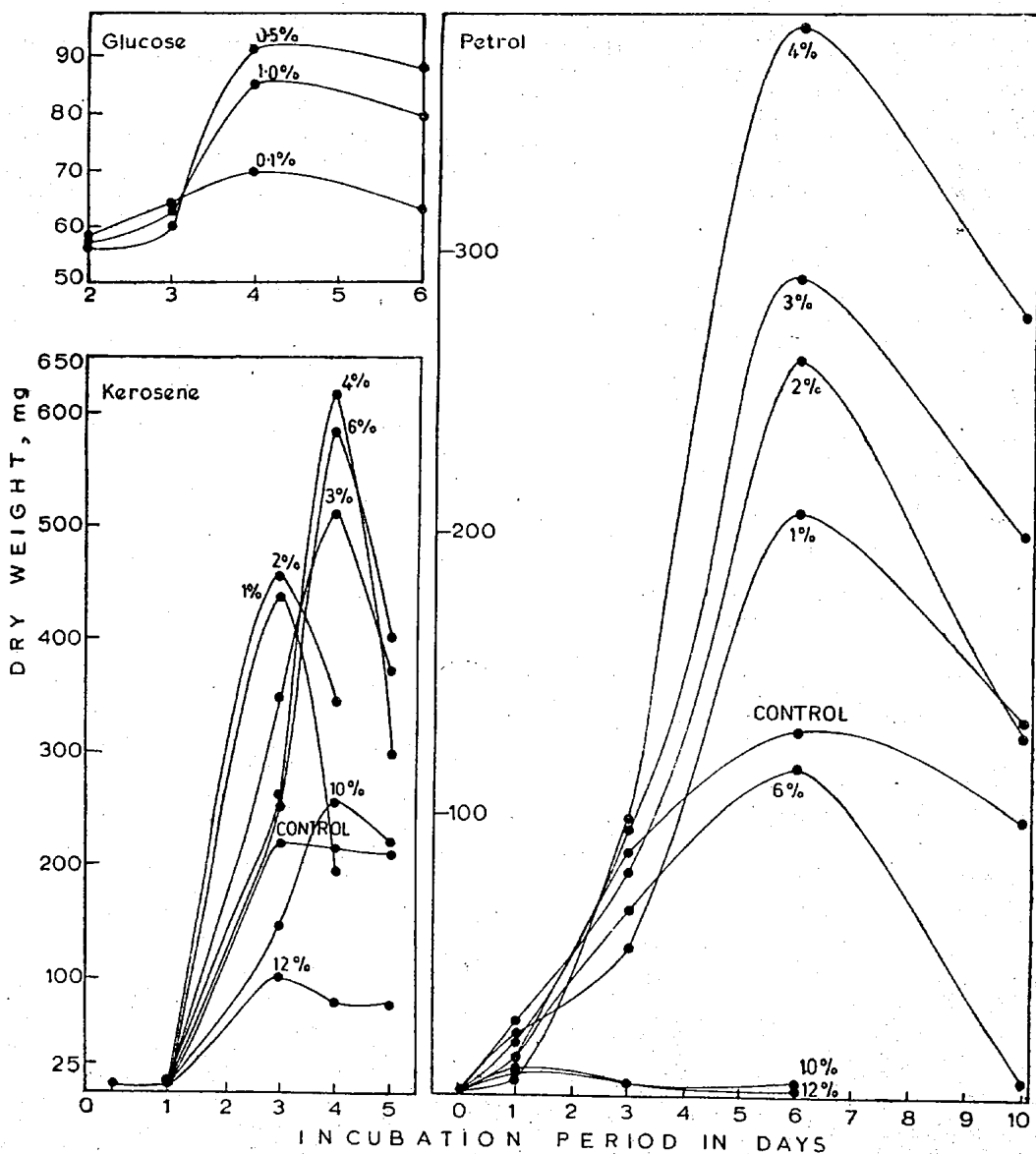


Fig. 1 — Growth of *Fusarium* sp. in different concentrations of glucose, kerosene and petrol

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This clearly indicates that *Fusarium* sp. does not utilize glucose much as a source of carbon.

**Effect of kerosene**—The results show (Fig. 1) that in 1 and 2% conc. maximum growth (438.5 and 456.5 mg respectively) was attained on the 3rd day of incubation as compared to control which recorded only 219 mg growth. In 3, 4, 6 and 10%, on the other hand, peak (510.7, 616.7, 580.3 and 255.7 mg respectively) growth was attained on 4th day. At 12% level, the peak was reached on the 3rd day itself and the growth was very much reduced (101 mg). Results indicate that 4% kerosene provides optimal condition for the growth of *Fusarium* sp. and that above this level growth becomes sparse and below which (4%) the substrate concentration becomes inadequate. Concentrations above 10%, appears to be inhibitory. Early attainment of peak at lower concentrations (1 and 2%) might have been due to non-availability of substrate. The sudden fall in growth on the 5th day may be due to autolysis.

**Effect of petrol**—Growth pattern of this fungus in different concentrations of petrol indicates (Fig. 1) that in control as well as at concentrations up to 6%, peak growth was attained on the 6th day of incubation. In 10 and 12% conc. growth, though poor (10 and 9 mg respectively), attained maximum on the 1st day. Growth rate increased progressively from 1% onwards and reached maximum in 4% (380.5 mg). At concentrations higher than 4%, however, the growth decreased considerably and in 6% it was lower (117 mg) than that of the control (129.5 mg). In petrol the shift in the peak to the 6th day may be because of the low initial weight of the isolate.

Although more than 200 species of microorganisms are known to degrade the various kinds of hydrocarbons<sup>10</sup>, very little is known about the toxic effects of these hydrocarbons on microorganisms. The results of the present study clearly show that higher concentrations of hydrocarbons limit the growth of *Fusarium* sp.

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## Regeneration & Re-growth of *Gelidiella acerosa* (Förssk.) Feld. et Hamel at Kilakkarai, South-Eastern Shores of India

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Greater growth in length (35 mm) was observed in the natural population as compared to that in regeneration (24 mm) and re-growth (29 mm) experiments. Growth rates in these experiments however exhibited irregular variation.

**GELIDIELLA ACEROSA**, the principal agaro-phyte in India, is being harvested almost throughout the year in the Ramanathapuram District along the south eastern shores. In the areas where frequent harvesting is done this weed shows reduction in habit and growth<sup>1-3</sup>. Information on regeneration including re-growth of the economic marine algae is essential to assess their harvesting potentialities<sup>4-9</sup>. Regeneration in *G. acerosa* at Veraval, West coast of India, takes place in 90 days<sup>10</sup>. Joshi has studied the regeneration and recolonization pattern in the species occurring at Veraval. In view of lack of any such information from the south-eastern shores, a study of the regeneration and re-growth of *G. acerosa* at Kilakkarai has been made and the results reported in this paper.

An uniform strand of *G. acerosa* occurring near the lower intertidal region at Kilakkarai was selected for the study. It is situated on a reef at about 3 km to the south of the Kilakkarai Jetty. Three transects, each of 1×10 m area running horizontal to the shore, and one similar transect were fixed with 'U' shaped iron hooks for regeneration and re-growth studies respectively. Further, six 0.5 m quadrats from each of the transects were selected at random and marked in the same way.

For regeneration, 18 quadrats were cleared off all the organisms (seaweeds and associated animals) except *G. acerosa*. After recording growth in length and cover of the plants they were harvested with the help of scissors leaving behind 10 mm (approximately) of the basal part of the plants, and the biomass determined.

For the study of re-growth, 6 quadrats were completely denuded. Special care is taken to remove the entire plant of *G. acerosa* by hand picking. However, basal parts of the plants are left behind.

Growth data at monthly intervals from August 1975 to March 1976, of *Gelidiella* plants in the experimental quadrats marked for regeneration and re-growth were collected both in terms of percentage cover and length. In the regeneration experiments seaweed was re-harvested after 4 months (Dec. 1975) and further growth was followed. Growth pattern in re-growth experiments in terms of length and percentage cover were followed continuously without re-harvest as growth was not