

YEASTS FROM THE SEDIMENT SAMPLES OF THE EEZ ALONG THE SOUTHWEST COAST OF INDIA

ABSTRACT

Fiftyeight yeast isolates were obtained from the benthic sediment samples of 19 stations during R. V. *Gaveshani* Cruise No. 187 of the Exclusive Economic Zone along the southwest coast of India. The depths ranged from 20 to 1,055 m. Asporogenous yeast isolates were more in number belonging to the genera *Candida*, *Rhodotorula* and *Geotrichum*. Isolates of sporogenous yeasts belonged to *Debaryomyces* and *Saccharomyces*. Genus *Candida* was the most common represented by its species at all depths and distances from the coast and *Rhodotorula* was next in abundance. Colony forming units (cfu) per gram of wet weight of samples ranged from 4 to 54.

OCCURRENCE of yeast along with other micro-organisms had been reported since the last century (Fischer, 1894; Issatchenko, 1914; ZoBell and Feltham, 1934; ZoBell, 1945). Bhat and Kachwalla (1955) were the first to analyse 17 samples of sea water off Bombay Coast reporting a number of yeasts and were the first to establish that sea had autochthonous yeast flora. Since then several papers appeared dealing specifically with marine yeast biota from different seas and oceans of the world (Fell *et al.*, 1960; Roth *et al.*, 1962; Kriss, 1963; Fell and Van Uden, 1963; Meyers *et al.*, 1967, 1971; Ahearn *et al.*, 1968; Volz *et al.*, 1974). Fell (1967) studied the distribution of yeasts in the Indian Ocean for 16 stations along 60°E meridian. Since last decade there was hardly any report on the yeast flora of open sea and oceans, although their occurrence in coastal areas in relation to coastal pollution studies have been reported by Bruni *et al.* (1983), Mujdaba - Apas (1980), Ahearn *et al.* (1980) and Pagnocca (1989). No systematic study has been carried out on the yeast flora of EEZ along the Indian Coast, their distribution, taxonomy and ecology, except the recent one by Ranu Gupta and Prabhakaran (1989). This is the second report of the incidence of yeast along the EEZ of the Indian Coast.

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Materials and methods

The position of 20 sampling stations of R. V. *Gaveshani* Cruise No. 187 (10-10-1987 to 26-10-1987) is shown in Fig. 1. The depth of the station ranged from 20 to 1,055 m and distance from the coast 3.59 to 154.33 km.

LaFond Dietz Snapper was used to collect the sediment samples. The snapper was wiped with cotton wool soaked in alcohol (95%) before each collection. After each collection the whole lump of the sediment sample was immediately taken in a pre-sterilized polythene bag. The samples were taken out aseptically inside a sterile chamber from the centre of the lump to avoid any chance of contamination. One gram of this sediment sample was shaken well with 100 ml. of sterilized sea water till the suspension was homogenous, then it was allowed to stand for 10 minutes to let the sediment particles to settle down. The super-

natant was then concentrated on 0.45 μm porosity millipore cellulose acetate membrane filter which was placed in petri plates on nutrient medium with antibiotic mixture (modified GYPA medium to avoid bacterial growth —

The plates were incubated at $20 \pm 2^\circ\text{C}$ for the samples above 500 m depth and at $10 \pm 2^\circ\text{C}$ for the samples below 500 m depth. The yeast isolates were identified according to Kreger Van Rij (1984).

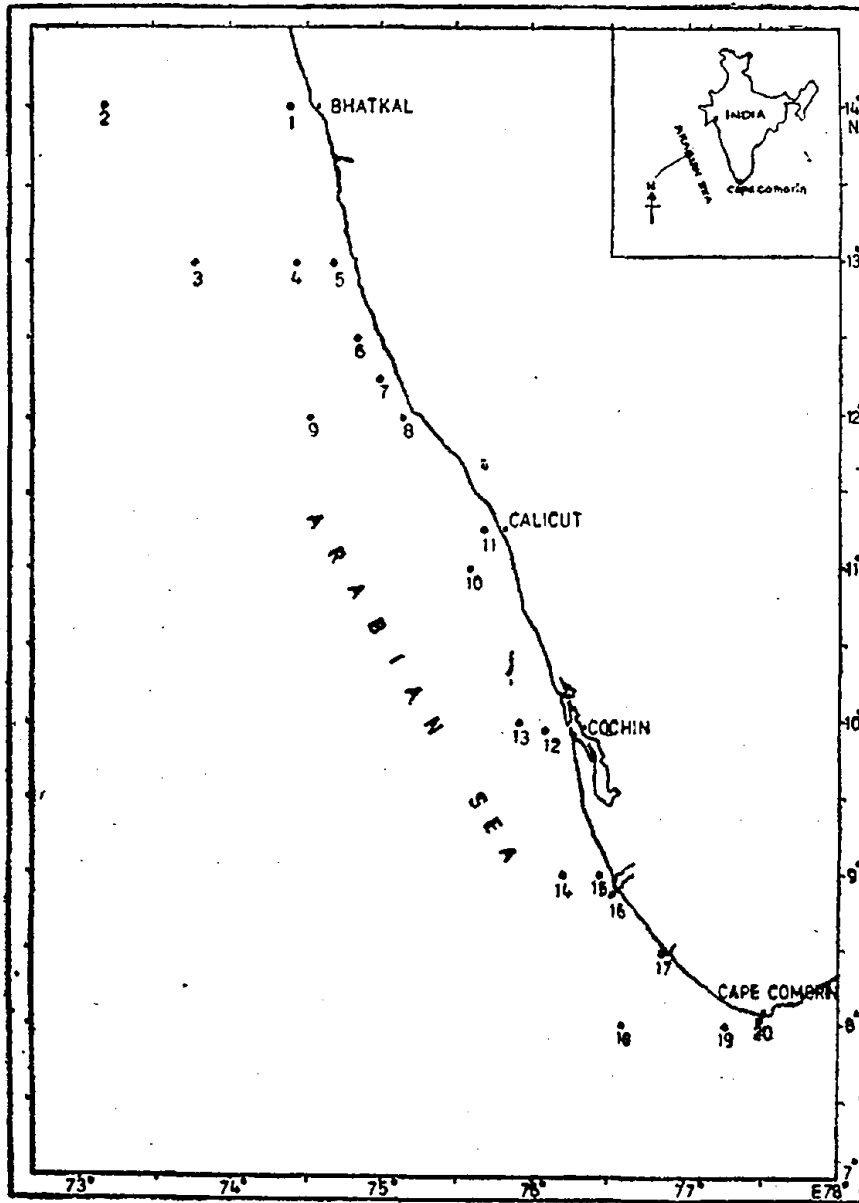


FIG. 1. Sampling stations along the southwest coast of India.

Van Uden and Fell, 1968). Triplicate samples were taken from each collection, then from each sample triplicate plates were prepared.

Results and discussion

The sporogenous yeasts isolated during the cruise were *Debaryomyces hansenii* and *Saccha-*

romyces sp. Asporogenous yeasts were *Candida albicans*, *C. guilliermondii*, *C. parapsilosis*, *C. tropicalis*, *Candida* spp., *Geotrichum candidum*, *Rhodotorula glutinis*, *R. graminis*, *R. minuta*, *R. rubra* and *Rhodotorula* sp.

The station numbers, their depths and the yeast species obtained are given in Table 1. The results of the isolation and colony counts show more number of asporogenous yeast isolates than the sporogenous ones. The control plates did not show any yeast growth.

Candida was the dominant genus of all with a number of species; next in abundance was *Rhodotorula*. Obligate marine yeasts isolated were *R. glutinis* and *Candida* sp. The facultative marine yeasts were *C. guilliermondii*, *C. albicans*, *C. tropicalis*, *C. parapsilosis*, *D. hansenii* and *Saccharomyces* spp.

Macrozonation: When observed broadly, it is clear that the stations having shallower depth range of 20 to 50 m and with lesser distances

from the coast of 3.59 to 36.48 km had higher densities of yeast populations (Table 1). This indicates the formation of macrozonation in the inshore areas and in the intracontinental waters than the open sea (Van Uden and Fell, 1968).

Microzonation: Station 13 with 47 m depth and 35.80 km off the coast was quite similar to station 14 with 15 m depth and 36.48 km off the coast, yet they showed marked difference in yeast flora. The former yielded only *Candida* spp. with 5 cfu while the latter 28 cfu of *C. albicans*, *C. tropicalis*, *Candida* spp. and *R. graminis*. Similarly Station 5 and 6 were of the same depth of 20 m and the same distance of 14.36 km off the coast, yet the former station yielded 50 cfu. of *D. hansenii*, *C. albicans*, *Candida* spp. and *R. minuta*, while the latter station failed to yield any yeast colony. According to Van Uden and Fell (1968) the distribution of yeasts in sea water is characterised by microzonation, an irregularity possibly

TABLE 1. Number and species of yeasts isolated from sediment samples of the EEZ along the southwest coast of India during R. V. Gaveshani Cruise No. 187

Station No.	Depth (m)	Distance from the shore (km)	Species isolated	Number per gram sediment (cfu)
1	20	16.15	<i>Debaryomyces hansenii</i>	5
			<i>Candida guilliermondii</i>	10
			<i>Rhodotorula graminis</i>	5
			<i>Rhodotorula minuta</i>	3
			<i>Rhodotorula rubra</i>	10
2	1017	154.33	<i>Candida</i> spp.	5
3	1055	116.64	<i>Candida</i> spp.	5
4	53	43.07	<i>Candida parapsilosis</i>	10
			<i>Candida</i> spp.	2
			<i>Rhodotorula glutinis</i>	5
			<i>Rhodotorula rubra</i>	10
5	20	14.36	<i>Debaryomyces hansenii</i>	15
			<i>Candida albicans</i>	20
			<i>Candida</i> spp.	10
			<i>Rhodotorula minuta</i>	5
6	20	14.36	—	—

Station No.	Depth (m)	Distance from the shore (km)	Species isolated	Number per gram sediment (cfu)
7	28	14.26	<i>Debaryomyces hansenii</i>	5
			<i>Saccharomyces</i> spp.	4
			<i>Candida albicans</i>	8
			<i>Candida</i> spp.	11
			<i>Rhodotorula rubra</i>	18
8	20	12.7	<i>Candida albicans</i>	7
			<i>Candida guilliermondii</i>	15
			<i>Candida</i> spp.	10
			<i>Rhodotorula rubra</i>	20
			<i>Rhodotorula</i> spp.	2
9	120	82.33	<i>Candida</i> spp.	8
10	33	32.30	<i>Debaryomyces hansenii</i>	7
			<i>Candida tropicalis</i>	8
			<i>Candida</i> spp.	3
			<i>Rhodotorula rubra</i>	18
11	20	11.49	<i>Candida albicans</i>	9
			<i>Rhodotorula minuta</i>	10
12	28	17.89	<i>Candida albicans</i>	15
			<i>Candida guilliermondii</i>	2
			<i>Candida tropicalis</i>	5
			<i>Candida parapsilosis</i>	9
			<i>Candida</i> spp.	3
13	47	35.80	<i>Candida</i> spp.	5
14	50	36.48	<i>Candida albicans</i>	6
			<i>Candida tropicalis</i>	9
			<i>Candida</i> spp.	8
			<i>Rhodotorula graminis</i>	5
15	22	8.95	<i>Debaryomyces hansenii</i>	12
			<i>Candida albicans</i>	3
			<i>Candida parapsilosis</i>	8
			<i>Candida</i> spp.	9
16	20	7.18	<i>Candida albicans</i>	2
			<i>Geotrichum candidum</i>	6
			<i>Rhodotorula minuta</i>	10
17	28	3.59	<i>Saccharomyces</i> spp.	5
			<i>Rhodotorula graminis</i>	6
			<i>Rhodotorula minuta</i>	3
18	970	66.21	<i>Candida</i> spp.	4
19	51	16.09	<i>Candida</i> spp.	12
20	29	5.37	<i>Saccharomyces</i> spp.	8
			<i>Candida tropicalis</i>	19
			<i>Candida</i> spp.	3
			<i>Rhodotorula rubra</i>	8

correlated with analogues discontinuities in the distribution of assimilable organic matter. This could be a factor for such small scale spatial differences in the occurrence of yeasts in two of the cases cited above of nearly identical stations.

The results of this initial study of the yeast populations along the EEZ of the southwest coast of India indicated that more detailed study along this line will reveal the interesting distributional patterns of yeast flora and the factors governing these patterns.

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