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Distribution of *Sporobolomyces* (Kluyver et van Niel) Genus in the Western Coast of Baja California Sur, Mexico

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Summary

One hundred forty one strains of yeast were isolated from 98 seawater samples collected in the Pacific Ocean, off the west coast of Baja California, Mexico. The genera *Sporobolomyces* represented 32% of the total isolates, and was comprised of the species *Sp. holsaticus* (10%), *Sp. puniceus* (20%) and *Sp. roseus* (2%). By correlating the distribution of marine yeast with temperature, salinity, dissolved oxygen and depth, it was possible to establish the distribution pattern for each species.

Key words: *Sporobolomyces* – Distribution – Pacific – Marine yeast

Introduction

The taxonomy and distribution of yeast in the Pacific Ocean have been studied on several occasions since 1960 (*Goto* et al., 1974; *Yamasato* et al., 1974). The genera *Cryptococcus, Rhodotorula, Pichia, Candida, Metschnikowia, Saccharomyces, Leucosporidium* and *Torulaspora* are considered common to marine environments (*Kriss* et al., 1967; *Uden* and *Fell,* 1968). In one study, a less common yeast belonging to *Sporobolomyces* genus, *Sp. salmonicolor,* was reported in 10% of samples taken off the west coast of the North American continent (*Kriss* et al., 1967). However, the isolation of yeast below 29° latitude N. had not been done prior to this study.

This report partially summarizes the results of a research cruise to evaluate the economic potential of marine resources on the west coast of Baja California, Mexico. In the ensuing microbiological analysis, *Sporobolomyces* was the most common and widely distributed genus of marine yeast to be isolated from the study area.

This zone (Fig. 1) is located in a very special geographical situation (27° 10′ N, 110° 28′ 45″ W; 27° 26′ 38″ N, 114° 45′ W; 23° 53′ 20″ N, 110° 11′ 15″ W and 23° 8′ 40″ N, 112° 30′ W) where two marine fronts encounter one another: one is the warm-temperate California current, and the other is the tropical Panamic stream. It is likely that the unique condition of mixing currents and the resulting availability of nutrients favor and unusual distribution of living forms in the zone.

Materials and Methods

Sea water samples were collected from May to June of 1985 along the western coast of Baja California Sur during the cruise CIB-CICIMAR 8605 on the Mexican oceanographic ship "El Puma". The samples were taken with Van Dorn bottles at depths of 0.3, 50 and 100 meters. Five milliliters of water samples were inoculated on 5 ml of *Uden* and *Fell* (1968) modified culture medium (g/l):(glucose 40, peptone 20, yeast extract 10, tetracycline 0.2 mg, chlortetracycline 0.4 mg, streptomycin 0.4 mg, sea water, pH 4.5 adjusted with 0.1 N HCl), and incubated at 25 °C (± 2 °C) while shaken at 100 rpm. The yeast strains were purified on agar plates (containing: (g/l) glucose 20, peptone 15, yeast extract 5, sea water, pH 4.5 adjusted with 0.1 N HCl), by application of the cross-streak method. Identification was based on procedures described by *Kreger van Rij* (1983). The *Sporobolomyces* genus was identified by the presence of pigment, development of ballistospores, urease activity and by the formation of pseudomycelium and true mycelium.

Results

141, aparently different, yeast strains were isolated from 98 samples obtained from 37 stations off the west coast of Baja California Sur, Mexico. The *Sporobolomyces* genus was found in about 32% of the total isolates. Identification of the *Sporobolomyces* species indicated the presence of three different kinds: *Sp. roseus, Sp. holsaticus* and *Sp. puniceus.* Table 1 shows the isolate number of the

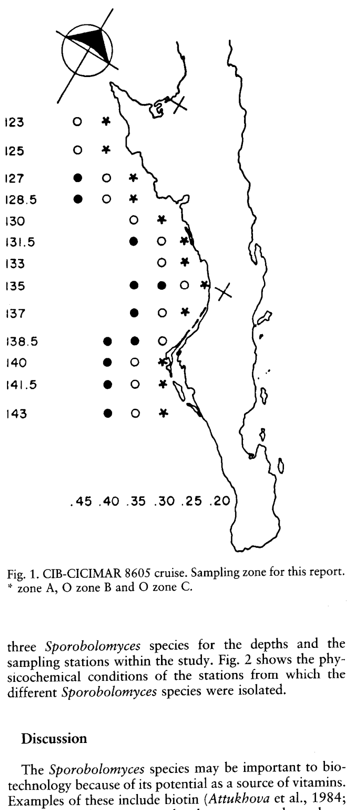

Fig. 1. CIB-CICIMAR 8605 cruise. Sampling zone for this report. * zone A, O zone B and O zone C.

three *Sporobolomyces* species for the depths and the sampling stations within the study. Fig. 2 shows the physicochemical conditions of the stations from which the different *Sporobolomyces* species were isolated.

Discussion

The *Sporobolomyces* species may be important to biotechnology because of its potential as a source of vitamins. Examples of these include biotin (*Attukhova* et al., 1984; *Pearson* et al., 1986), and other compounds such as isomeric C sub (3)-R- alcohols (*Furuichi* et al., 1984), methylamine oxidase (*Sherlock* et al., 1986), lytic enzymes (*Ritcher* and *Thalmann*, 1983), and for use in the degradation of many oil constituents (*Kvasnikov* et al., 1982). While *Sporobolomyces* genus has been isolated from several oceans (*Kriss* et al., 1967; *Uden* and *Fell*, 1968), it has only been reported in the northwest area of the Pacific Ocean and in the Okhotsk Sea (*Kriss* et al., 1967). From this study it is clear that this yeast genus can be found elsewhere in the Pacific.

Table 1. Number of isolates of *Sporobolomyces* species found within the study zone at different depths

Species	Area			Depth (m)		
	A	B	C	0.3	50	100
Sp. roseus	0	1	2	0	1	2
Sp. puniceus	5	4	18	2	11	14
Sp. holsaticus	2	1	12	4	7	4

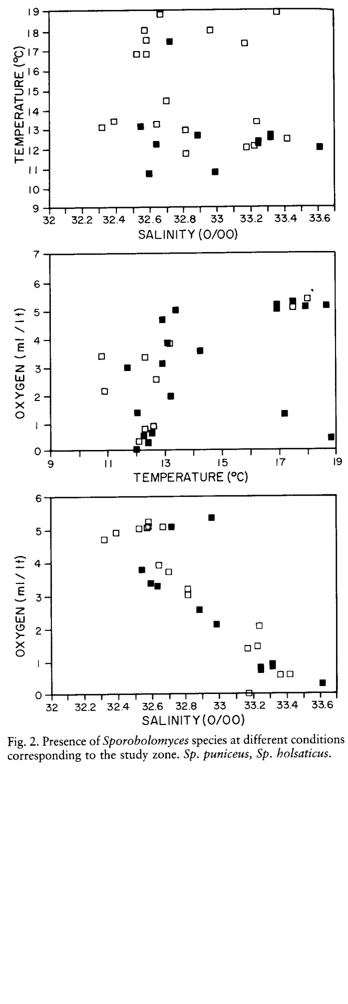

Fig. 2. Presence of *Sporobolomyces* species at different conditions corresponding to the study zone. *Sp. puniceus, Sp. holsaticus.*

Frequently, this genus is closely related to plant leaves in terrestrial habitats (*Lodder* and *Kreger van Rij*, 1983). It is economically important because it has been isolated from several fruits and plants (*Frossard* and *Fokkema*, 1982; *Frossard* et al., 1983) and is also found in plant phyllosphere (*Nakase* and *Suzuki*, 1985; *Picco*, 1985). More recently, it has been associated with extrinsic allergic alveolitis (*Cockcroft* et al., 1983) and dermatitis infections (*Bergman* and *Kauffman*, 1984).

The importance of *Sp. holsaticus* and *Sp. puniceus* in terrestrial environments is well known (*Lodder* and *Kreger van Rij*, 1983), although they had not been previously isolated from sea water. *Sp. roseus* has been found in both terrestrial and marine environments (*Lodder* and *Kreger van Rij*, 1983).

The distribution of the three *Sporobolomyces* species in this study do not follow a defined pattern. On the other hand, the fact that they were found far from the coastline, would indicate a tendency to occupy marine environments (Table 1). Furthermore, the *Sporobolomyces* species reported here do not appear to be restricted to specific sites where oxygen concentration, temperature, hydrostatic pressure and salinity fall within certain limit (Fig. 2), thus suggesting an excellent capacity for adaptability. The different *Sporobolomyces* species also showed some differences between their preferred habitats. For example, *Sp. roseus* was isolated from stations 30 to 45 miles off the coastline at 50 and 100 m depths, while *Sp. holsaticus* showed preference for the stations 30 to 45 miles off the coast line at 100 m depth, and *Sp. puniceus* particularly in stations 30 miles (average) away from the coastline at 100 m depth. These results are in agreement with the reports of *Kriss* and *Novozhilova* (1954).

Yeast populations usually decrease in number and density at increasing depth and distance from the coast line. A more detailed work recognized that the yeast's distribution resulted from geographic and hydrographic environmental conditions (*Fell*, 1967). In the present study, temperature, salinity and dissolved oxygen were determined for correlation with the distribution of the different *Sporobolomyces* species. Our results suggest that there exists a correlation between the presence of *Sporobolomyces* in the study area and the salinity and dissolved oxygen of the ocean water (Fig. 2). Nevertheless, these cannot be the only parameters that combine to allow the presence and development of particular yeast strains. It is very likely that the amount and kind of nutrients may also influence the yeast population and distribution.

It is noteworthy that the *Sporobolomyces* in this study was not found close to the coastline or at the surface of the ocean. This differs significantly from the isolation of the genus *Candida* where it was determined that terrestrial influences and wind conditions were influential in its distribution (*Paula* et al., 1983). The fact that *Sporobolomyces* was found in the sea, and without obvious relationship to terrestrial influences, suggest that the presence of this yeast is determined by other physicochemical parameters. Further research would contribute to the understanding of this phenomena.

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