Distribution of *Sporobolomyces* (Klyuyver 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 *S. holsticus* (10%), *S. punicus* (20%) and *S. 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 (Kris et al., 1967; Uden and Fell, 1968). In one study, a less common yeast belonging to *Sporobolomyces* genus, *S. salmonicolor*, was reported in 10% of samples taken off the west coast of the North American continent (Kris 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 seawater 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, chlorotetacycline 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, apparently 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: *S. roseus*, *S. holsticus* and *S. punicus*. Table 1 shows the isolate number of the
Ocean and in the Okhotsk Sea (Kris et al., 1967). From this
genus it is clear that this yest genus can be found
abundantly in the Pacific.

Table 1. Number of isolates of Sporabolomyces species found
within the study area at different depths

<table>
<thead>
<tr>
<th>Species</th>
<th>Zone</th>
<th>0.0</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp. manae</td>
<td>A</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sp. panuccii</td>
<td>B</td>
<td>1</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Sp. hyperborea</td>
<td>C</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Sp. aralica</td>
<td>0.3</td>
<td>4</td>
<td>11</td>
<td>14</td>
</tr>
</tbody>
</table>

Frequently, this genus is closely related to plant leaves in
general habitats (Ledder and Kragem 1963). In the
ecologically important because it has been isolated from
genera and plant species. (Fursaud and Fukuhara, 1984;
Fursaud and Ledder, 1983) and is also found in plant phyl-
axes (Nakats and Sukezane, 1985; Picus, 1985). Moreover,
this species is associated with extrinsic allergic al-

gens (Ledder and Kragem, 1983) and dermatitis infections
(Bergman and Kaufman, 1984).

The importance of Sp. hyperborea and Sp. panuccii in
temperate environments is well known (Ledder and Krag-
em 1957), although they had not been previously
isolated from seawater. Sp. panuccii has been found in both
temperate and marine environments (Ledder and Kragem
1963). The distribution of the other Sporabolomyces 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 Sporabolomyces species re-
presented here do not appear to be restricted to specific sites
but oxygen concentration, temperature, hydrostatic pressure
and salinity will determine certain limits (Fig. 2), thus
suggesting an excellent capacity for adaptability. The dif-
ferent Sporabolomyces species also showed some diff-
rences in their preferred habitats. For example, Sp.
manae was isolated from stations 30 to 45 miles off the
coastline at 50 and 100 m depths, while Sp. hyperborea
showed preference for the stations 30 to 45 miles of the
coastline at 100 m depth, and Sp. panuccii particularly at
stations 30 miles (average) away from the coastline at 100 m
depth. These results are in agreement with the reports of
Kris and Nyssochouvides (1954).

Yeast populations usually decrease in number and den-
sity at increasing depth and distance from the coast line. A
more detailed work reported that the yeasts’ distribution
resulted from geographic and hydrographic environmental
conditions (Fur, 1965). In the present study, temperature,
salinity and dissolved oxygen were determined for correla-
tion with the distribution of the different Sporabolomyces
species. Our results suggest that these factors are
associated between the presence of Sporabolomyces 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 influence the presence and development of
particular yeast strains. It is very likely that the amount
and kind of nutrients are also related to the yeast popula-
tion and distribution.

It is noteworthy that the Sporabolomyces 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
yeast Candida where it was determined that terrestrial
influences and wind conditions were influential in its dis-
tribution (Paule et al., 1983). The fact that Sporabolomy-
eces was found in the sea, and without obvious relationship
to terrestrial influences, suggests that the presence of this
yeast is determined by other physicochemical parameters.

Further research would contribute to the understanding of
this phenomena.

References

Athaulea, E. A., Voronina, L. I., Khaybuleev, M. F.; Growth
of the yeast Sporabolomyces panecencis and the fungus
Rhizopus oryzae and its biostasis in different conditions.
Bojarov, A. G., Kaufman, O. A.: Dermatosis due to
Sporabolomyces inanis. Arch. Dermatol. 120, 2010-2016
(1954).
Coddington, D. W., Cook, A. J., Kawamura, J. I., Doolan-
ish: Sporabolomyces: a possible cause of extrinsic allergic al-
Fursaud, R., Fukuhara, N. J.: Effect of nitrogen fertilization
on the growth of Sporabolomyces on the wheat leaves.
Fursaud, R., Fukuhara, N. J., Pizzari, T.: Influence of
Sporabolomyces and Chlorella vulgaris (theeides) on
washing of sugar (1985): labeled assimilates of sugar
Jarnouch, A., Atta, S., Elahi, H., Ebhers, A., Oulah, Y.: The
use of microorganisms in organic synthesis. V. Chem. Pharm.
Gori, S. G., Ohbasa, K., Yamazaki, K.: Identification of yeast
isolated from seawater and sediment in Abashirua Islands.
Kris, A. E., Nyssochouvides, M.: A new yeast species inhabiting
Kris, A. E., Reisman, L., Kedrosiuk, N., Zemskaya, E. V.,
Microbial populations of ocean and seas. New York: Mari-
Kusakari, E., Nagomeya, S., Kubocho, K., Yanae in
the Deepwater river water. Mikrobiol. Zh. (Mosk.) 49, 42-48
volume study, Third ed. Amsterdam, Elsevier Science Publisher
North Holland 1981.
Nakano, T., Suzuki, M.: Ballouessier forming yeast found on
the surface of the Japanese rice field, Osaka active. J. Gen.
Paule, C., Peltom, A., Gambrall, W. Y.: Yeast from beach
in the sand and in water in San Pedro, Florida peninsula,” Brazil.
Porin, R. F., McKinnon, D. S., Fearn, M. J.: Production
Picus, V. L., Mecklenburg, R. G., Missey, D. R., Powell, P.J.: The
intraspecies interaction of Micropolis. Soil Biol. Biochem., 21,
149-151 (1989).
Kishita, Z., Tsuchiya, A.: Some observations about yeast found
Mehl, J. A., Large, F. P., Whicker, G. A.: A new type of
metabolism for yeasts. Science studies published during growth
of Sporabolomyces albo-roseus on primary ah


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