STUDY OF YEAST BIOTA OF COASTAL SURFACE WATERS OF ZMIINYY ISLAND: ECOLOGICAL AND MICROBIOLOGICAL ASPECTS

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Yeasts are important and integral components of marine biogeocenosis because they are involved in various function control of the biosphere. Zmiinyy Island is situated in the traverse of the most important water streams of Europe. Its coastal waters are the place of transformation and accumulation of altered microbiota incoming from the main European river Danube, that contains the sewage water of 18 European countries. Thereby, the relevance of population dynamic and biodiversity study of such poorly investigated group of microorganisms as marine yeasts is important and indisputable.

Aim. The main goal of the present study was quantitative and qualitative (species composition) evaluation of the yeast population of offshore strip seawater of Zmiinyy Island, Ukraine. Also, we have tried to determine the peculiarities of potentially pathogenous yeasts distribution and to establish dominant species into investigated marine yeast population.

The objects of study were marine yeasts isolated from superficial biotope of coastal waters of Zmiinyy Island.

Materials and methods. Seawater sampling was undertaken during one of the last expeditions to Zmiinyy Island in May 2009. Eight samples of surface seawater were aseptically collected from different sites located around the island. The main peculiarities of water regime and presence of possible infection source have been considered [4]. For the isolation of yeasts, 0.1–0.5 ml of native sample of seawater was directly spread on Petri dish with Sabouraud's medium containing 10.0 g of casein hydrolyzate, 40.0 g of dextrose, 15.0 g of agar and supplemented with 0.1% of chloramphenicol [1, 3].The cultivation was performed at 20–22^{0}Ñ for 2 days. The morphological characteristics, physiological and biochemical properties of the yeast isolates were routinely examined. Taxonomic identification procedures of isolated yeasts were performed as recommended by Kreger-van Rij (1984), Kurtzman and Fell (1998) [6, 7]. The frequency of each yeast species was calculated. The data were conventionally analyzed for statistically significant differences. P values < 0.05 were considered as significant.

Results. In the present study the density of isolated yeast population formed from 10 to 31 colony forming units/ml (CFU/ml), whereas average yeast number was 15 CFU/ml. The distribution of yeasts in studied population was sufficiently homogeneous, that can be explained by high intensity of surface coastal seawater mixing. Also, it is evidently that saltiness and temperature conditions are not baleful for living and active development of these marine yeasts.

In this study, a total of 5 genera of yeasts were identified. Prevailing species of yeasts were *Cryptococcus albidus, C. neoformans, Aerobasidium pullulans, Candida albicans, Rhodotorula rubra, R. glutinis, Rhodosporidium paludigenum.* All of them are typical cosmopolites and commonly widespread in various natural environments.

The water areas of the Black Sea, that were immediately close by slopping ground coast of the island, demonstrated the most expressed density of isolated yeast population (e.g., 31 CFU/ml in the moorage zone), because they are usually characterized by abundance of various organic nutrients that are supplied during atmospheric precipitation. Moreover, the results obtained suggest some fidelity of *A. pullulans* to these areas. At the same time the water areas which contact with a rock-ribbed coast demonstrated the lowest values of yeast population density (e.g., only 10 CFU/ml in the water area of Damsjkyy beach).

It is well known that potentially pathogenous (opportunistic) yeasts, widespread in various environmental

habitats, are capable of causing mycoses in humans and animals. The evidence of our experiments also suggests active natural circulation of such pathogenous yeasts as *C. albidus, C. neoformans and C. albicans*, that have been quite frequently isolated from seawater samples (the frequency of occurrence was approximately 43.0 %). The population peak of *C. albidus* was only 7.5%, whereas in *C. neoforman* and *C. albicans* this index has reached 24.7 and 40.5 % respectively. Such variation of percentage pathogenous yeast composition probably can be associated first of all with seawaters circulation direction.

It is important to emphasize that two species of yeasts – *A. pullulans* and *R. rubra* were significantly predominant in examined yeast population. So, the observed frequency of black yeast *A. pullulans* occurrence was 54.1 %, and pink yeast *R. rubra* occurrence – 34.1 %. This phenomenon of dominance of black and pink species in general yeast population is common for various water ecosystems, indeed conditions of marine environment are seemed to be optimal for living of two aforementioned yeast species in their ecological niches.

Conclusions. Firstly, the main peculiarities of marine yeasts space distribution of coastal surface waters of Zmiinyy Island have been described. Summing up, the findings in this study show that isolated yeasts characterized by zonality of their distribution depended on source of organic substances arrival into seawater. Frequent occurrence of opportunistic yeasts into superficial waters demonstrates their rapid adaptation to marine environment. Moreover, the absolute prevalence of two pigment-containing species among all yeast isolates indicate the most expressed adaptability of these yeasts to the conditions of this marine ecosystem.

This work was supported by the Ministry of Education and Science of Ukraine (grants no. ÇÌ/321-2008 and ÄÇ/300-2008).

References.

1. Babjeva I.P., Golubev V.I. Yeast isolation and identification methods. – Moscow: Pischevaya promyshlennostj, 1979. (In Russian).
2. Berry N., Davis R. Yeast biology. – Moscow: Mir, 1985. – 157 c. (In Russian).
3. Golubcev V.B. Taxonomy and identification of yeasts of genus *Cryptococcus*. – Moscow: Mir, 1990. – 321 c. (In Russian).
4. Kvasnikov L.N. The Yeasts. – Kiev: Naukova dumka, 1998. – 264 c. (In Russian).
5. Kvasnikov L.N., Schelokova I.F. The Yeasts. Biology. Directions of application. – Kiev: Naukova dumka, 1991. (In Russian).
6. The yeasts. A taxonomic study. Ed. N.J.W. Kreger-van Rij. Third edition. Amsterdam: Elsevier, 1984, 1082 p.
7. The yeasts. A taxonomic study. Eds. C.P. Kurtzman, J.W. Fell. Fourth revised and enlarged edition. Amsterdam: Elsevier Science B.V., 1998, 1055 p.