Community of microorganisms with dominance of phototrophs for oil pollution biodegradation in coastal areas

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1. **Introduction.** Oil and oil products pollution in unique deltas and estuaries ecosystems is difficult to degrade due to the structural and functional features of communities and ecosystems. Microbiological destruction is a promising direction of prevention of oil and oil products pollution, since some species can consume metabolic products of other species, ensuring the sustainable functioning of the community. Lithophilic and epiphyllous species are the most effective communities to remove oil pollution from soil and plants, especially in periodically flooded areas. Communities of microorganisms, which are dominated by phototrophs, such as cyanobacteria or algae can be used for pollution control.

The aim of this work was to assess the possibility of using psychrophilic communities with dominance of cyanobacteria and microalgae from the entrance zone of a cave for oil biodegradation.

2. **Experimental.** Two thermotolerant communities isolated from the entrance zone of the Novoafonskaya cave were used for the experiments. The predominant species were green algae and cyanobacteria. The algae and cyanobacteria were cultivated in Bristol medium and micromycetes in Chapek-Dox medium. The communities' optimum temperature ranges between 24 and 9 °C, and the growth limits range from 25 – 35 °C and 1 – 9 °C. Kerosene, diesel, gasoline, oil and ligroin oil fractions were used for the tests. The communities' period of cultivation with oil fractions was 60 days, and the concentration was 40 ml/l. The abundance of species in the community was assessed using a five-point scale. The concentration of oil fractions was estimated by gas chromatography.
3. **Results and Discussion**. Three types of micromycetes of the genus *Penicillium*, which are resistant to cultivation with oil fractions were isolated. In the structure of the original communities the dominant species were: *Stichococcus bacillaris* and *Chlorella vulgaris*, among the filamentous cyanobacteria: *Leptolyngbya tenuis* and coccal forms of *Chroococcus minimus* and *Cyanothece aeruginosa*.

During oil fractions cultivation the structure and composition of the communities changed, and some species disappeared. From the obtained communities, a new community was created. The assessment of the oil fractions biodegradation ability by the initial and modified communities was carried out. It was revealed that biodegradation of light oil fractions is faster than the other oil fractions categories. It should be mentioned that biodegradation is faster at the initial stage in the artificially created community.

4. **Conclusions -** The community with dominance of cyanobacteria was the most effective. The most abundant green algae species in cultivation conditions with oil fractions were *Stichococcus bacillaris*, *Chlorella vulgaris*, *Mychonastes homosphaera*, *Coccomyxa confluens*, and among the cyanobacteria species: *Cyanothece aeruginosa*, *Microcystis sp.*, *Synechocystis sp.*, *Leptolyngbya tenuis*, and *Chroococcus minimus*. Three types of micromycetes of the genus *Penicillium* were identified. They showed resistance to cultivation in medium with oil fractions. The community with dominance of cyanobacteria had the highest rate of biodegradation. The artificially created community showed a high rate of biodegradation the first three days.

5. References

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