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Polycyclic Aromatic Hydrocarbons in Macrophyte Plants of the Don River Estuarine Region (Russia)

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ABSTRACT

Accumulating in the depositing environments of the water-land system, PAHs contribute to the inhibition of growth and development of coastal aquatic macrophyte plants, which can provoke negative consequences for the entire terrestrial-aquatic ecosystem. In this regard, the aim of the work was to assess the PAH content in plants using the example of macrophytes growing in the highly functional territory of the Don River estuary region, exposed to the influence of industrial enterprises, river and sea transport. The object of the study was the widespread in the coastal zone of the Don River estuary macrophyte plants - southern reed (Phragmites australis). For the purposes of the study, plant samples were collected from 14 monitoring sites evenly distributed throughout the river estuary. During the study, the content of priority PAHs in the root and aboveground parts of plants was determined. Pollutants were extracted from their samples with hexane, and PAHs were quantitatively determined in the extracts using high-performance liquid chromatography. The degree of pollution was assessed using the total load index according to Chaplygin et al. (2024). The study found that in the root part of the southern reed, the total PAH content varies from 81 ng / g to 222 ng / g, in the stem part - 30-115 ng / g. The dominant individual compounds in the roots are phenanthrene (up to 32.8%), fluoranthene (up to 28.3%), pyrene (up to 30.1%), benzo(b)fluoranthene (up to 16.3%) and benzo(g, h, i)perylene (up to 22.7%). In the stem part of the plants, the composition of the predominant PAH compounds shifts towards the dominance of low-molecular PAHs, primarily phenanthrene (up to 58%). According to the total toxic load index, most of the monitoring sites are impact sites. The most polluted areas are located on the northern shore of the Taganrog Bay and at the mouth of the Kagalnik River. The greatest contribution to pollution is made mainly by phenanthrene, benzo(a)pyrene and benzo(g, h, i)perylene. Thus, the accumulation of PAHs in the organs of macrophyte plants in the mouth area of the Don River depends on the proximity of the plants to the source of pollutants. The greatest contribution to pollution is made by phenanthrene, benzo(a)pyrene and benzo(g,h,i)perylene. As a result, the coastal area of the mouth of the Don is characterized mainly as an impact zone.

Keywords: PAHs, pollution, water-land system, coastal zone

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