ADVANCED IDENTIFICATION METHODS OF THE FUNCTIONAL FEATURES OF WINTER WHEAT RHIZOSPHERE MICROBIOME

Milantieva T, Patyka N.
National University of Life and Environmental Sciences of Ukraine,
Department of ecobiotechnology and biodiversity
e-mail: tmilantieva@gmail.com

Cereals are the major food crops in most countries of the world. Winter wheat occupies the first place in Ukraine by sowing areas. Meeting the needs of the population with high-quality products is of great economic importance. The rhizosphere formation is a vital basis for plant ontogenesis homeostasis. Effective interaction of microorganisms occurs at all levels, starting from molecular. Functionally significant rhizospheric microorganisms determine up to 70% of the optimal development of plants. Biological and functional features of the microbial communities of the rhizosphere are evaluated by their effective interaction in plant-microbial systems.

Investigation of biological functional features of plant-microbial interactions, the groups of microorganisms, the orientation of nutrition processes, in particular, the biological transformation of carbon and nitrogen in soil greatly contributes to effective construction of biological systems in agricultural biomes. Furthermore, immobilizing emissions of organic forms in the form of biomass accumulation may play an important role in the development of sustainable agricultural production methods. The study of typical black soil microorganisms was carried out in a stationary field experiment at "Agronomic Experimental Station" of the NULES of Ukraine. The object of research was to study the rhizosphere of wheat. The aim of the experiment was to study functional features of rhizospheric microorganisms, their physiological state in regard to sources of carbon and interaction with plants. The number of dominant groups of microorganisms, microbiological processes orientation and ecological indexes of biodiversity and the dominance of typical black soil bacterial complex in agrocenosis of wheat for different systems of agriculture and cultivation of soil were investigated. Subsequently, isolated microorganisms were used in laboratory experiments to determine the isolates species using an innovative colorimetric identification system for carbohydrate utilization – KB009 TM HiCarbo Kit.

As a result, significant changes were noticed in the number and the structure formation of the main physiological and taxonomic groups of microorganisms in the ontogenesis of wheat under the influence of different agriculture systems and soil cultivation methods. The sources of carbon nutrition also varied for the obtained isolates. In relation to nitrogen and its forms during the phase of the flowering of winter wheat, the number of the nitrogen-fixing bacteria in the industrial and biological systems of agriculture was 2.6-3.7 times higher than for the ecological system. The selection of dominant microorganisms of the *Triticum aestivum* wheat rhizosphere was carried out and the morphology of 85 isolated morphotypes was described. According to the indicators, the following groups of microorganisms were identified: dominant (> 10%), subdominant (5-10%), frequent (1-5%), and rare (<1%). Among them, the dominant group included 21 morphotypes, subdominant - 14, frequent - 40 and accidental - 8.

Results of Carbon utilization tests carried out with KB009 TM HiCarbo Kit indicated that rhizosphere forming dominant microorganisms have different sources of nutrition, which may be an indicator for different species affiliation. Identification of functional properties of dominant winter wheat rhizospheric microorganisms may allow further to use the obtained microbial agents in the agricultural engineering of biological systems.