Abstract

Exo-enzymes secreted by plant roots in common with microbial exo-enzymes are involved in soil biochemical processes, namely the processes of mineralization of soil organic matter and providing by mobile species of nutrients. Rhizosphere soil enzyme activity is less studied than the bulk soil. Research aim was to assess the enzyme activity involved in nitrogen and phosphorus cycles in rhizosphere soil of soybean plants under different conditions of nutrition and soil water content. The greenhouse experiment was conducted in plastic pots (5 kg of dry soil - calcareous chernozem, humus content 1.85%, pH 7.93), in four replicates. The two soil water content were examined: optimal (70% WHC) and low (35% WHC), both in unfertilized and fertilized soil. Water stress period was 17 days. Enzyme activity of cultivated soil had higher values than the soil without plants, i.e. it is confirmed that rhizosphere soil is influenced by root exudation and rhizospheric microorganisms increased activity. In most cases in the rhizosphere of soybean variety Aura the enzymatic activities had a higher level in comparison with Clavera variety. In the soybean rhizosphere soil fertilized with mineral forms of N and P urease activity reached a higher level, but protease and phosphatase activities decreased compared with unfertilized soil. The mineral N and P amended before seeding regulate the processes of mineralization of soil organic matter and reduce soil enzymatic activity according to the feedback principle. Phosphatase activity determined at different pH values, showed the highest alkaline phosphatase activity in calcareous chernozem under soybean plants. Soil enzyme activity was negatively influenced by low soil moisture. One exception was the soil urease activity with significantly higher values ($p<0.05$) at low soil water content. The changes in soil enzyme activity coincided with the concentration of mobile forms of N and P determined in rhizosphere soil. After water stress the green mass of Aura variety was higher than those of variety Clavera, with 2.3 to 13.1%. But the difference was not supported statistically ($p>0.05$). The research results contribute to understanding the biochemical processes in rhizospheric soil to realize the potential of soybean productivity and to maintain the soil fertility.

Key words: calcareous chernozem, soybean rhizosphere, enzyme activity