

Activity of Enzymes Involved in Nitrogen and Phosphorus Circulation in Cropland Soils

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Abstract

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According to the data of the Mongolian Ministry of Agriculture the area of rapeseeds increases every year, and for today it makes up about 15% from entire agriculture area. In our country the crop rotation occurs as wheat-rape-wheat-rape, which leads to loss of soil fertility and yield reduction. Study on fertility changes of agricultural soil, especially influence of cultivation on soil fertility is lacking. That is why in this study we tried to evaluate the intensity of biochemical processes in soil by comparing activity of enzymes involved in nitrogen and phosphorus cycle (protease, urease, acid and alkaline phosphatases) of the wheat, rape soils with enzymes of soils where seeding crops did not produce. The results show that in cropland soils, acidity of all soils was increased, amount of available phosphorus decreased, activity of acid and alkaline phosphatases noticeably changed compared to the control soil. From these results we can see that crop cultivation influences the biological processes in soil. So we have to take it into consideration for further farming and management systems, and plant cultivation activities.

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Introduction

Soil is a complex system wherein chemical, physical and biochemical factors are held in dynamic equilibrium. The alteration of this equilibrium by natural or anthropogenic activity, may cause instability and stress (Doran & Parkin, 1994). Usually microbial biomass and activity can be considered good indicators of soil biological status (Masciandaro *et al.*, 2012), however, soil fertility largely depends on the activity of biological processes in the soil in which soil enzymes actively participate. Studies on enzyme activities provide information on the biochemical processes occurring in the soil.

There is growing evidence that soil biological parameters may be potential, sensitive indicators of soil ecological stress or restoration (Kizilkaya & Bayrakli, 2005), and management-induced changes in soil quality (Kennedy &

Papendick, 1995). Hydrolytic enzymes as phosphatases, protease and urease are involved in the decomposition of organic nitrogen and phosphorus compounds in soil. They play a key role in formation of soil biological activity. Phosphatases are a group of enzymes that catalyze hydrolysis of phosphoric acid esters and anhydrides (Nannipieri *et al.*, 2011). Apart from being a good indicator of soil fertility, phosphatase enzymes play key roles in the soil system (Eivazi & Tabatabai, 1977). Proteases (EC 3.4.) in the soil originate from a number of different sources, including microorganisms, plants, animal excrements (urine and feces), decomposition of dry and wet deposition (including leaching from vegetation). The significance of these sources varies according to the type of ecosystem and applied management