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Influence of different fertilizer supplements on decomposition of cereal stubble remains in chernozem soil

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Introduction
Recently, many farmers have converted to low-disturbance tillage land cultivation as disk or plow fields can result in water and wind erosion of soil. So, crop residue and plant crowns and roots are left to hold the soil. However, low-disturbance tillage can be a challenge to manage since the key to crop production still requires good seed-to-soil contact. Therefore, decomposition of stubble in agricultural soils in situ is an issue of the day of modern agriculture. The aim of the present study was to compare different organic and inorganic fertilizer supplements on decomposition of cereal stubble remains in chernozem soil.
Materials and methods
Field trials were conducted in Krasnodar region, Russia. To promote stubble decomposition, a biopreparation that was cultural liquid obtained during cultivation of white-rot fungi Coriolus hirsutus 075 (Wulf Ex. Fr.) Quel. was used at the dosage of 150 ml/ha. The other tested supplements included ammonium nitrate (34 kg/ha), commercially available humate LignohumateTM (0.2 kg/ha) and combination of Lignohumate and biopreparation. Test plots were treated once after wheat harvesting. Non-treated ploughed plot was used as a blank. Soil samples were collected within 2 and 14 weeks after soil treatment. To control soil potential for stubble remains decomposition enzymatic activity is soil was determined. To perform soil analysis, stubble remains were carefully separated from soils followed by soil extraction with 0.14 M phosphate buffer pH 7.1 and analysis of the extracts for laccase and peroxidase activities [1,2]. Estimation of stubble decomposition in soil was performed by cellulose contents determination [3].
Results and discussion
The obtained results demonstrated after 14 weeks of treatment increase of soil enzymatic activity due to soil supplementation was observed. Introduction of ammonium nitrate resulted in 108% of peroxidise activity as compared to blank. That value for Lignohumate variant was estimated as 106%. The most pronounced promoting effect on soil enzymatic activity was observed for biopreparation and its combination with Lignohumate where peroxidise activity was as much as 180% and 425% respectively. Moreover, for the above supplements enhancement of laccase activity was also observed, while ammonium nitrate or Lignohumate did not affect that parameter. Treatment of soil with biopreparation led to increase of laccase activity to 265% of blank value, and combined introduction of biopreparation with Lignohumate to 390%. That finding was evident for high potential of soil treated with biopreparation or its combination with Lignohumate to decompose cereal stubble remains. The latter was confirmed by direct measurements of cellulose contents in soil. The most dramatic decrease in plant residue cellulose content was registered for soils treated with biopreparation and Lignohumate where it was 32.4 and 44.3% of blank value respectively.
Conclusions
Effects of mineral and organic supplements on decomposition of cereal stubble remains in chernozem soil were determined. Among supplements studied, the most efficient treatment was combined application of biopreparation with Lignohumate.
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