

Comparison of nutrition, anti-nutritional factors of rice straw and microbial composition in soil according to GM and non-GM rice field

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Abstract

The study was conducted to evaluate differences of growth characteristics of rice cultivated in two different regions (Cheonan and Jeonju). It focused on nutritional composition and anti-nutritional factors of rice straw produced from 21 rice varieties including GM rice (Iksan 483). The range of general nutrition ingredient is that crude was 0.97 ~ 3.2 %, carbohydrate was 67.45 ~ 80.01 %, crude protein was 1.46 ~ 4.81 %, crude ash was 6.52 ~ 18.96 %, crude fiber was 25.77 ~ 40.02 %, NDF was 51.84 ~ 67.77 %, ADF was 27.11 ~ 40.44 %, calcium was 0.49 ~ 5.18 mg/g and phosphorous was 0.26 ~ 2.77 mg/g. The general nutritional contents of GM rice were included above range. The range of phytic acid of rice straws cultivated in Cheonan and Jeonju was 0 ~ 0.056 mg/ml and 0 ~ 0.059 mg/ml, respectively. The phytic acid content of GM was 0.033 mg/ml, which was in the range of the content of rice straw in Cheonan and Jeonju. The range of trypsin inhibitor of rice straws cultivated in Cheonan and Jeonju was 0.061 ~ 0.461 TIU/mg and 0 ~ 1.278 TIU/mg, respectively. The trypsin acid content of GM was 0.461 TIU/mg, which was in the range of the content of rice straw in Cheonan and Jeonju. In addition, we investigated microbial community from each soil sample by using metagenomics sequencing based on rRNA microbial diversity in order to inspect indirect changes of soil environment with cultivation of GM rice. Metagenomics analysis was carried out using soil samples cultivated with GM and non-GM rice for before transplanting, young panicle differentiation stage, heading stage, and ripening stage. Beta diversity of microbial community in both soil environments were calculated by using Bray-Curtis distance method and showed low value with an average of 0.24 (dissimilarity = 1). As a result, it was confirmed that the cultivation of GM does not give a significant effect on the change of microbial composition in soil. Therefore, Our study demonstrates that there is no difference in the composition of soil microorganism due to GM and non-GM rice. (Acknowledgement: This work was carried out with the support of “Cooperative Research Program for Agriculture Science and Technology Development (Project No. PJ 0117722016)” Rural Development Administration, Republic of Korea)

Keywords: rice, GM rice, nutritional composition, anti-nutritional factors, metagenomics sequencing

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