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Variations of N_2O by no tillage and conventional-tillage practices under the different kinds of fertilizer applications on the cultivation of soybean in Korea

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Abstract

Anthropogenic activities have increased the concentrations of greenhouse gases, such as CO_2, CH_4, N_2O, HFCs, SF_6, and PFCs, in the atmosphere. Among others, N_2O is well known as an important greenhouse gas accounting for 7.9% of the total greenhouse effect and the effect of its emission is 310 times greater than that of CO_2. Agricultural N_2O emissions are now thought to contribute to about 60% of the global anthropogenic N_2O emission, which have been increased primarily due to fertilizer N consumption and manure management. Therefore, the reduction of N_2O emissions in agriculture is being required. This study was conducted to determine the variation of N_2O emissions by no-tillage (NT) and conventional tillage (CT) practices in the cultivation of soybean from the sandy loam soils under the different kinds of fertilizer treatments June through September 2016 in Cheong-ju, Republic of Korea. An experimental plot, located in the temperate climate zone, was composed of two main plots that were NT and CT, and were divided into four plots, respectively, in accordance with types of fertilizers (chemical fertilizer, liquid pig manure, hairy vetch and non-fertilizer). Among all the treatments, N_2O emission was the highest in August and the lowest in June. When N_2O emissions were evaluated during the growing season (June to September) in all fertilizer treatments, NT with hairy vetch treatment emitted the highest N_2O emission in August, whereas, N_2O emissions was the lowest in NT with non-fertilizer treatment in June, respectively (p = 0.05). Based on the cumulative amount of N_2O emissions during the growing season of soybean, NT had lower N_2O emission than CT by 0.01 – 0.02 kg N_2O, although NT had higher N_2O emission than CT by 0.03 kg N_2O in only the chemical fertilizer treatments. As a result, it seems that the applications of liquid pig manure and hairy vetch rather than chemical fertilizer could decrease the N_2O emission in NT, compared to CT.

Keywords: Nitrous oxide, Greenhouse gas, No tillage, Conventional tillage, Soybean

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