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Effect of Applying Rice Hull Biochar on the Yield of Chinese Cabbage and Greenhouse Gas Emissions in Cropland

Do Gyun Park[1,2], Hyeon Cheol Jeong[1], Jong Mun Lee[1], Hyo Suk Gwon[1], Hyoung Seok Lee[1], Hye Ran Park[1], Sun Il Lee[1]*

[1]Dept. of Assessment of Climate Change, National Institute of Agricultural Sciences, Wanju 55365, Korea
[2]Doctoral Course, Dept. of Bio Environmental Chemistry, Chungnam National University, Daejeon 34134, Korea

[Introduction]
Agriculture is directly affected by climate change and can pose a long-term threat to food security. To solve these problems, biochar is emerging as a new material. However, the application of biochar in agriculture is limited. In this study, agricultural by-products, especially rice hull by-products, were used as biochar to compare and review the effects on cabbage production and greenhouse gas emissions.

[Materials and methods]
Experiments were conducted at the National Institute of Agricultural Sciences field test site using a three replication random block design. The cabbage variety used was "Cheongomabi" grown from September 2, 2022 to November 23, 2022. The ridge width was 75cm, the planting interval was 45cm, and the amount of fertilizer was N-P-K: 32-7.8-19.8 kg/10a. Additional fertilizers were applied twice at 30 and 45 days after sowing. The applied amount of biochar were set as control = 0 ton/ha, B1 = 1 ton/ha, B3 = 3 ton/ha, and B5 = 5 ton/ha, and greenhouse gas emissions were measured using the closed chamber method with Gasmet GT5000 and analyzed using the FTIR method.

[Results and Discussion]
The above-ground biomass of autumn cabbage harvested 82 days after sowing was 2.40-2.70 kg/plant in the control and biochar treatments (B1, B3, and B5), with no significant differences (p>0.05). Cumulative CO_2 emissions during the cultivation period varied by treatment group, with initial emissions of 6.93-11.96 g/m^2·day and cumulative emissions of 3.23-3.73 ton/ha. Although riuce hull biochar did not significantly affect yield, it reduced greenhouse gas emissions from the soil, suggesting its potential as an agricultural method to mitigate emissions. Further research is needed to investigate its benefits and application.

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*Corresponding author: E-mail. silee83@korea.kr Tel. +82-063-238-2495