Effects of Salinity on Yield and Grain Antioxidant Contents of Black Rice

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**【Background】**Rice with a black-colored pericarp (black rice) is famous for its abundant antioxidants. The antioxidant contents are expected to increase under unfavorable conditions as a part of tolerance-defense responses to abiotic stress. This study conducted a field experiment to evaluate the effects of salinity on black rice production.

**【Materials and methods】**The experiment was conducted at the Aobayama experimental field for plants in Tohoku University, Sendai, Japan in 2021 and 2022. A black rice variety "Asamurasaki" and a common rice variety "Hitomebore" were tested in this study. Salt treatment and control plots were prepared, and the salt treatment was applied with irrigation of salt solution. Electric conductivity (EC) in soil solution ranged 0 to 3 dS/m and 5 to 10 dS/m in 2021 and 2022, respectively. Leaf area index (LAI), relative chlorophyll content of leaf (SPAD), tiller number, and plant height were measured every week. Yield components were determined at the harvest. Grain phenolics and flavonoid contents were measured as antioxidant components.

**【Results and discussion】**The salt treatment adversely affected rice growth except for SPAD both in 2021 and 2022. SPAD increased by salt treatment, presumable due to a decrease in LAI. The adverse effect on rice growth caused yield reduction. The reduction rate was 9% and 26% in 2021 and 2022, respectively, being caused by the difference in soil solution EC. The reduction rate was not significantly different between Asamurasaki and Hitomebore. The grain phenolics and flavonoid contents tended to increase by salt treatment The increase was more obvious under higher EC conditions in 2022. The results suggest a tradeoff relation between yield and antioxidant contents, requiring optimization of salt treatment level to obtain higher phenolics and flavonoids yield. Black rice will be an alternative variety to increase profitability in salt-affected areas. The results also imply the applicability of black rice to organic farming because a similar phenomenon is expected under biotic stresses.

**Keywords**Black rice; Grain yield; Salinity; Flavonoid; Phenolics

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