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## Physiological and Spectroscopic Changes of Rice by Nitrogen Fertilization Conditions

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### **[Abstract]**

An appropriate amount of nitrogen fertilizer input during rice cultivation is essential for rice growth, quality control, and reduction of greenhouse gases in paddy fields. Therefore, it is necessary to develop a technology that can check whether an appropriate amount of fertilizer is applied in paddy fields. In this study, we tried to derive a method for diagnosing nitrogen fertilization level using spectroscopic diagnosis, physiological analysis, and molecular indicator genes. Nitrogen fertilization treatment was performed in a greenhouse by dividing into five treatment conditions: no fertilization (N0), low fertilization (N0.5), standard fertilization (N1.0), excessive fertilization (N1.5), and double fertilization (N2.0), respectively. Growth characteristics analysis was investigated by nitrogen fertilization conditions and growth stages, and the height of the canopy was analyzed using a laser scanner. Physiological and spectroscopic analyses were performed by analyzing chlorophyll and sugar contents and measuring SPAD and leaf spectrometer on rice leaves. In addition, real-time PCR experiment was performed to check the relative expression levels of several known nitrogen metabolism related genes. These results suggest that spectroscopic techniques can be helpful in diagnosing the level of nitrogen fertilization in rice paddy fields.

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