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Effects of Shading on the Growth and Chlorophyll Fluorescence under Agrivoltaic System Conditions

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[Abstract]

Agrivoltaic System (AVS) was introduced with the concept that it could generate electricity by using the extra light remain after crops use for photosynthesis in farm, which can earn additional income. However, crop yield was declined under the AVS condition due to the decrease in light energy. In the past, many researchers have been studied about crop states under shading conditions. However, the phenomenon of partial shading such as under the AVS is not well studied. In this study, to figure out the response of crop under the different light conditions, the electron transport rate (ETR) and non-photochemical quenching (NPQ) of rice was investigated using the chlorophyll fluorescence measurement. Also, physiological changes of crops under the shading conditions were investigated.

The growth experiment under partial shading under AVS and overall shading which made of 35% shade cloth was conducted to understand the eco-physiological responses of rice to light in terms of the photosynthesis. Under the shading conditions, SPAD value and chlorophyll contents were higher, but the leaf thickness was lower than control. The overall shading condition show lower ETR than others during the growing season. In contrast, NPQ was higher than other treatments. This means the available light energy cannot contribute to photosynthesis under the shading condition.

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