ORAL 09

온난화 조건에서 벼에 대한 구조적, 생화학적, 생리적 식생지수 반응

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Response of Structural, Biochemical, and Physiological Vegetation Indices on Paddy Rice under the Elevated Air Temperature

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Remote sensing-based vegetation indices have been utilized to non-destructively monitor the crop conditions. The structural vegetation index, such as normalized difference vegetation index (NDVI), effectively expressed the crop phenology including growth and development of the crop. However, not only structural vegetation index but also biochemical and physiological vegetation indices are necessary to comprehensively understand the crop status. Our purpose is to evaluate the response of structural, biochemical, and physiological vegetation indices on paddy rice under the elevated air temperature. Paddy rice was cultivated for 3 years from 2016 to 2018 in the temperature gradient field chambers (TGFC). The growth parameters, such as plant height, leaf area index (LAI), above ground dry matter (AGDM), were measured, and grain components, such as grain yield, harvest index, ripening ratio, were investigated. In addition, the spectral reflectance of paddy rice was observed to estimate vegetation index on a sunny day at near solar noon time. MERRIS terrestrial chlorophyll index (MTCI) significantly expressed the stats of crop growth under the different air temperature conditions. Paddy rice grew rapidly under the high air temperature, and MTCI represented this phenomenon sensitively. Photochemical reflectance index (PRI) was responded when air temperature was extremely high. Unlike MTCI and NDVI, PRI decreased although it is not in ripening stage. After heading stage, the vegetation indices normally decreased because of physiological senescence. The ratios of decreased NDVI and PRI after heading stage were different depending on the degree of heat stress during reproduction phases, and it had a sigmoid relationship with the ripening ratio of paddy rice. Our results can help to effectively utilize the vegetation indices and to diagnose crop conditions.

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Acknowledgements:

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2016R1D1A1B03933218).