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Evaluation of the relationship between growing temperature and grain yield components across years in two japonica rice varieties in Korea

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Abstract

Rice grain yield is determined by crop dry matter production that is sensitive to temperature. Our objective was to determine whether the difference in temperature between years had an impact on the relationship between yield components and grain yield. Field experiments were conducted under machine transplanting cultivation by using yield data of two japonica rice varieties, Odaebyeo (early maturing) and Nampyeong (mid-late maturing), in 2013 to 2016 in Suwon, Korea. Plant height, dry weight, and yield components were examined by analysis of variance, correlation. The milled rice yield of the two varieties were the highest in 2016, however the lowest yields were observed in the different years. In 2016, Odaebyeo produced 0.96 t ha^{-1} greater milled rice yield than in 2015, and Nampyeong produced 1.11 t ha^{-1} greater yield than in 2013. The correlation analysis indicated that spikelet per panicle (R = 0.53) was associated with grain yield of Odaebyeo. In Nampyeong, biomass at heading date (R = 0.74), 1000-grain weight (R = 0.71), spikelet per panicle (R = 0.58), and panicle number per m^2 were associated with grain yield. Sink size (spikelet number per m^2) of the two varieties responded to accumulative temperature from transplanting to panicle initiation stage. In this experiment, optimal accumulative temperature before panicle initiation has effect on increased spikelet number and/or number of panicle that were mainly responsible for yield difference. Rice production research to increase grain yield should consider all yield components, but increased emphasis on biomass production before heading is also necessary as well as grain ripening conditions.

Keywords: rice, temperature, yield, yield component

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