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Responses of spikelet fertility to air, spikelet, and panicle temperatures and vapor pressure deficit in rice

Woo-sung Jung, Bum-Suk Seo and **Byun-Woo Lee**
Seoul National University, Republic of Korea

For delineating the responses of spikelet sterility to environmental variables and panicle temperature, a series of experiments were conducted in four plastic houses that were controlled to the target temperatures of ambient (AT), AT+1.5ºC, AT+3.0ºC and AT+5.0ºC at the experimental farm of Seoul National, Korea in 2013 and 2014. Three rice (*Oryza sativa* L.) cultivars differing in maturity were grown under ambient temperature plastic house until transferred to different temperature-controlled plastic houses at initial heading stage of each cultivar. Air temperature, solar radiation, vapor pressure deficit (VPD), internal temperature of spikelet (Ts), and surface temperature of panicle (Tp) were monitored at an interval of one minute and, for subsequent analysis, averaged over flowering time during seven days after initial heading of panicle. The spikelet fertility showed wide range of variation from 100% to 4.6% depending on treatments. The ridge regression revealed that not only air temperature but also VPD was negatively associated with spikelet fertility. The spikelet fertility was well fitted to logistic equations not only of air temperature, Ts, and Tp but also of VPD. The model performances showed no clear differences regardless of temperatures employed to the model equations, while the bi-logistic equation model employing air temperature and VPD as independent variables showed the best performance.Our result was contrary to the previous reports that the increase of VPD reduced high temperature-induced spikelet sterilityby increasing transpirational cooling of panicle. The present results indicate that increasing VPD in high temperature conditions would accelerate desiccation of anther or pollen during flowering and recuce pollen viability and germination, leading to lower spikelet fertility. Further detailed study is needed to verify VPD effects on spikelet fertility in high temperature conditions.

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Biography

Woo-Sung Jung graduated from Department of Plant Science, Seoul National University in summer 2012. His research interest is climate change effect on rice.

jeng3487@snu.ac.kr

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