

Effects of elevated temperature, and shading treatment on grain weight and spikelet sterility at different positions of rice panicle

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[Introduction]

High temperature during the reproductive stages affects rice yield and yield components. Especially, spikelet fertility and grain filling are vulnerable to high temperature stress after heading. The objective of this study was to evaluate the responses of spikelet fertility and grain filling to elevated temperature and shading after heading.

[Materials and Methods]

Hwasungbyeon (medium maturing group) was sown on May 2nd and transplanted in a 1/5000a Wagner pot on May 25th and grown with N-P-K fertilizer of 0.36-0.18-0.23g/pot. At the initial heading stage, the pots were transferred to the four plastic houses that were automatically controlled to ambient temperature (AT), AT+1.5°C, AT+3.0°C and AT+5.0°C. At the same time, shading treatment was conducted using 30% shading net. The heading date of each panicle was checked. After harvest, one grain weight and moisture contents in each primary rachis branch were measured, excluding empty spikelets. The number of spikelet in each primary rachis branch were investigated. Spikelet sterility(empty spikelet) was evaluated manually by pressing spikelet between thumb and index fingers.

[Results and Discussions]

Regardless of temperature and shading treatments, the distribution of heading date and the number of spikelet in each primary rachis branch were not different. But the number of spikelet at middle position of panicle was larger than at the other positions. Elevated temperature and shading treatments increased spikelet sterility, but spikelet sterility was not different among spikelet positions. Increasing temperature above ambient decreased one grain weight. One grain weight in the upper position decreased more than those in the other positions by high temperature. At ambient temperature condition, shading treatment decreased one grain weight.

Treatments of temperature and shading after heading didn't affect heading date and spikelet number. Spikelet sterility, which is sensitive to temperature at spikelet opening, increased under high temperature condition. Because the duration of spikelet opening in a panicle is less than 2 weeks, spikelet sterility was not significantly affected by spikelet position. Elevated temperature reduced one grain weight. Especially, one grain weight at upper position was more sensitive to high temperature than at the other positions. The reason of this response was assumed that increased sink competition with accelerated grain filling rate due to high temperature or high temperature damage at early grain filling stage.

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