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High Temperature-Induced Spikelet Sterility of Japonica Rice at Flowering in Relation to Air Temperature, Humidity and Wind Velocity Conditions

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Abstract:

Although the impact of anticipated global warming on regional rice production merits intensive investigation, quantitative information regarding the effects of high temperatures on japonica rice is limited. The purpose of this study was to clarify the critical temperature for high temperature-induced spikelet sterility at the time of flowering in japonica rices and how it is affected by humidity and wind velocity. This research consisted of two experiments. In the first experiment, we examined the response of the varieties 'Akihikari' and 'Koshihikari' to high temperatures at the time of flowering. Under a six-hour high-temperature treatment of panicles for eight days at flowering, the critical temperatures to induce 50% sterility were estimated to be about 36.5°C for Akihikari and 38.5°C for Koshihikari. The major cause of the cultivar difference was attributed to the difference in the number of pollen grains shed on stigma. In the second experiment, we examined the effects of humidity and wind velocity upon the high temperature-induced spikelet sterility of Akihikari. The fertility of spikelets flowered at 37.5°C was highest at 45% relative humidity (R.H.) followed by that at 60% R.H., and lowest at 80% R.H. Wind velocity above 0.85m s⁻¹ drastically decreased spikelet fertility at 37.5°C, mainly through reduction of the pollen grain number shed on stigma.

Keywords:

Air humidity, Cultivar difference, Flowering stage, High temperature, Japonica rice, Pollination, Spikelet sterility, Wind velocity

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