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Effect of Tillering on Heading Response of Rice by Temperature and Day-length Conditions

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[Introduction]

In rice, tillering is known to have a large coefficient of variation, depending on the environment as well as genetic factors. The day-length for increased tillering is opposite to the condition in which the flowering is accelerated and the vegetative growth period is shortened. Because tillering mainly occurs during the vegetative growth period, it is strongly influenced by developmental processes such as floral induction. florigen-activation-complex has been reported to affect growth such as tillering in addition to floral-induction, many related studies have been conducted. However, the mechanism and functions of this interaction have not yet been fully elucidated and report contradictory results.

[Methods and Materials]

In this study, we subjected rice plants ('Saenuri' and 'Odae') with tillers removed to short and long day-length regimes and observed the growth and flowering responses. Light intensity, temperature, and humidity can be artificially controlled. The light turned on at 7:30 AM regardless of day-length treatment, thus day-length was adjusted by the off time. The day-length conditions after removing the tiller were matched between short (12 hour light/12 hour dark) and long (14 hour 30 minute light/9 hour 30 minute dark) day-length conditions, and the temperature was set to 28 °C (maximum 33 °C/minimum 23 °C).

[Results and Discussion]

In the long day-length condition, plant height tended to increase in the tiller removed treatment group compared to that in the control in both cultivars. However, in the short day length condition, which was considered to promote flowering, plant height decreased in the tiller removed treatment group. The number of growing days from sowing to heading in the short day-lengths decreased in the tiller removed treatment group compared to that in the control group. Conversely, for long day-length, the number of growing days from sowing to heading was longer in the tiller removed treatment group than that in the control group. In short day-length condition, the expression levels of the florigen genes (Hd3a, RFT1) increased with treatment time. The expression levels of both the florigens in the main stem, from which the tiller was removed, increased compared to those in the control, under short day-length condition.

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