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Transplanting Shock: Physiological Causes of Rice Growth Inhibition and Delay in Heading

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[서론]

Transplanting is an important rice cultivation method; however, transplanting shock commonly affects grain yield, and the mechanisms underlying the inhibition of growth, development, and delay in heading caused by transplanting shock have not yet been clearly elucidated. We investigated the effects of seedling age, temperature, and root damage during transplanting on growth, development, and time to heading, both under artificially controlled and natural day length. Additionally, we investigated the impact of seedling root growth space as well as the potential mitigating effects of residual seed nutrients on young transplanted seedlings.

[재료 및 방법]

The following rice cultivars, representing ecotypes with different maturation times, were used in all the experiments: Odae (early-maturing), Daebo (mid-maturing), and Saenuri (mid- to late-maturing). A composite slow-release fertilizer based on 9 kg/10a nitrogen, 4.5 kg/10 a phosphate, and 5.7 kg/10a potassium at an area ratio corresponding to three plants (planting distance: 30 × 14 cm). Experiment 1: The impact of root damage, temperature, and seedling age on time to heading. Experiment 2: The impact of natural day length and temperature on time to heading. Experiment 3: The effect of growth tray size on rice seedling growth and development. Experiment 4: The effect of residual seed nutrients on growth and development of transplanted seedlings.

[결과 및 고찰]

The delay in leaf development and heading of rice due to Transplanting shock appeared to be affected more by inhibition of growth during the seedling period than by root cutting. However, root cutting increased the ratio of the final number of leaves to the final number of tillers by affecting tiller development. In the current model used for predicting the phenology of rice, the parameter is constructed by simply using the seedling period as a factor representing the period of growth inhibition due to TR shock. To increase the accuracy of prediction, it is necessary to include the number of leaves or the temperature and seedling conditions during the seedling period. In response to global warming, for a successful rice cultivation under short-day conditions at high temperatures, the period during which growth and development are inhibited in the seedling stage should be reduced, whereas the number of plantings should be increased to increase the overall number of tillers produced, and hence the panicle number. This will help to ensure sufficient growth and yield. Regarding the different flowering ecotypes, cultivars with a high rate of basic vegetative growth that can rapidly produce a sufficient number of tillers under short-day conditions should be used.

[사사]

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