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Morphological and molecular characterization of germinability related to direct-seeding in rice varieties

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Abstract

Direct-seeding cultivation of rice is increasing in Asia instead of transplanting system, because of its lower cost and operational simplicity. Low-temperature germinability (LTG) and anaerobic germinability (AG) are important characters for breeding of varieties for wide-spread adoption of direct-seeding cultivation in rice. This study was performed to characterize LTG and AG of seven rice varieties and identify varieties with strong germinability on both low-temperature and anaerobic conditions. The mean germination rate and germination vigor of seven varieties were 51.7% and 6.0 under low-temperature condition, respectively. Among these varieties, Cheongcheongjinmi and Hwanggeumnodeul had the highest germination rate of 80%, indicating that Cheongcheongjinmi and Hwanggeumnodeul have a good LTG. In anaerobic conditions, the germination rate and coleoptile length for all varieties were 47.6% and 3.2 cm, respectively. Of them, the highest germination rate and coleoptile length were observed in Subo and Hopum, respectively, suggesting that these two varieties are tolerant to anaerobic during germination stage. Molecular characterization by SDS-PAGE revealed that the protein patterns differed at 50 kDa, 40 kDa, and 22 kDa between low-temperature and anaerobic conditions. Varieties identified as good LTG or AG in this study may be used for developing new direct-seeding rice cultivars through pyramiding these traits in the breeding program.

Keywords: rice, low-temperature germinability, anaerobic germinability, direct-seeding cultivation

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