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Reduction of quality of rice due to submergence during ripening stage and identification of its physiological cause

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Abstract

This study was conducted to analyze the reduction of quality and ripening rate of rice due to submergence during ripening stage and identify the physiological cause. Korean japonica type rice cultivars, Nampyeong was used in the experiment. The following 7, 14 day after heading, they were then moved into submergence treatment facility and we conducted the tests under three different submergence conditions - T1(clear water and overhead submergence), T2(Muddy water and exposure of Flag leaf end), T3(Muddy water and overhead submergence), and the treatment lasted for 4days. The decrease of ripening rate was most severe in T3 treatment at 7days after heading, and the decrease of head rice ratio was most severe in T3 treatment at 14days after heading. Meanwhile the starch synthesis was inhibited, as the supply of assimilation products was inhibited in grain during the submergence treatment. And in stem, sucrose content was increased because the soluble carbohydrates accumulated before heading were decomposed. These changes may be due to the consumption of respiratory substrate in anaerobic conditions and the inhibition of the production of photosynthetic products by light interception. In order to see what kind of reaction occurs at the molecular level, we examined the degree of RNA expression in grain, stem and leaf. First, the expression of rna associated with starch synthesis in grain was decreased in all submergence treatment. and especially Ospul(DBE) was more decreased in 14days after heading treatment than 7days after heading treatment. This difference can explain the result that the decrease of head rice ratio was more severe at 14days after heading. And in stem, the expression of rna associated with the supply of assimilation products was decreased in submergence treatment. Finally in leaf, the expression of rna(ADH, ALDH) associated with anaerobic respiration was increased, while the expression of rna associated with photosynthesis was decreased. These results of physiological analysis can used to develop the cultivation technique and to offer the information for breeding the cultivars with tolerant characteristics to submergence stress during ripening stage in rice.

Keywords: rice, submergence, quality, physiological characteristic

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