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Filling Percentage of Rice Spikelets as Affected by Availability of Non-Structural Carbohydrates at the Initial Phase of Grain Filling

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Abstract:

The observed reaccumulation of non-structural carbohydrates (NSC) in culm and leaf sheath in the later half of the grain filling period, in spite of the existence of imperfectly filled rice spikelets, indicate that grain filling is determined not only by total availability of carbohydrates during the grain filling period but also by the sink ability for accumulating carbohydrates. The objectives of this study were to clarify which plant factors determine the sink ability of rice grain and their cultivar difference. Periodic measurements were made of crop dry weight and the amount of NSC during grain filling period of Milyang 23 and Nipponbare grown under various conditions. Filling percentage, defined as the ratio of rough brown rice yield to the product of spikelet density and weight of a fully ripened grain, was positively correlated with RGR in grain weight over the initial 10 days after full heading. This period corresponded to the reported period in which endosperm cell number is determined. A highly positive correlation was also obtained between the amount of NSC available per grain in the initial 10 days of grain filling and the RGR of grain, indicating that the filling percentage of rice crop is determined by the availability of NSC in that period. Interestingly, Milyang 23 had a significantly higher filling percentage than Nipponbare under a given amount of NSC per grain in the initial 10 days of grain filling.

Keywords:

Grain filling, Initial growth of grain, Non-structural carbohydrate, Rice (*Oryza sativa* L.), Sink ability, Sink source ratio

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