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Activities of Enzymes for Sucrose-Starch Conversion in Developing Endosperm of Rice and Their Association with Grain Filling in Extra-Heavy Panicle Types

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Abstract: Rice cultivars with numerous spikelets per panicle (extra-heavy panicle types) frequently fail to exhibit their high yield potential due to low grain filling. Existing genetic variation in grain filling, however, opens possibilities for genetic improvement for this trait. We studied the correlation between grain filling and the activities of enzymes for sucrose-starch conversion in developing endosperm. The activity of sucrose synthase (EC 2.4.1.13, SuSy) and ADPglucose pyrophosphorylase (EC 2.7.7.27, AGPase), were measured in three extra-heavy panicle types and a standard cultivar grown at two locations under different environmental conditions. The proportions of grains with definite specific gravities and the rate of grain filling were adopted as the parameters related to grain filling. AGPase activity, but not that of SuSy, was consistently correlated to high proportions of high-density grains (specific gravity>1.20) and high rates of grain growth in spikelets, particularly in those on secondary branches in which low grain filling is the rule. Such correlation was also detected in spikelets on primary branches which generally show better grain filling, but only early stages. Therefore, a high activity of AGPase might contribute to the reduction of the sucrose concentration by accelerating sucrose metabolism at the developing seed, a sink terminus of the phloem. Thus the sink-directed phloem transport of sucrose would be promoted, resulting in improved grain filling of extra-heavy panicle types. SuSy would play some roles in such a cultivar difference in grain filling, but depending on environments.

Keywords: [ADPglucose pyrophosphorylase](#), [Developing endosperm](#), [Extra-heavy panicle type](#), [Grain filling](#), [Inferior spikelet](#), [Rice](#), [Sink activity](#), [Sucrose synthase](#)

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