

Category	: International Rice Research Conference
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Title of Entry	: Trade off between spikelet number and grain filling in rice panicle: The physiological linkage.
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Abstract : Rice is the premier cereal crop that provides food calories to half of the human population on earth. After the success of green revolution in the late 1960s, the yield potential of rice has stagnated threatening food security of consumers in the forth coming decades. To break the yield barrier, breeders have increased spikelet number per panicle in the new large-panicle type rice for improving grain yield potential. But this advantage of a panicle with numerous spikelets is not sustained in grain yield because of poor grain filling of inferior type spikelets located on secondary branches especially on the basal part of panicle. High spikelet density of the large-panicle rice changed hierarchy in spikelet development and made the pattern relatively homogeneous. The resulting reduction of metabolic dominance lowered sink strength for starch synthesis and assimilate partitioning of spikelets particularly on the disadvantaged positions. There has been no comprehensive study of either physiology or genetics of the metabolic dominance in grain filling of superior over inferior spikelets although rice genome sequencing data base has provided precise information of genes/QTLs determining yield and yield components. Unpolished rice consists of 80-90% starch and its synthesis in developing kernels primarily determines the nature of sink activity for development. Inferior type spikelets produce more ethylene and high ethylene promotes greater genetic expression of ethylene signal transducers, while infringing expression of genes encoding endosperm starch synthesizing enzymes. This physiological linkage that undermine filling of inferior grains is not genetically constitutive and amenable for modification through either external application of ethylene inhibitors or decrease of spikelet number of panicle by surgical excision and trait selection for low spikelet number. Thus, ethylene could be the physiological link for the trade off between spikelet number and grain filling. A comparative account of the intrinsic factors controlling grain filling between two extreme types of spikelets (superior and inferior) of panicle is discussed in quest for breaking yield barrier of large-panicle type rice.

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