

W01

What factors reduce the yield potentiality in high-yielding rice?

Tohru Kobata,* Haruka Yoshida, Uukina Masiko, Tohru Honda, Hibiki Ishi and Hiroyuki Iwasaki

Faculty of Life and Environmental Science, Shimane University, 1060 Nishikawatsu-cho, Matsue, 690-8504, Japan

Abstract

The *indica* × *japonica* rice (*Oryza sativa* L.) cultivars released in Japan since 1980 are high-yielding. However, occasionally in these cultivars their high yield potentials cannot be realized, particularly depending on climate conditions. The objectives of this study were to identify the reason for yield instability and the critical yield component factor causing lower grain yield in these high-yielding cultivars. Standard-yield *japonica*, high-yielding *japonica*-dominant, and *indica*-dominant cultivars were grown in western Japan. Rough grain yield (RY) in these high-yielding cultivars ranged from 450 to 980 g m⁻², and was positively correlated with potential grain yield (PRY). By fluctuations of solar radiation, RY changed with spikelet number (SNO), and SNO was correlated with cumulative radiation during the panicle formation period of 30 days before heading. Even if higher SNO was achieved under higher radiant conditions, RY was lower than PRY. The lower grain-filling in plants bearing higher SNO resulted from a lower filling percentage of spikelets (%F, RY/PRY), and %F was strongly correlated with spikelet fertility (%S) across all cultivars. %S was highly influenced by cumulative radiation per PRY during pollen development and establishment around heading. Inhibition of assimilation by leaf removal lowered %S. Conversely, stem thinning and removal of upper panicles around heading increased %S in spikelets of the lower part of the panicle in which sterility was higher. These results suggest that limitation of assimilate-supply due to low irradiance at the spikelet-formation and flowering stages restrains the potential of the high-yielding cultivars, depending on reduction of SNO and %S, respectively.

Keywords: fertility, high yield, rice, spikelet number

Corresponding author*

Tohru Kobata

Faculty of Life and Environmental Science, Shimane University, 1060 Nishikawatsu-cho, Matsue, 690-8504, Japan

+81 852-32-6505

kobata@life.shimane-u.ac.jp