W11

Dry matter and grain production of a near-isogenic line carrying a 'Takanari' (high yielding, Indica) allele for increased leaf inclination angle in rice with the 'Koshihikari' (Japonica) genetic background

Nan Su San[1]*, Yosuke Otsuki[1], Shunsuke Adachi[1], Toshio Yamamoto[2], Tadamasa Ueda[2], Takanari Tanabata[3], Taiichiro Ookawa[1] and Tadashi Hirasawa[1]

[1]*Graduate School of Agriculture, Tokyo University of Agriculture and Technology, 3-4-8 Saiwai-cho, Fuchu, Tokyo 183-8509,* [2]*Institute of Crop Science, NARO, 2-1-2 Kannondai, Tsukuba 305-8666,*
[3]*Department of Frontier Research, Kazusa DNA Research Institute, Kisarazu, 2-6-7 Kazusa-kamatari, Kisarazu, Chiba 292-0818, Japan)*

Abstract

To increase rice production, manipulating plant architecture, especially developing new high-yielding cultivars with erect leaves, is crucial in rice breeding programs. Leaf inclination angle determines the light extinction coefficient (*k*) of the canopy. Erect leaves increase light penetration into the canopy and enable dense plantings with a high leaf area index, thus increasing biomass production and grain yield. Because of erect leaves, the high-yielding *indica* rice cultivar 'Takanari' has smaller *k* during ripening than 'Koshihikari', a *japonica* cultivar with good eating quality. In our previous study, using chromosome segment substitution lines (CSSLs) derived from a cross between 'Takanari' and 'Koshihikari', we detected seven quantitative trait loci (QTLs) for leaf inclination angle on chromosomes 1 (two QTLs), 2, 3, 4, 7, and 12. In this study, we developed a near-isogenic line (NIL-3) carrying a 'Takanari' allele for increased leaf inclination angle on chromosome 3 in the 'Koshihikari' genetic background. We compared *k*, dry matter production, and grain yield of NIL-3 with those of 'Koshihikari' in the field from 2013 to 2016. NIL-3 had higher inclination angles of the flag, second, and third leaves at full heading and 3 (- 4) weeks after full heading and smaller *k* of the canopy at the ripening stage. Biomass at full heading and leaf area index at full heading and at harvest did not significantly differ between NIL-3 and 'Koshihikari'. However, biomass at harvest was significantly greater in NIL-3 than in 'Koshihikari' due to a higher net assimilation rate at the ripening stage. The photosynthetic rates of the flag and third leaves did not differ between NIL-3 and Koshihikari at ripening. Grain yield was higher in NIL-3 than 'Koshihikari'. Higher panicle number per square meter in NIL-3 contributed to the higher grain yield of NIL-3. We conclude that the QTL on chromosome 3 increases dry matter and grain production in rice by increasing leaf inclination angle.

Keywords: dry matter production, leaf inclination angle, light extinction coefficient, quantitative trait locus, rice

*Corresponding author
Nan Su San
Graduate School of Agriculture, Tokyo University of Agriculture and Technology, 3-5-8 Saiwai-cho, Fuchu, Tokyo 183-8509, Japan
Tel: +81-42-367-5672
Fax: +81-42-367-5672
Email: nansu2007@gmail.com