**16. Identification of a dominant suppressor of photoperiod-sensitive gene using *indica/japonica* backcrossed progenies in rice (*Oryza sativa* L.)**

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Photoperiod-sensitivity is one of the most important features of rice adaptability. There are two major types of photoperiod-sensitive genes, *Se* and *E*, in rice (Okumoto et al. 1996, Ichitani et al. 1998). Meanwhile, some modification factors such as *i-Se-1* and *Su-Se-1 (t)* suppressed the expression of *Se1* gene (Chang et al. 1969, Sano 1990, Ohshima et al. 1993). We observed that IR24 was a photoperiod-insensitive indica and Asominori was a photoperiod-sensitive japonica cultivar. Under long-day growing environments, the days to heading (hereafter abbreviated as DTH) of IR24×Asominori $F_1$ exhibited great over-parental heterosis and the DTH of the RIL population derived from IR24× Asominori (Tsunematsu et al. 1995) showed apparently transgressive segregation, which suggested that photoperiod-sensitive genes and their suppression factors co-existed in IR24.

To identify photoperiod-sensitive suppression genes, we constructed two $F_1$ populations using a CSSL population derived from Asominori×IR24 with genetic background of Asominori genome (Kubo et al. 1998) as female parents and Asominori and IR24 as pollen parents. We planted the two $F_1$ populations and all CSSLs under natural long-day environment (Nanjing, $32^{o}$ 04′N) to observe the phenotypic data of DTH. In the winter of 2004, we also planted the CSSL population in Hainan ($18^{o}$ 29′ N). In this study, we defined the DTH difference of the same line between Nanjing and Hainan as photoperiod-sensitive effect of DTH. The results showed that: 1) the CSSLs (hereafter we temporarily called these CSSLs as CSSLs-6) containing the substituted segment of chromosome 6 linked with RFLP marker R2171 (Fig. 1) had average DTH 7 days shorter than that of Asominori (Fig. 2A), 2) CSSLs-6 had no photoperiod-sensitivity (Fig. 2B), which indicated that Asominori had lost photoperiod-sensitivity due to the introgression of the allele of IR24, 3) The combinations of CSSLs-6 with Asominori had DTH as early as that of the early maturing CSSLs-6 (Fig. 2A) and the $F_1$s with IR24 had great negative heterosis for DTH (Fig. 2C), which indicated that the allele of IR24 was a dominant photoperiod-sensitive suppression gene. We tentatively designated this gene as *Su-PS-6(t)*.

To further understand the photoperiod-sensitive suppression effect of *Su-PS-6(t),* we created some hybrids of Asominori, IR24 and AIS43, one of CSSLs-6, crossing with two indica and three japonica cultivars, and planted all the hybrids at Nanjing in the summer of 2005. The DTH of all the hybrids of AIS43 exhibited early while the inter-subspecific hybrids of Asominori performed over-parental late maturing and the hybrids of IR24 had no DTH heterosis (Table 1), which further verified that *Su-PS-6(t)* was a dominant photoperiod-sensitive suppression gene. When *Su-PS-6(t)* was introduced into restorer or sterile lines, it could suppress the expression of some photoperiod-sensitive genes. Thus, *Su-PS-6(t)* eliminated the interaction effects between photoperiod-sensitive genes from both parents of hybrids and significantly promoted heading of the intra- or inter-subspecific hybrids. Whether *Su-PS-6(t)* identified here is the same as *Su-Se-1(t),* a dominant suppressor of photoperiod-sensitive gene *Se1* documented early (Ohshima et al. 1993, Sano 1990) or not, it is need to conduct further experiments.

Table 1. DTH of testers and the combinations between AIS43, Asominori, IR24 and testers in the summer of 2005, Nanjing, China

| Testers | DTH of tester | DTH of combination (days) | | |
|---|---|---|---|---|
| | (days) | AIS43/tester | Asominori/tester | IR24/tester |
| R084 (indica) | 91 | 82 | 115 | 92 |
| 9311 (indica) | 101 | 86 | 113 | 100 |
| C418 (japonica) | 92 | 78 | 98 | 89 |
| 02428 (japonica) | 94 | 83 | 97 | 90 |
| Balila (japonica) | 76 | 76 | 88 | / |
| AIS43 | 76 | / | 77 | 81 |
| Asominori | 87 | 77 | / | 103 |
| IR24 | 92 | 81 | 103 | / |

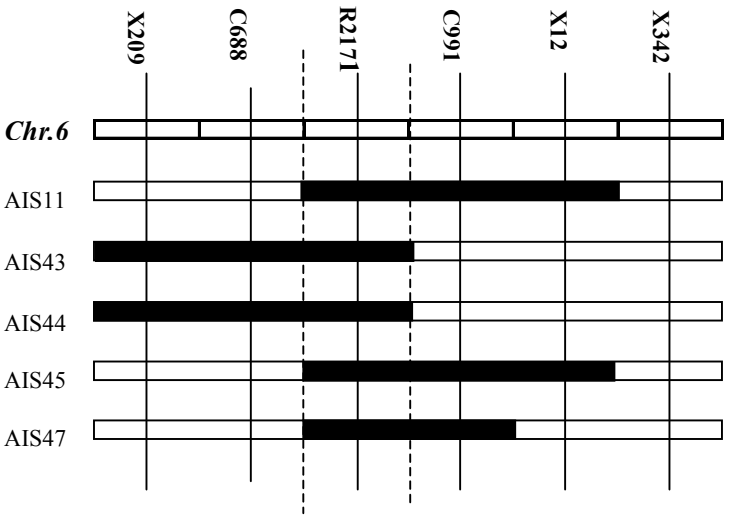


Fig.1. Graphical genotype analyses of CSSLs containing*Su-PS-6 (t)* on chr. 6. The black horizontal bars represent chromosome substituted segments.

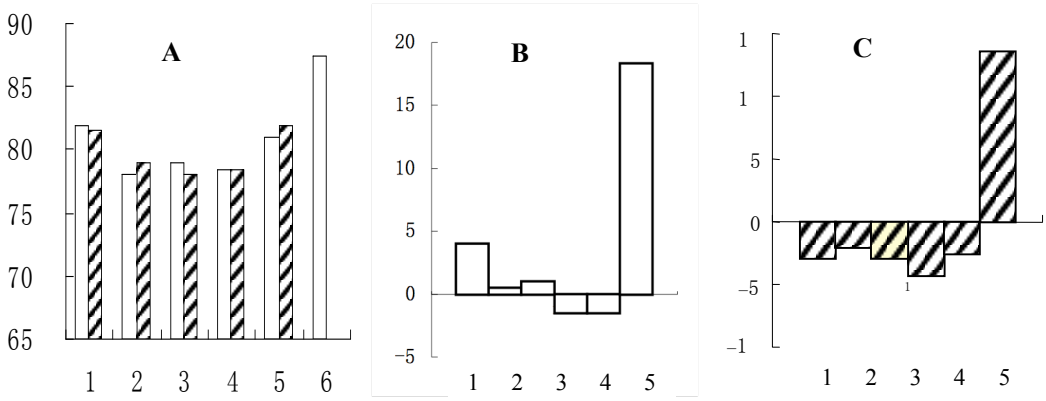


Fig. 2. Analyses of photoperiod-sensitive suppression effect for *Su-PS-6(t)*. 1, 2, 3, 4, 5 and 6 on X-axis represent CSSL AIS11, AIS43, AIS 44, AIS 45, AIS47 and Asominori, respectively**.** A: DTH of CSSL (left white bar) and corresponding CSSL/Asominori F1 (right bar). B: Photoperiod-sensitive effect of DTH. C: Mid-parent heterosis of CSSLs/IR24.

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