

## 5. Introgression and mapping of erect panicle gene from *Oryza glaberrima* into *Oryza sativa*

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Erect panicle, an important plant type trait for rice breeding program, is receiving greater attention by rice breeders. Varieties with erect panicle were regarded as high yield potential. Thirty erect and semi-erect panicle rice varieties accounting for 36.6% of the total rice area were released from 1974 to 2000 in Liaoning province, the People's Republic of China. The planting area of erect panicle rice had been extended rapidly since 1990s, accounting for more than 50% of total planting area in Liaoning province at present (Tan et al. 2001, Xu et al. 1995). Recently, more and more erect panicle rice varieties are being released in north and east China (Xu et al. 2004). However, two-thirds erect panicle varieties in China possess the same erect panicle gene (s) from Balilla. Genetic uniformity of these varieties is now considered as increasing the potential vulnerability of the crop to biotic and abiotic constraints. Exploiting new genes of erect panicle type is urgent (Zhang et al. 2002).

*Oryza glaberrima*, one of the two cultivated species in genus *Oryza*, was considered as the best gene pool for introgressing elite genes into *O. sativa* (Xu et al. 2005). Mining and introgression of favorable genes from *glaberrima* will expand genetic background of *sativa*. IRGC101901, one *O. glaberrima* accession, introduced from the International Rice Research Institute, as maternal parent, and Dianjingyou 1, a *japonica* cultivar from Yunnan, as paternal and recurrent parent, were used to make an interspecific cross. BC<sub>3</sub>F<sub>5</sub> advanced backcross inbred population was planted in Chuxiong, Yunnan province, the People's Republic of China in 2005. 20 erect and 20 normal panicle type lines were phenotyped including panicle type, plant height, and some panicle traits (Fig. 1, Fig. 4, Table 1), and genotyped using 250 SSR markers subsequently. The result showed that three markers, RM5879, RM3332, and RM131 on chromosome 4 were linked to the target trait. Software Map Manager QTXb20 (Manly et al. 2001) was used for mapping analysis, and the target trait was mapped between RM5879 and RM3332 (Fig. 2~3).

Compared with normal panicle type, plants with erect panicle were significantly different from those with normal type for some traits: plant height, number of spikelet per panicle, and grain density, namely, plants with erect panicle type were simultaneously shorter culm, more grain, and higher grain density than normal ones. The study in larger secondary population to verify whether it is caused by linkage effect or pleiotropism is ongoing.

Shennong 265, one *japonica* variety from Liaoning province with erect panicle gene

(s) derived from **Balilla**, was crossed and backcrossed with Dianjingyou 1 to develop BC<sub>1</sub>F<sub>8</sub> mapping population to carry out allelic analysis. Although genotype polymorphism was detected between Shennong 265 and Dianjingyou 1 at locus of SSR marker RM5879, but linkage between panicle type and RM5879 was not detected, which indicates both are highly nonallelic to each other. Since there is no report regarding erect panicle gene mapping in rice chromosome 4, this gene is tentatively nominated as *Ep2* (t) so as to be different from *Ep* mapped on chromosome 9 (Chang et al. 2007, Kong et al. 2007)

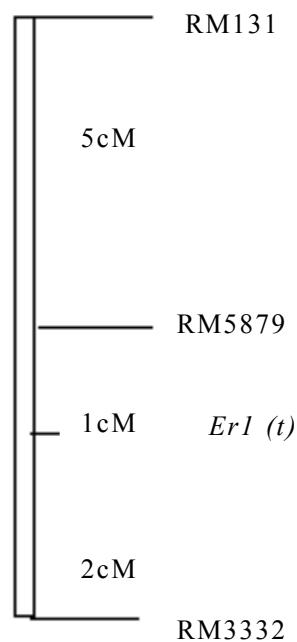


Fig. 2 *Er1* (t) on chromosome 4 introgressed from *Oryza glaberrima* IRGC101901

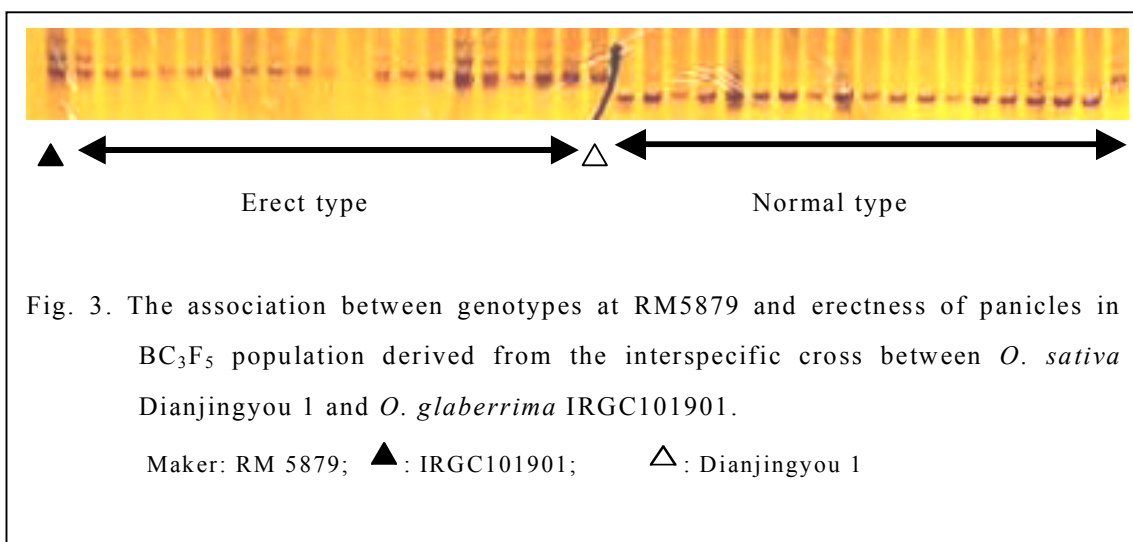




Fig. 4. Performance of erect type line (center) in IRGC1901/Dianjingyou 1/4/Dianjingyou 1 BC<sub>3</sub>F<sub>5</sub> population in the field

Table 1. Difference of plant height and panicle traits between two types from IRGC101901/Dianjingyou 1/ 4/Dianjingyou 1 BC<sub>3</sub>F<sub>5</sub> population

	Plant height (cm)	Panicle number / plant	Panicle length (cm)	Spikelet number / panicle	Fertile spikelet number / panicle	Grain fertility (%)	Grain density (number of spikelet/cm)
Erect type (n=20)	102.4	5.92	21.85	133.14	109.17	82.33	6.09
Normal type (N=20)	109.7	5.88	22.49	114.16	89.65	78.97	5.08
Differential significance between two types (Pr >  Z )	0.0004	0.892	0.3033	0.0003	<0.0001	0.2012	0.0006

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