

Near-isogenic lines carrying QTL for high spikelet number with the genetic background of IR64, an Indica-type rice variety

IR64, recognized globally as a high quality Indica-type rice variety, was first released by the International Rice Research Institute (IRRI) in 1985. To improve the yield potential of IR64, a set of near-isogenic lines (NILs) of IR64 with increased total spikelet number per panicle (TSN) was developed using New Plant Type (NPT) varieties as tropical Japonica-type donor parents.

A total of five NILs derived from different donor parents were developed through marker-assisted selection. Regardless of the donor parents, Quantitative Trait Locus (QTL) for high TSN was detected on common region of the long arm of chromosome 4 (Table 1, Fig. 1). We designated this QTL as *qTSN4*. Marker information linked to *qTSN4* is shown in Table 1. NILs have 196-239 spikelets per panicle (i.e., 40-70% greater TSN than IR64), which is attributed to the increase in larger number of spikelets on the secondary and ternary rachis branches. Variation in TSN was observed among NILs; the number of spikelets was greatest in IR64-NIL2 (IR65564-2-2-3 as donor parent) and in IR64-NIL4 (IR66215-44-2-3 as donor parent).

In this study, we succeeded in developing five NILs for high TSN with a rice variety (IR64) genetic background by employing molecular marker-assisted selection. The materials are expected to be useful for enhancing the yield potential of rice varieties. These NILs are also available for understanding the genetic basis of TSN and the effects of single QTL/gene by testing it under different environmental conditions. Further investigation is required to determine if the variation in panicle architecture is simply due to the allelic effects or not.

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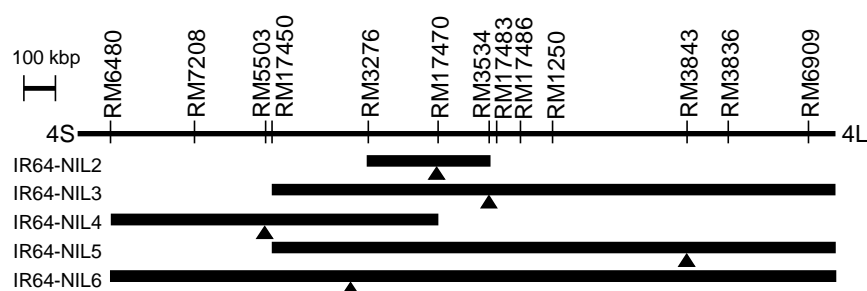


Fig. 1. The location of QTLs for spikelet number per panicle on the long arm of chromosome 4. Arrowheads indicate the location of peak LOD score.

Table 1. Marker information on QTLs and panicle structure of IR64 and its NILs for high TSN

Variety/Line	Donor parent (NPT variety)	Marker ^A	Total spikelet number per panicle ^B	Number of rachis per panicle ^B		
				Primary rachis	Secondary rachis	Ternary rachis
IR64	-		141.2±17.8 c	9.2±0.4 c	28.6±4.0 c	1.3±1.1 c
IR64-NIL2	IR65564-2-2-3	<u>RM17470</u> - <u>RM3534</u>	233.9±22.6 a	10.6±0.8 ab	46.8±4.7 a	11.2±3.2 a
IR64-NIL3	IR69093-41-2-3-2	<u>RM3534</u> - <u>RM17486</u>	196.4±19.1 b	11.3±0.7 a	37.2±3.5 b	1.9±2.3 c
IR64-NIL4	IR66215-44-2-3	<u>RM6480</u> - <u>RM5503</u>	239.4±36.4 a	10.9±0.7 a	46.2±6.4 a	6.8±4.3 b
IR64-NIL5	IR68522-10-2-2	<u>RM3843</u> - <u>RM1113</u>	197.6±19.6 b	10.8±0.8 ab	39.4±3.8 b	2.3±1.5 c
IR64-NIL6	IR66750-6-2-1	<u>RM17450</u> - <u>RM17470</u>	213.5±25.3 ab	9.8±0.9 bc	43.1±5.3 ab	6.9±1.8 b

A) Flanking markers for *qTSN4*. Underlines show the nearest marker.

B) Data was obtained in the dry season of 2009 in IRRI (values are indicated as average ± SD). Different letters (a, b and c) indicate significant difference at 5% by Tukey-Kramer's test.



Fig. 2.

Panicle architecture of IR64 and its NILs for increased spikelet number