Marker assisted introgression of the major QTL associated with tolerance to low soil P, *Pup1*, into the popular rice variety, Bhadrakali (WGL-3962)

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Abstract:

Phosphorus (P) is a vital nutrient required for growth and development of rice plant. Phosphorus (P) is one of the six essential macronutrients (N, P, K, Ca, Mg, and S) required by plants. Phosphorus deficiency is one of the most important abiotic stress factors that limit rice yields in India. Bhadrakali (WGL-3962) is a high yielding, long slender grain type rice variety with 130-135 days of duration and is resistant to gall midge biotype 1, but is highly susceptible to low soil P. In the present investigation, we attempted to improve Bhadrakali for tolerance to low soil P by introgressing a recently cloned and characterised major QTL associated with low P tolerance, Pup1QTL through marker-assisted backcross breeding (MABB) coupled with phenotype-based selection. Swarna MTU (7029), a high yielding variety possessing *Pup1* was used as the donor and was crossed to Bhadrakali to generate F_1s. A functional marker, K46-1, specific for *Pup1* was used for foreground selection in F_1, BC_1F_1 and BC_2F_1 generations, while background selection was carried out based on physically observable phenotypic traits and parental polymorphic markers in each backcross generation. At BC_2F_4, four backcross derived lines *viz.*, SB14-1-1-9-49, SB15-2-1-10-54, SB16-4-1-22-36 and SB17-3-1-11-72 possessing tolerant allele for *Pup1* QTL, high yield, long slender grain type similar to recurrent parent, Bhadrakali with recurrent parent genome recovery ranging from 88.8 % to 98.6 % were selected and advanced for further evaluation.

Keywords: Marker-assisted selection, *Pup1* QTL, P use efficiency.