

Genetic analysis of photoblastism and mesocotyl elongation

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Abstract

Seed germination stimulated by light is said to be photoblastism. Photoblastism has not been reported in cereal crops, especially in the rice, but Korean weedy rice was reported to have photoblastism and longer mesocotyl than cultivar. Photoblastic weedy rice (PBR) was used to identify QTLs for photoblastism and mesocotyl length. In previous works, QTLs for photoblastism, *pbr1* and *pbr12* were identified on chromosomes 1 and 12 using 124 F4 lines from a cross between Ilpum and PBR using bulked segregant analysis. Two QTLs for mesocotyl elongation, *qMel-1* and *qMel-3* were mapped on chromosomes 1 and 3 using 120 F8 lines from the same cross. Of interest, the RM8260-RM246 region of *pbr1* overlapped with a region of *qMel-1*. To know whether these two QTLs are functionally related, 110 F3 lines were developed from a cross between Ilpum and CR7124. CR7124 having photoblastism and long mesocotyl was selected from 120 F8 lines. 95 F3 lines were measured for germination rate in a light and dark condition and mesocotyl length. Mesocotyl length and germination rate in the dark condition in F3 lines showed significant correlation ($r = 0.7$, $P < 0.0001$). 95 F3 lines were genotyped with RM7419 on chromosome 1. ANOVA showed that RM7419 was tightly linked to QTLs for photoblastism as well as mesocotyl length on chromosome 1 ($P < 0.0001$) indicating the tight linkage of two QTLs. Fine mapping of the two QTL is underway to analyze their functional relationship.

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Keywords: Rice (*Oryza sativa* L.), weedy rice, photoblastism, mesocotyl, QTLs

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