

Efforts to Transfer White Rust Resistance in Brassica juncea through Transgenic Approach

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Abstract—*Brassica juncea* (L.) Czern. & Coss. is an economically important oilseed crop cultivated globally with nearly 30% contribution to the Indian oilseed economy. The Indian cultivated varieties are susceptible to fungal diseases. White blister caused by *Albugo candida* (Pers.) Kuntze, an oomycete with 24 identified subgroups (races) results in 60 % yield loss globally, challenging the conventional methods to transfer resistance.

In the present work, we have studied the virulence of White rust (WR) isolates collected from different WR affected mustard belts of India on the cotyledon and true leaf of susceptible host *B. juncea* var. *Varuna*. Agrobacterium mediated genetic transformation of *B. juncea* var. *Varuna* was initiated to transfer the WR resistance genes *WRR4A-Col0* and *WRR4B-Col0* from *Arabidopsis thaliana*. The selected genes belong to TIR-NB-LRR (Toll-like/interleukin-1 receptor-nucleotide binding-leucine-rich repeat) gene family. Three different phyto-hormone combinations were tested; (i) NAA 1 mg/l + BAP 1 mg/l (ii) 2,4 D 0.1 mg/l + BAP 1 mg/l, and (iii) 2,4 D 0.05 mg/l + BAP 1 mg/l for in vitro regeneration. MS media supplemented with 1 mg/l of BAP and NAA, 2% glucose and 20 µM AgNO₃ proved to be the optimum with 86% regeneration efficiency. For rooting of well-elongated shoots, MS with IBA 2 mg/l and ½ MS with 1% or 0.5% sucrose were tested, and the former gave 100% root development. The regeneration frequency of 59- 60% was achieved for the putative *WRR4A-Col0* and *WRR4B-Col0* transformants, with kanamycin as selection agent. Twenty three *WRR4A-Col0* and 16 *WRR4B-Col0* PCR confirmed transgenic lines from 153 Npt II PCR positive plants have been identified with transformation efficiency of 2%-3.5%. The results would be discussed in light of gene integration in the WRR PCR positive plants and their response to white rust isolates collected from different geographical locations in India.