

#068

Lectin genes, concanavalin, curculin and hevein, enhances resistance to the fungal pathogen *Sclerotinia sclerotiorum* in *Brassica napus*

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Sclerotinia sclerotiorum is a fungal pathogen of *Brassica napus* where yield loss is a result of stem infection. Earlier we developed a stem inoculation method that simulates natural infection. The Chinese cultivar Zhongyou 821 (ZY821) showed partial resistance (<40mm lesions, <20% stem collapse) which was ~70% less than susceptible lines. Also, we demonstrated that lectin genes were up-regulated in ZY821 6-72 hours after infection. Lectins are known to contribute to the defense against fungi, virus, bacteria and insect pests. In the current study, a single allele of three lectin genes were cloned from ZY821 and inserted in a susceptible line, DH12075, under the constitutive gene promoter, CaMV35S, using *Agrobacterium*-mediated transformation. The cloned genes were curculin BnaA07g34440D, concanavalin BnaA05g24230D and hevein BnaA03g28780D. Homozygous lines with single gene inserts were identified in T1-T3 generations. Five of the transformed lines showed 50-80% reduction in lesion length compared to DH12075 and no stem collapse. Furthermore, each lectin gene was up-regulated in transformants after inoculation with *S. sclerotiorum*. Lectins have a signal peptide (SP) with a transmembrane domain that directs the protein into vacuoles destined for the cell's secretory system after which the SP is cleaved off. The remaining protein contains carbohydrate recognition domains (CRD) characteristic of all lectins, but with different substrate specificities. Curculin has two CRDs, a B-type that binds mannose and PAN-APPLE with unknown specificity. Concanavalin has an L-type CRD that also binds mannose. Hevein has two CRDs, type-1 and Brawin, both binding to chitin. Mannoproteins and chitin are constituents of the fungal cell wall and, therefore, may be targeted by the plant's CRDs. Gene homologs in *Arabidopsis*, curculin At1g78850 and concanavalin At3g16530, are induced by fungal pathogens or chitin treatment and their proteins are prominent in the apoplast and xylem, including in *B. napus* and *B. oleracea*. Homologous lectin genes in *B. napus* lines harbour numerous amino acid changes, thus, allelic variants in ZY821 were likely responsible for enhanced SP and/or CRD activity, which could be utilized in molecular breeding to improve sclerotinia resistance in canola.

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