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Abstract

Never-Ending Battle between Defense Metabolites of Indian Oilseed Mustard and the Necrotrophic Fungal Pathogen †

Bhanu Malhotra *, Pawan Kumar and Naveen C. Bisht

National Institute of Plant Genome Research, Aruna Asaf Ali Road, New Delhi 110067, India; pawan@nipgr.ac.in (P.K.); ncbisht@nipgr.ac.in (N.C.B.)

* Correspondence: ncbisht@nipgr.ac.in

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Abstract: Oilseed *Brassicas* stand first in the edible oil production of India [1] however, are under constant threats from environmental challenges like the white mold disease caused by the necrotrophic phytopathogen *Sclerotinia sclerotiorum* [2]. Indeed, in case of oilseed mustard *Brassica juncea,* a dominant oilseed crop of the Indian subcontinent, white mold has become a major limiting factor both during pre and the post-harvest stages with >92% yield losses reported [3]. *Brassica* species produce a group of unique defense metabolites called glucosinolates, which along with their hydrolysis products are reported for toxicity against *Sclerotinia* both under in-vitro and in-vivo conditions [4,5]. Nevertheless, pathogens like *Sclerotinia*, are able to infect, colonize and cause significant yield losses on glucosinolate producing plants. In this context, we initially assessed the disease dynamics of *S. sclerotiorum-B. juncea* pathosystem at different time points and analyzed changes in the in-planta levels of different glucosinolates (C3, C4 and C5 fractions) during *Sclerotinia* infection. Our results suggest that, *Sclerotinia* infection activates the glucosinolate-myrosinase system by modulating changes in total and component glucosinolates of *B. juncea* plants throughout the time course of infection. We also assessed the toxicity of allyl-ITC (degradation product of sinigrin, an abundant glucosinolate in *B. juncea* cultivars) on the growth of *Sclerotinia* in-vitro and observed that this C3-aliphatic glucosinolate derived product, has proven to be one of the most toxic to *Sclerotinia*. In addition, we performed HPLC analysis to determine the glucosinolate content and types across 250 diverse germplasm accessions of *B. juncea* that span a range of variation in the glucosinolate metabolite trait, which shall be useful for identification of resistance to *Sclerotinia* in the mustard crop. Overall, this research work will be useful to understand the disease mechanism and enable selective manipulation of defense metabolites to prevent white mold disease losses in polyploid crop species.

Keywords: plant defense; white-mold; Oilseed Brassica; glucosinolates; polyploid crops; plant pathology; disease resistance

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