Research Article

Expression Analysis of Pathogenesis Related Proteins Induced by Compatible and Incompatible Interactions of *Tilletia indica* in Wheat Plants

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Abstract

Karnal bunt (KB) in wheat caused by *Tilletia indica* Mitra has been placed as quarantine pest in more than 70 countries. Despite its economic importance, little information about the molecular components of disease resistance is known. To elucidate the molecular mechanisms involved in compatible and incompatible interactions of wheat genotypes to *Tilletia indica* Mitra, real time PCR based expression profiling of pathogenesis related (PR)-proteins (*PR1*, *PR5* and *PDF1.2*) in resistant (HD 29) and susceptible (WL 711) genotype at different point times was carried out. All the three genes regulating accumulation of PR-proteins were always expressed at higher levels in resistant genotype relative to susceptible one. The average amount of individual PR protein induced in resistance cultivar was: *PDF1.2* (16.33 folds), *PR1* (15.93 folds) and *PR5* (5.74 folds) relative to control. In case of susceptible cultivar, the expression of *PDF1.2* (18.77 folds) was higher than *PR1* (4.13 folds) and *PR5* (3.12 folds) at 5 days post inoculation (dpi) and in next two days sharp decrease in the accumulation of *PDF1.2* transcript (3.05 folds) was recorded. The time of up-regulation of these genes differ in both genotypes, suggesting that the differences between these wheat genotypes in susceptibility and resistance are a matter of timing and magnitude of the expression of PR proteins.

Key words: Gene expression, karnal bunt, PR proteins, qPCR, wheat

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Tilletia indica Mitra (syn *Neovossia indica*), causing Karnal bunt (KB) of wheat is a floret-infecting fungus. The pathogen was first reported in 1931 from wheat grain samples collected from India (Mitra 1931). Since then, the disease has been reported from various parts of globe including Afghanistan, Iran, Iraq, Mexico, Nepal, Pakistan, South Africa, and USA (Rush et al 2005; Singh et al 2007; Gupta et al 2010). It is a seed- and soil-borne disease and usually causes air borne infection that leads to partial conversion of individual kernels into sori filled with black mass of stinking teliospores (Carris et al 2006; Kashyap et al 2011). It has been reported that the wheat containing more than 3per cent bunted kernels is unfit for human consumption (Warham 1986). Direct and indirect losses caused by *T. indica* in Northwestern Mexico were estimated at US $7 million per year (Brennan and Warham 1990; Singh et al 2012). Similarly, more than $25 million per year monetary loss due to KB has been documented by Rush et al (2005). At present, KB pathogen is under strict quarantine regulations by several countries and its presence act trade barriers to wheat exports (Kashyap et al 2018). Despite intensive efforts made to manage the disease through resistance, cultural practices and fungicides, researchers has got only a limited success to contain KB. Due to slow growing nature of *T. indica* and its concomitantly dependence on host from flowering to grain filling stages, understanding the molecular basis of fungal invasion and resistance is crucial for framing any