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Resistance Gene Expression and Antioxidant Enzymes Activities in Wheat Genotypes Affected by Bipolaris sorokiniana and Heterodera filipjevi

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Abstract : Bipolaris sorokiniana, and Heterodera filipjevi, are important wheat diseases that lead to yield losses worldwide. Identifying novel resistant sources helps us combat these devastating diseases. In this study, we studied the role of Cre3 gene and antioxidant enzymes in the immune responses of wheat genotypes to H. filipjevi and B. sorokiniana. Therefore, real-time PCR analysis using Cre3 gene marker, a resistant gene to cereal cyst nematodes, was conducted on leaves and roots, along with changes in the activity of antioxidant enzymes, peroxidase, and catalase. Enzyme activity assay was performed on roots attacked by nematode and in leaves infected with Bipolaris. Wheat accessions including “Bam” (resistant), “Parsi” (moderately-resistant), “Azar2”, “Ohadi”, “Homa” (highly-susceptible) were previously screened against both stresses under greenhouse and field conditions. Results showed that Cre3 expression against cyst nematodes was significantly higher in resistant cultivars compared to susceptible cultivars. Cre3 was used in marker-assisted selection programs to identify genotypes carrying resistant genes to cyst nematodes. Interestingly, Cre3 was also up-regulated in both tissues of resistant cultivars to B. sorokiniana. Therefore, Cre3 in wheat similarly modulates immunity against B. sorokiniana and might be one of the central components of the induced immune system in wheat. The activity of antioxidant enzymes also indicated the highest increase in resistant genotypes upon both stresses that subsequently neutralize oxidative stress in tissues and decrease damage. Further studies on these resistance components may help us gain insight into the molecular basis of resistance and shed new light on the interaction and overlap between different forms of stress.

Keywords : Bipolaris sorokiniana, Heterodera filipjevi, resistant gene expression, wheat
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