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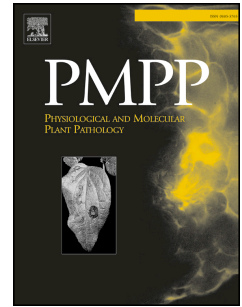
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Expression analysis of defense related genes in wheat and maize against *Bipolaris sorokiniana*

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Abstract

Wheat (*Triticum aestivum* L.) and maize (*Zea mays* L.) are important cereal crops grown worldwide. In Pakistan, various varieties of wheat and maize are grown and a number of biotic and abiotic factors influence its production. These are mainly used as a food source and raw material for animal feed. *Bipolaris sorokiniana* is a hemibiotrophic phytopathogenic fungus that affects various grass species and causes number of diseases on small grains. An investigation was undertaken to evaluate the comparative expression of pathogenesis-related protein genes in wheat and maize under *B. sorokiniana* stress. After stress, these crops showed disease resistance by improving biochemical parameters like proline, protein, sugar and chlorophyll content. Morpho-physiological parameters including shoot length, root length, relative water content and fresh as well as dry weight were affected by fungal stress. Expression analysis of PR-proteins in stressed plants of wheat confirmed their role in plant defence. PR-1, Thaumatin-like protein (TLP), and β 1,3 glucanase were highly expressed under stress in wheat variety (RWP13), it suggests the role of these genes in the prescribed variety. These genes did not show their expression in susceptible wheat variety (SWG13). Zm PR-5 and Zm 1,3 β -glucanase were highly expressed in maize variety (RMN27) after stress which suggests their role in defence mechanism of this variety. While on the other hand, no significant expression of these genes was observed in susceptible maize variety (SMIG). In future, these genes can be over-expressed in transgenic plants to make them resistant against a number of biotic and abiotic factors.

Keywords: Pathogenesis-related proteins; Wheat; Maize; *Bipolaris sorokiniana*; Pathogenesis-related protein genes

Abbreviations:

RWP13: Pakistan-2013

SWG13: Galaxy-2013

RMN27: NARC-2704

SMIG: Islamabad Gold

Introduction

Wheat (*Triticum aestivum* L.) is the leading crop in temperate countries being used for human food and livestock feed. Wheat is counted among the “big three” cereal crops, with over 600 million tonnes being harvested annually (Shewry, 2009). Wheat (*Triticum aestivum* L.) is a staple food crop and *B. sorokiniana* is responsible for up to 22% yield loss by causing spot blotch disease in warm and humid regions of the world (Chowdhury et al. 2013; Mina et al., 2016). *B. sorokiniana* had a high frequency of occurrence in wheat glumes (Larran et al. 2007). Due to this cosmopolitan nature, spot blotch caused by *B. sorokiniana* is estimated to affect 25 million hectares of wheat plantation worldwide to variable degrees, which accounts for 12% of the total area (Duveiller et al. 2005).

In addition to wheat, maize (*Zea mays* L.) is another most important cereal crop grown worldwide in a wider range of environments because of its greater adaptability (Kogbe and Adediran 2003). It is mainly used as a food source and now has become the most important raw material for animal feed (Ghany, 2013). In Pakistan, maize is considered as the most important cereal after wheat and rice. It is grown on 0.9355 million hectares annually with production of about 1.7371 m tonnes with an average yield of 1857 kg/hectare (Anonymous, 2007). Grey leaf spots,

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