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Effect of the *Stagonospora nodorum* effector SnTox3 on regulation of plant redox metabolism

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The most important virulence factors of the *Stagonospora nodorum* are multiple fungal necrotrophic effectors (NEs) that cause necrosis and/or chlorosis on wheat lines possessing dominant susceptibility genes (*Snn*). One such NE is SnTox3, which evokes programmed cell death and leads to disease when recognized by the wheat *Snn3-B1* susceptibility gene. In this study, combinations of different genotypes of wheat variety and fungal isolate ($Snn3^+/Tox3^+$, $snn3^-/Tox3^+$, $Snn3^+/tox3^-$, $snn3^-/tox3^-$) were studied. Some *S. nodorum* isolates, characterized by the presence or absence of the Tox3 ($Tox3^+$ and $Tox3^-$) effector gene and genetically characterized wheat samples were used. Full compatibility reaction in combination of genotype $Snn3^+/Tox3^+$ was shown. The suppression of hydrogen peroxide generation in a compatible $Snn3^+/Tox3^+$ interaction was most likely due to high activity of catalase, low activity of peroxidase and reduce of expression of genes encoding NADPH-oxidase (*TaRboh*), anionic peroxidase (*TaPrx*) and superoxide dismutase (*TaSod*) at the early stage of infection (24 hours), which further led to the formation of extensive lesions. The increase expression of ethylene biosynthesis genes *ACS* (ACC synthase), *ACO* (ACC oxidase) and ethylene signaling pathway genes *EIN3*, *ERF1* after 24 hours of infection in this genotype was shown. Incompatibility reaction in combinations $snn3^-/Tox3^+$, $Snn3^+/tox3^-$, $snn3^-/tox3^-$ was shown. The increase of hydrogen peroxide generation due to alterations in redox enzymes activity and increasing expression of *TaRboh* and *TaSod* genes, as well as the absence of activation of biosynthesis and signaling pathway genes of ethylene at early stage of infection, which led to the development of hypersensitivity reactions and inhibition of the pathogen mycelium growth was found in incompatible interactions. Thus, the pathogen effector SnTox3 influenced the biosynthesis and the signaling pathway of ethylene with a view to regulate the redox metabolism of infected wheat plants for successful colonization of the host.

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