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Investigating the Potential Use of Unsaturated Fatty Acids as Antifungal Crop Protective Agents

Authors : Azadeh Yasari, Michael Ganzle, Stephen Strelkov, Nuanyi Liang, Jonathan Curtis, Nat N. V. Kav

Abstract : Pathogenic fungi cause significant yield losses and quality reductions to major crops including wheat, canola, and barley. Toxic metabolites produced by phytopathogenic fungi also pose significant risks to animal and human health. Extensive application of synthetic fungicides is not a sustainable solution since it poses risks to human, animal and environmental health. Unsaturated fatty acids may provide an environmentally friendly alternative because of their direct antifungal activity against phytopathogens as well as through the stimulation of plant defense pathways. The present study assessed the in vitro and in vivo efficacy of two hydroxy fatty acids, coriolic acid and ricinoleic acid, against the phytopathogens Fusarium graminearum, Pyrenophora tritici-repentis, Pyrenophora teres f. teres, Sclerotinia sclerotiorum, and Leptosphaeria maculans. Antifungal activity of coriolic acid and ricinoleic acid was evaluated using broth micro-dilution method to determine the minimum inhibitory concentration (MIC). Results indicated that both ricinoleic acid and coriolic acid showed antifungal activity against phytopathogens, with the strongest inhibitory activity against L. maculans, but the MIC varied greatly between species. An antifungal effect was observed for coriolic acid in vivo against pathogenic fungi of wheat and barley. This effect was not correlated to the in vitro activity because ricinoleic acid with equivalent in vitro antifungal activity showed no protective effect in vivo. Moreover, neither coriolic acid nor ricinoleic acid controlled fungal pathogens of canola. In conclusion, coriolic acid inhibits some phytopathogens in vivo and may have the potential to be an effective crop protection agent.

Keywords : coriolic acid, minimum inhibitory concentration, pathogenic fungi, ricinoleic acid
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