

Antifungal potential of secondary metabolites involved in the interaction between citrus pathogens.

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Abstract

Numerous postharvest diseases have been reported that cause substantial losses of citrus fruits worldwide. *Penicillium digitatum* is responsible for up to 90% of production losses, and represent a problem for worldwide economy. In order to control phytopathogens, chemical fungicides have been extensively used. Yet, the use of some artificial fungicides cause concerns about environmental risks and fungal resistance. Therefore, studies focusing on new approaches, such as the use of natural products, are getting attention. Co-culture strategy can be applied to discover new bioactive compounds and to understand microbial ecology. Mass Spectrometry Imaging (MSI) was used to screen for potential antifungal metabolites involved in the interaction between *Penicillium digitatum* and *Penicillium citrinum*. MSI revealed a chemical warfare between the fungi: two tetrapeptides, deoxycitrinadin A, citrinadin A, chrysogenamide A and tryptoquialanines are

produced in the fungi confrontation zone. Antimicrobial assays confirmed the antifungal activity of the investigated metabolites. Also, tryptoquialanines inhibited sporulation of *P. citrinum*. The fungal metabolites reported here were never described as antimicrobials until this date, demonstrating that co-cultures involving phytopathogens that compete for the same host is a positive strategy to discover new antifungal agents. However, the use of these natural products on the environment, as a safer strategy, needs further investigation. This paper aimed to contribute to the protection of agriculture, considering health and ecological risks.

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