

Evaluating the efficacy of natural deep eutectic solvents in biocontrol of *Alternaria alternata*

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Abstract

The excessive and widespread use of synthetic fungicides has raised numerous environmental and health-related concerns. In response, there has been a growing global interest in the use of natural plant-derived products for plant protection. A promising area of research in this field is the development of natural deep eutectic solvents (NADES). These solvents, composed of natural compounds, offer a sustainable alternative for extracting bioactive compounds from plants, thereby enhancing the effectiveness of natural pesticides and antimicrobial agents. This study aimed to evaluate the efficacy (E%) of different NADES based on menthol, thymol, and camphor. Antifungal activity was tested against *Alternaria alternata*. Due to volatility of terpenoids, the experiment was conducted in the vapour phase in Petri plates. The incubation lasted seven days at 26 ± 1 degree Celsius, with the plates sealed and covered with parafilm. At the end of the experiment (7th day), the diameter of *A. alternata* mycelium was measured, and the inhibition percentage was calculated into E%. Among the menthol-based NADES, Menthol:Thymol stood out with an E% ranging from 58-100%, while for the thymol-based NADES, Thymol:Caprylic acid achieved an inhibition of 52-100%. However, the camphor-based NADES did not reach 100% efficacy. Such studies are crucial for selecting NADES that could be used for the biocontrol of *A. alternata*, offering a potentially sustainable alternative to synthetic fungicides.

Key Words: HDES, menthol, thymol, camphor

