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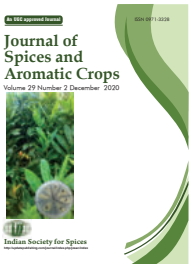

Volatile metabolites of endophytic *Klebsiella aerogenes* from *Zingiber zerumbet* rhizome and its antagonistic effect on soft rot causative *Pythium myriotylum*

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Abstract

Rhizomes of *Zingiber zerumbet* collected from their natural habitat and reported earlier to have high zerumbone content were selected for isolation of endophytes. Biochemical and molecular characterization using 16S rRNA sequencing of the endophytes identified the isolates as belonging to genus *Klebsiella*, *Pantoea* and *Enterobacter*. Isolate designated *ZzKSD*8 identified as *K. aerogenes* yielded maximal antagonistic activities against *P. myriotylum* determined as 83.5% ± 0.77. Volatile metabolites produced by *ZzKSD*8 caused absolute impairment of *P. myriotylum* hyphal growth compared to control (23.9 ± 0.37 cm). Volatile metabolites were extracted from 48 hour grown stationary phase *ZzKSD*8 cultures using absolute methanol, ethyl acetate and ethanol (60% v/v). GC-MS metabolite profiling detected alkanes and fatty acid methyl esters as the predominant constituents in the solvent extracts. Major constituents included methyl palmitate (31.37%), methyl stearate (18.57%) and cyclopropaneoctanoic acid, 2-hexyl-, methyl ester (17.05%) in methanol extract; alkanes like tetratetracontane (13.18%) and 2-methyloctacosane (12.10%) in ethyl acetate extracts and 4,22-sigmastadiene-3-one as major metabolite (22.51%) and stigmast-5-en-3-ol, (3.beta) (17.40%) in ethanol extract. Identified metabolites reported to modulate defense strategies in plants against phytopathogens makes *ZzKSD*8 a potential candidate for development of biological alternatives to control soil-borne soft-rot disease.

Keywords: antagonistic, endophyte, soft-rot, volatile organic compounds

Introduction

Compared to foliar pathogens for which resistance is often encoded in plant genome, finding resistance factors against soil-borne pathogens is challenging. Roots and rhizomes with their nutrient reserves tend to attract microbes to rhizosphere (Shubin *et al*. 2014; Santoyo *et al*. 2016). As a consequence there exists increased competition and dynamics