

Abstract

Endophytes are microorganisms, which reside inside the living plant tissues asymptotically or instigating pathogenicity to the host plant for a brief period. Endophytic fungi are considered as ‘mines of pharmacological therapeutics’ owing to their recognition as inexhaustible sources of structurally and functionally novel bioactive compounds. The present study aimed to identify, optimize biosynthesis, isolate and characterize a few antimicrobial, quorum sensing inhibitory and antioxidant metabolites originated from endophytic fungi. Among several endophytic fungi isolated from a few medicinal and crop plants, three endophytes and their corresponding bioactive metabolites were characterized in details. The endophytic yeast-like fungus *Geotrichum candidum* PF005 from *Solanum melongena* (brinjal) fruit was found to synthesize antifungal volatile mixture which inhibited 54% mycelial growth of rice pathogen *Rhizoctonia solani*, besides having mild antifungal activity against a few other fungi. Feeding precursors of 2-phenylethanol and 3-methyl-1-butanol biosyntheses or exogenous naphthalene addition enhanced the antifungal activity of *G. candidum*. An endophytic yeast *Kwoniella* sp. PY016 isolated from *Terminalia bellirica* (Bahera) fruit was documented to exhibit substantial quorum sensing (QS) inhibition and anti-biofilm activities against *Chromobacterium violaceum*. Sugar, sugar alcohol, lipid, carboxylic acid, and phenolic classes of metabolites (predominantly xylitol) in the *Kwoniella* sp.’s endo-metabolome were found to be responsible constituents for the desired bioactivity. The QS inhibitory activity of *Kwoniella* sp.’s metabolome was increased by ~30% upon optimization of culture medium components through hybrid model (i.e., artificial neural network coupled with genetic algorithm). The endophytic fungus *Cercospora* sp. PM018 isolated from *Aerva javanica* Juss. Ex. Schult (Lal-bisalyakarani) leaf was noted to possess broad-spectrum antimicrobial, antioxidant and QS inhibitory activities. Optimization of carbon sources in growth medium and culture conditions enhanced the desired bioactivities of *Cercospora* sp.’s endo-metabolome. Among several constituents, palmitic acid, stearic acid, and mannitol were found to be crucial for the three bioactivities of *Cercospora* sp. Interestingly, the host plant botanicals modulated *Cercospora* sp. to grow more at the expense of reduced bioactivities, and the altered endo-metabolomic profile was accountable for this reduction. In conclusion, owing to such diverse bioactive potentials, all three endophytic isolates (*G. candidum* PF005, *Kwoniella* sp. PY016 and *Cercospora* sp. PM018) have worthy future prospect to be utilized as mycofumigant for controlling phytopathogens or in pharmaceutical and processed food/feed industries.

Keywords

Antimicrobial, Antioxidant, *Cercospora* sp., *Chromobacterium violaceum*, Endo-metabolome, Endophytic fungi, *Geotrichum candidum*, *Kwoniella* sp., Medicinal plant, Mycofumigant, Quorum sensing inhibition.