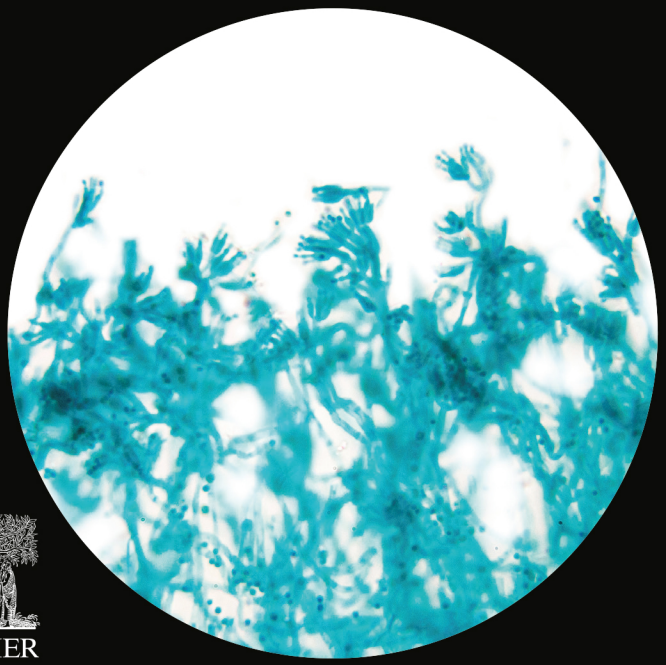
New and Future Developments in Microbial Biotechnology and Bioengineering

Recent Advances in Application of Fungi and Fungal Metabolites: Applications in Healthcare



Edited by
Joginder Singh
Praveen Gehlot

ELSEVIER

CHAPTER

5

Therapeutic potency of bioactive compounds from fungal endophytes

Rajendiran Kamaraj Kennedy[a], *Ramamurthy Nagarajaprakash*[b], *and Jayakumar Pathma*[c,*]

[a]Department of Biotechnology, St. Joseph's College, Trichy, Tamil Nadu, India, [b]Chemical Sciences Research Group, Division of Research and Development, Lovely Professional University, Phagwara, Punjab, India, [c]Department of Entomology, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India
*Corresponding author. E-mail: pathma.22668@lpu.co.in

5.1 Introduction

The recent development of drug resistance in pathogens and the decreased efficiency in conventional drugs has grabbed the global researcher's concern. Our rapidly changing and enormously growing modern society requires an immediate and sustainable response to the new challenges. Moreover, the new drug inventions should be economic and meet our greater demands in terms of novelty and efficiency with negligible or no side effects. Bioactive compounds from natural sources have dominant eminence than synthetic drugs due to their broad-spectrum activity with less induced toxicity and fewer side effects. Since the 20th century, after the discovery of penicillin, microbial metabolites have increasingly drawn our attention and proved their potential as a major source of natural therapeutic compounds. With approximately 1.5 million or more known species that include pathogenic and beneficial groups, fungi that influence plant and human health have been reported. In addition, fungi-derived natural products have been an excellent source for pharmaceutical drugs such as penicillin (antibacterial), griseofulvin (antifungal), cyclosporin A (immunosuppressant), ergotamine (vasoconstricting), taxol (anticancer), lovastatin (dropping LDL levels), etc. However, the recent focus has been on fungal endophytes that could serve as a perfect platform to explore novel compounds due to the production of varied structural classes of bioactive molecules such as aromatic compounds, amino acids, indole alkaloids, terpenes, nonribosomal peptides, phenolic compounds, polyketides, anthracenones, butanolides, butenolides, cytochalasans, macrolides, napthalenones, pyrones, etc. In this chapter, we summarize and highlight an array of diverse secondary metabolites synthesized by fungal endophytes that are of pharmacological importance in human medicine and those that could be used as biopesticides for sustainable agriculture.

5.2 Endophyte-host relationship

A plant not only lives as a single entity, but it closely associates with the microorganisms inside, such as fungi, bacteria, and actinobacteria. These endophytes exhibit an array of interactions with their host plants, including symbiotic, mutualistic, or parasitic relationships, depending upon the share of benefits between the endosymbionts and the associated host plant (Patil et al., 2016; Daley et al., 2017). Strobel (2003) reported that bioactive metabolites from endophytic microbes protect the host plant from microbial pathogens, arthropod and nematode pests, and grazing animals. Additionally, colonization by endophytes has been shown to enhance the host plant's fitness and competitive abilities by constructively modifying the host plant's biochemical pathways and enhancing the synthesis of the growth hormones, namely auxins (indole-3-acetic acid, indole-3-acetonitrile) and cytokinins (Joshi et al., 2018).

https://doi.org/10.1016/B978-0-12-821006-2.00005-4