

PUBLICATIONS

ISOLATION, IDENTIFICATION AND METABOLOMIC CHARACTERIZATION OF BIOACTIVE ENDOPHYTIC FUNGI ASSOCIATED WITH *Silybum marianum*

L. Khayrullaeva¹, D. Kushakova², S. Madaminov², M. Karakozova², F. Eshboev²

¹Department of Biochemistry, National University of Uzbekistan, Tashkent 100174,
Uzbekistan

²Laboratory of Biotechnology and Bioinformatics, Institute for Advanced Studies, New
Uzbekistan University, Tashkent 100007, Uzbekistan

Endophytic fungi associated with medicinal plants are recognized as promising sources of structurally diverse secondary metabolites with significant biological activities and pharmaceutical potential. These microorganisms can produce a broad spectrum of chemically diverse compounds and therefore represent an important resource for natural-product discovery. However, the diversity and metabolite-producing potential of endophytic fungi associated with medicinal plants of Central Asia remain insufficiently explored. *Silybum marianum* (L.) Gaertn., a well-known medicinal plant, is particularly interesting as a potential host of endophytic microorganisms capable of producing biologically active compounds.

The aim of the present study was to isolate and identify endophytic fungi associated with *S. marianum*, evaluate their antibacterial activity, and characterize the secondary metabolites produced by the most promising fungal strains. Healthy plant tissues were collected, surface sterilized, and cultivated on suitable fungal growth media. The isolates were subsequently screened for antibacterial activity against selected bacterial test organisms, and strains demonstrating pronounced antibacterial effects were selected for further investigation.

Molecular identification of the fungal isolates was performed based on sequencing of the internal transcribed spacer (ITS) region of ribosomal DNA. The obtained isolates were assigned to several fungal genera, including *Penicillium*, *Alternaria*, *Aspergillus*, and *Fusarium*. The isolates exhibited different levels of antibacterial activity, with several strains showing pronounced inhibitory effects against the tested bacterial microorganisms. The most active strains were selected for chemical profiling using liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS).

LC-MS/MS analysis revealed a chemically diverse metabolite profile in extracts obtained from the bioactive endophytic fungi. The detected compounds belonged to several major chemical classes, including organic acids, alkaloids, terpenes, and peptides. The presence of these structurally diverse metabolite classes indicates a considerable biosynthetic capacity of the investigated endophytic fungi and may contribute to their observed antibacterial properties.

Overall, this study demonstrates that *S. marianum* is a valuable source of diverse endophytic fungi with antibacterial and metabolite-producing potential. The integration of fungal isolation, molecular identification, antibacterial screening, and LC-MS/MS-based metabolomic profiling provides an effective approach for exploring the chemical diversity of plant-associated endophytes. The identified bioactive fungal strains and their chemically diverse metabolite profiles provide a promising foundation for further studies aimed at the discovery and characterization of novel biologically active natural products.