

PRODUCTION OF VOLATILE ANTIBIOTICS FROM AN ENDOPHYTIC FUNGUS (PHOMOPSIS SP.) OF ODONTOGLOSSUM SP. (ORCHIDACEAE) AND ITS POTENTIAL PRACTICAL APPLICATIONS

Author(s) SANJAY K. SINGH¹, GARY A. STROBEL²

Institution(s) 1. MACS-ARI, NFCCI, MACS' AGHARKAR RESEARCH INSTITUTE, G.G.AGARKAR ROAD, PUNE-411004, MS, INDIA 2. MSU, DEPARTMENT OF PLANT SCIENCES, MONTANA STATE UNIVERSITY, 206 AG BIOSCIENCES BUILDING, BOZEMAN, MT-59717, USA

Abstract:

Compounds derived from natural sources have been the subject of intensive search recently by the agriculture and medicinal industries throughout the world, especially in those areas of the world possessing high biodiversity. Other than the plants, endophytic microorganisms have become a natural source for many valuable bioactive products as several classes of natural products have recently been reported from these endophytes. However wide application of volatile organic compounds (VOCs) produced by endophytic fungi has opened a new dimension for research in the biology of endophytic microorganisms. The present communication deals with an unusual *Phomopsis* sp. isolated, identified and described based on morphological characters (using Scanning Electron Microscopy) and a comparison of sequences of the Internal Transcribed Spacer region of rDNA (ITS1-5.8S-ITS2), as endophyte of *Odontoglossum* sp. (Orchidaceae) growing in a cloud forest in Ecuador. This fungus produces mixture of volatile organic compounds (VOCs) with Sabinene, (a monoterpene) as major compound of interest. This compound turns out to be previously known only from plants. It has been identified by the gas chromatography/mass spectrometry including proton transfer reaction mass spectrometry. The mixture of volatiles produced by *Phomopsis* sp. possesses antifungal properties and exhibited maximum inhibition after 6 days of growth at 21±2°C. In qualitative analysis (olfactory tests) media enriched with starch, glucose, and cellobiose as a source of carbohydrates facilitated higher concentrations of volatile compounds and optimal production of VOCs recorded on PDA. An artificial mixture of VOCs mimicked the antibiotic effects produced by this *Phomopsis* sp. and showed bioactivity against wide range of test fungi including *Pythium*, *Phytophthora*, *Sclerotinia*, *Rhizoctonia*, *Fusarium*, *Botrytis*, *Verticillium*, *Colletotrichum*, etc. Tests on 2-34 μ l of the artificial gas mixture per 50 ml of air space above the colony grown in PDA plate revealed IC₅₀ value which range between 8–25.65 μ l/mL for 50% inhibition of test fungi in the assay system. Proton transfer reaction-mass spectrometry (PTR-MS) was used to monitor the concentration of VOCs emitted by *Phomopsis* sp. which was recorded as 18.4 ppm. This is the first report of fungal sabinene and the report describes potential practical applications of fungal VOCs.

Key words: Antifungal volatile organic compounds, GC-MS Analysis, ITS sequence of *Phomopsis*, PTR-MS, Sabinene (a monoterpene)