

# Impact of Altitudinal Variation on the Phytochemical Profile, Anthelmintic and Antimicrobial Activity of Two Pinus Species

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## Abstract

Active components from natural sources are the current focus in most pharmacological research to provide new therapeutic agents for clinical use. Essential oils from the Pinus species have been traditionally used in medicine. This study aimed to investigate the chemical profile of two Pinus species, Pinus halepensis L. and Pinus pinea Mill, from different altitudes in Libya and study the effect of environmental conditions on the biological activities of essential oils. A clevenger apparatus was used to prepare the essential oils by hydrodistillation. Analyses were done using GC/MS. Anthelmintic and antimicrobial activities were tested against the earthworm *Allolobophora caliginosa*, gram-positive bacteria, gram-negative bacteria, and fungi. Different chemical profiles were observed among all tested essential oils, and terpenes were the most dominant class. All studied essential oils from the Pinus species exhibited a remarkable anthelmintic activity compared to the standard piperazine citrate drug. Pinus halepensis from both altitudes showed broad-spectrum antimicrobial activity against all tested microorganisms, while Pinus pinea was effective against only *Escherichia coli*. From these findings, one can conclude that there are variations between studied species. The essential oil compositions are affected by environmental factors, which consequently affect the anthelmintic and antimicrobial activity.

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