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Pine Forest Bioactive Compounds Involved in the Formation of Sparse Understory Vegetation

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Editorial

The understory vegetation of *Pinus*, the most widespread genus of the *Pinaceae* family in the northern hemisphere, is frequently scant. The intensity of sunlight on the pine forest floor, on the other hand, is sufficient for undergrowth. As a result, allelopathy is thought to have a role in the establishment of sparse understory vegetation. Over the years, the literature has amassed evidence indicating the allelopathy of various pine species. Several plant species, including undergrowth plant species in pine forests, were repressed by extracts of pine needle-like leaves, roots, litter, and soil under pine trees. Pine needles and roots, litter, and soil around pine trees have been found to contain a large number of secondary metabolites such as terpenoids, phenolics, cinnamic acids, carboxylic acids, fatty acids, and flavonoids. Some of these compounds are likely released into the soil through the breakdown of plant litter, as well as into the surrounding environment as volatiles, according to the data. The most active chemicals identified in pine soil were methyl 15-hydroxy-7-oxodehydroabietate and 7-oxodehydroabietic acid, both of which may be generated by the decomposition of resin acids, which were prevalent in pine trees. Bioactive molecules produced into the soil and surrounding environment may act as allelochemicals, preventing understory plants from invading forests and resulting in the formation of sparse understory vegetation. *Pinus* is the most widespread genus of the *Pinaceae* family in the northern hemisphere, with over 100 species that often create large forests. The majorities of pines are fast-growing and can withstand poor soil conditions. Plantations of some pines are grown for lumber and edible seeds. The species is distinguished by needle-like leaves, which may aid in its adaptation to arid climates. Although the majority of pine species are evergreen, senescent leaves are removed and replaced by new ones. On the forest floor, the shed leaves form litter layers. On the pine forest floor, the amount of sunlight is sufficient for undergrowth to thrive. Pine forests, on the other hand, frequently contain little understory vegetation, as has been documented since Roman times. Allelochemicals emitted from the litter layers into the soil have been blamed for the scant understory vegetation of pine forests. The germination and growth of understory plant species were inhibited by these chemicals. As a result of the allelopathy of pine leaf litter, poor understory vegetation may result. Plants produce a wide range of secondary metabolites, including unique chemicals that can only be digested by certain plant species. Allelopathic activity is present in several of these substances. Allelopathic substances are released into the soil of forest floors and into the surrounding environment as volatiles, limiting the germination and growth of undergrowth plant species. Allelopathy has been found in a number of pine species, and this allelopathy may contribute to the scant understory vegetation. In numerous pine species, many bioactive chemicals with allelopathic activity have already been identified and described. However, no study of the bioactive chemicals involved in pine allelopathy has been conducted. As a result, this review article gives an overview of the allelopathic qualities of pines as well as bioactive chemicals that have allelopathic activity.

According to the findings presented 16 pine species are allelopathic. Several plant species, including undergrowth plant species in pine forests, were repressed by extracts of pine needle-like leaves, roots, litter, and soil under pine trees.

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Terpenoids, phenolics, cinnamic acids, carboxylic acids, fatty acids, and flavonoids were discovered in the needles, stems, litter, and soils beneath the pine trees, and some of the substances exhibit allelopathic activity. The findings also imply that some of those bioactive compounds are released into the soil under pine trees as volatiles as the litter decomposes. These substances may serve as allelochemicals, preventing other plant species from invading forests, resulting in scant understory vegetation.