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Composition Determined by IR Spectroscopy of Pine Oil

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Abstract

In this article, we determined the composition of pine oil using FTIR spectroscopy using a Bio-Raid Excalibur Series model FTS 3000 MX spectrometer. The pine oil studied

contains absorption bands in the wavelength range between 3362 and 500 cm^{-1} . The pine oil contains the following functional groups: C-H, C-C, C-OH, C=C, O-H.

Keywords: Chemical Composition, Pine Oil, IR Spectroscopy

Introduction

Pine buds contain volatile oil, as well as an essence rich in pimen, which gives it strong antiseptic properties, bitter substances, tannins and resins, while young branches contain essential oil, resin, tannin, resins, phenolic derivatives, vitamin C.

Essential oils, which are obtained by mechanical pressing or distillation, are concentrated plant extracts that preserve the natural smell and aroma of their source. Each essential oil has a unique composition of compounds with healing properties, and these compounds influence the smell, absorption and effects that the product has on the body. So if you want to benefit from the healing properties of pine essential oil, opt for an organic oil and not a synthetic one [1-5].

Pine oil is known for its role in treating various skin problems. For example, this type of oil is recommended for treating psoriasis, itching, pimples, eczema, skin diseases, dry skin, scabies, minor wounds. After using pine oil, the skin regains the shine and hydration it needs.

Another benefit of pine oil on the skin is that it can act as an antioxidant for free radicals, the latter having a negative impact on the skin. Free radicals attack healthy skin cells, promoting premature aging, the appearance of wrinkles and sagging skin, as shown by a very old study. However, a 2021 study shows that pine oil extract has a more intense antioxidant activity than the pine essential oils analyzed 1. The skin can be soothed by massaging with pine oil, preferably after a hot shower, to facilitate the penetration of the active substances into the skin.

Pine oil acts as a nasal decongestant, but also as an expectorant that is very helpful in treating coughs. At the same time, pine oil also reduces the risk of sinus infections.

Psoriasis, eczema, pimples and even insect bites can be treated with pine essential oil. This is possible due to its antioxidant effects, which combat the action of free radicals on the skin.

Pine essential oil has analgesic effects, so it is an excellent remedy for joint pain, for relieving arthritis symptoms, but also for treating rheumatic pain.

This essential oil speeds up metabolism and also helps treat intestinal problems. Being an effective diuretic, pine oil causes frequent urination. If the frequency and amount of urine excreted is stimulated, a greater amount of uric acid, water, salt and fat are removed from the body. In addition, it seems that pine oil can also take care of the kidneys, as it can eliminate toxins at a rapid pace through urination [6-12].

Materials and Methods

The FTIR spectra were obtained in a Fourier Transform Bio-Raid Excalibur Series (model FTS 3000 MX) spectrophotometer (Hopkinton, MA, USA), from 4000 to 500 cm^{-1} .



Fig 1: Bio-Raid Excalibur Series model FTS 3000 MX spectrophotometer

Results and Discussions

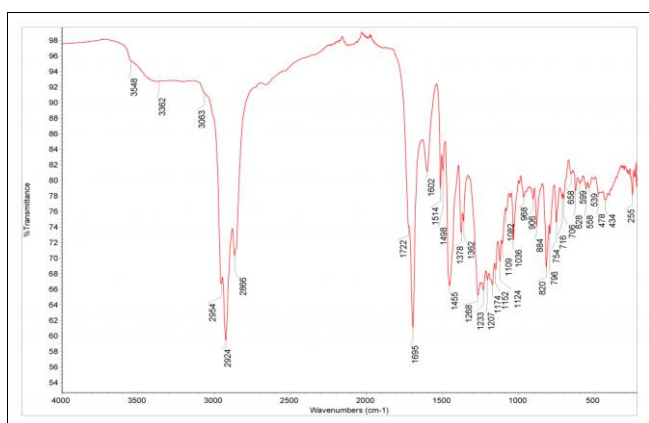


Fig 2: IR spectrum of pine oil

As found by Oliveira [20], the infrared spectrum of pine oil showed several bands of angular deformation C-C and aliphatic C-H between 500 and 1500 cm^{-1} , out-of-plane deformation of trans alkenes at 911 cm^{-1} , and bands with two signals at 1152 cm^{-1} and 1152 cm^{-1} , referring to the C-OH stretch of a secondary alcohol. The methyl band was observed at 1455 cm^{-1} and the geminal methyl, in pairs, at 1362 cm^{-1} and 1378 cm^{-1} .

Bands at 1722 cm^{-1} and 1695 cm^{-1} are associated with C=C axial deformation, between 2954 cm^{-1} and 2924 cm^{-1} , referring to the C-H of saturated aliphatic carbon sp^3 , with the high-intensity characteristic of the terpene skeleton, and at 3362 cm^{-1} , to the stretch of O-H (Figure 2). Complete characterization of pine oil is not possible as the composition of the material is complex and variable [13-19].

Conclusions

Pine buds contain volatile oil, but also an essence rich in pimen, which gives it strong antiseptic properties, bitter substances, tannins and resins, while young branches contain essential oil, resin, tannin, resins, phenolic derivatives, vitamin C.

The pine oil studied contains absorption bands in the wavelength range between 3362 and 500 cm^{-1} . Pine oil contains the following functional groups: C-H, C-C, C-OH, C=C, O-H.

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