

# Composition and Chemical Variation during Daytime of Constituents of the Essential Oil of *Pogostemon patchouli* Pellet Leaves

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## Abstract

To verify the composition and the chemical variation of its essential oil along 24 hours, leaves of patchouli of medicinal plant collection of the Department of Plant Production/Horticulture of UNESP-Botucatu-SP, were collected every three hours during one day (of the 06:00 to 03:00 h) between February, 25 and 26, 2001. The leaves had its oil extracted for hydro-distillation in Clevenger apparatus during three hours with two repetitions. The chemical composition analysis of the extracted essential oils was carried out in gas chromatography/mass spectroscopy. The phytochemical profile of the essential oils did not present significant difference in function of the harvest. The five most abundant were: patchouli alcohol (62.88 to 70.74 %),  $\alpha$ -bulnesene (55.12 to 6.84 %),  $\alpha$ -guaiene (2.87 to 4.25 %),  $\gamma$ -patchoulene (2.66 to 3.52 %) and another sesquiterpene (5.16 to 6.56 %) not identified, with retention time near to the major compounds.

## INTRODUCTION

Patchouli (*Pogostemon patchouli* syn. *P. cablin*) oil is one of the important natural essential oils under to give a base and lasting character to a fragrance in perfumery industry (Singh et al., 2002). Native to Malaysia and the Philippines, patchouli is now cultivated in tropical and subtropical regions around the world (Chevallier, 1996) with Indonesia as the major producer of patchouli oil in the world with a producer estimated 550 tons per year (Robbins, 1983). The national production of this oil is too small to supply the domestic market tends to run over the import (Gama et al.,1980). According to with farmers of the state of Paraná the yield is of 7 ton/ha/crop, being four annual crops, with content of 3,5 – 4 % of oil (Gama et al.,1983).

The shoots and leaves may be picked either 2 or 3 times a year, depending on the soil and climate (Chevallier, 1996). Patchouli (*Pogostemon patchouli* Pellet) is used in herbal medicine as an aphrodisiac, antidepressant, and antiseptic and in aromatherapy to treat skin complaints, it is also employed for headaches and fever. Its essential oil is constituted of benzoic aldehyde, eugenol, cinnamic aldehyde and sesquiterpene patchoulol. There are not references of quality studies and composition of the essential oil in Brazil. The objective of this work was verify the composition and the chemical variation of Patchouli essential oil along 24 hours, leaves of patchouli of medicinal collection plants of the Department of Vegetable Production/Horticulture of UNESP-Botucatu – São - Paulo, Brazil.

## MATERIALS AND METHODS

This work was conducted in the experimental area of the Department of Plant Production – Sector Horticulture of Agronomic Sciences College, UNESP in Botucatu-SP and in the Laboratory of Phytochemistry of IAC - Campinas-SP, between February 25 and 26, 2001.

Fresh leaf samples (100g) were collected in collection plants of the Department of

Vegetable Production/Horticulture every three hours during one day of the 06:00 to 03:00 h and its oil extracted by hydro-distillation in a Clevenger apparatus during three hours with two repetitions. The chemical composition analysis of the extracted essential oils was carried out in gas chromatography/mass spectroscopy (GC-MS, Shimadzu, QP-5000), under the following conditions: column- DB-5 fused silica capillary column (30 m x 0,25 mm, film thickness 0,25  $\mu$ m ); carrier gas – helium (1.7 ml/min); injector temperature– 240  $^{\circ}$ C; detector temperature 230  $^{\circ}$ C; column temperature –50  $^{\circ}$ C (5 min) - 210  $^{\circ}$ C, 4  $^{\circ}$ C/min then 210  $^{\circ}$ C - 280  $^{\circ}$ C, 15  $^{\circ}$ C/min; MS – electronic impact 70 eV, detector. The chemical representatives identification was made through the comparative analysis of the mass of spectra of the substances with the database of the system GC-MS (list 62.lib), literature (McLafferty & Stauffer, 1989) and retention index (Adams, 1995).

## RESULTS AND DISCUSSION

The chemical composition shows five more abundant constituents (Table 1): patchouli alcohol (62.88 to 70.74 %),  $\alpha$ -bulnesene (55.12 to 6.84 %),  $\alpha$ -guaiene (2.87 to 4.25 %),  $\gamma$ -patchoulene (2.66 to 3.52 %) and another sesquiterpene (5.16 to 6.56 %) not identified, with retention time near to the majority component. The constituents differed from previous investigations concerning the relation to the majority component in which the alcohol sesquiterpenes eugenol (Massada,1976), and to patchoulol (Betts,1994), were detected as major components . In this work, the presence of eugenol and patchoulol was not observed. In research developed by Singh et al., (2002) the constituents patchouli alcohol,  $\alpha$ -bulsene,  $\alpha$ -patchoulene and  $\alpha$ -guaiene were also found in the essential oil of leaves of plants patchouli, although the patchouli alcohol has similar values to the present work.

Patchouli alcohol and  $\alpha$ - patchoulene are important constituents of patchouli oil, which regulate the aroma of oil (Singh et al, 2002). In this work, the values of patchouli alcohol can be considered appropriate for the market demands, although the values of  $\alpha$ -patchoulene are well below those mentioned by the author as appropriate for market (9.9 to 10.3 %).

The phytochemical profile of the essential oils didn't present significant difference in function of the harvest. These data show of the timing for collecting *Pogostemon patchouli* Pellet not influence in the composition and concentration of the components of the essential oil of patchouli in the conditions of Botucatu, São Paulo, Brazil (Table 1).

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## **Tables**

Table 1. Daytime hourly variation of the chemical composition of patchouli (*Pogostemon patchouli* Pellet) leaf essential oil. Botucatu - SP, 2001.

	Time of collection							
Constituents	06.00	09.00	12.00	15.00	18.00	21.00	24.00	3.00
1-octen-3-ol	2.01a	1.24a	1.00a	0.83a	0.99a	0.72a	1.39a	1.10a
$\beta$ -patchoulene	1.01a	0.77a	0.63a	0.69a	0.58a	0.64a	0.85a	0.85a
$\beta$ -elemene	0.18a	0.38a	0.31a	0.37a	0.35a	0.38a	0.37a	0.37 <sub>a</sub>
Trans-caryophyllene	1.01a	1.14a	1.16a	1.21a	1.04a	1.20a	1.46a	1.40a
$\alpha$ -guaiene	2.87a	3.09a	3.19a	3.54a	3.08a	3.47a	4.72a	4.25a
$\gamma$ - patchoulene	2.94a	2.91a	2.91a	2.96a	2.66a	2.83a	3.52a	3.16a
$\alpha$ -hmulene	0.32a	0.37a	0.29a	0.28a	0.26a	0.33a	0.34a	0.5 a
$\alpha$ - patchoulene	1.52a	1.57a	1.58a	1.60a	1.47a	1.62a	2.02a	1.84a
diidro-aromadendrane	0.63a	0.94a	0.93a	0.65a	0.85a	0.95a	1.13a	1.0 a
trans- $\beta$ -guaiene	0.56a	0.59a	0.69a	0.73a	0.58a	0.75a	0.94a	0.85a
$\alpha$ -bulnesene	5.12a	5.19a	5.76a	6.04a	5.29a	6.01a	6.84a	6.25a
bata-copaen-4- $\alpha$ -ol	0.76a	0.55a	0.45a	0.48a	0.35a	0.35a	0.54a	0.54a
Sesquiterpene not identified	5.16a	5.54a	5.88a	5.78a	5.85a	6.56a	6.27a	6.41a
Patchouli alcohol	70.60a	70.53a	70.49a	69.62a	70.74a	68.53a	62.88a	66.17a

\* Means followed by the same letter, within line, don't differ at the 5 % of probability by Tukey's Test.