# The preliminary study of volatile oil in *Melaleuca cajuputi* by GC-MS

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**Abstract:**

*Melaleuca cajuputi*, commonly known as cajuput or white Samet, is a plant in the myrtle family, "Myrtaceae". It is found in many areas of the south and east of Thailand. The leaves of *Melaleuca cajuputi* possess antibacterial, anti-inflammatory and anodyne properties. Essential oil is produced from the leaves by solvent extraction and steam distillation. The preliminary examination for the volatile oil components from Samet, was performed using Gas Chromatography-Mass Spectrometry (GC-MS) with electron impact (EI). The result of GC-MS analysis showed that Samet essential oil consists of 34 components in wetted leaves and 36 components in dried leaves.

## 1. Introduction

*Melaleuca cajuputi*, a tree species within the family "Myrtaceae", (Figure 1) naturally grows in Myanmar and Thailand through Southeast Asia to northern Australia. *Melaleuca cajuputi* is able to grow in a wide range of environment disadvantages including high acid soil, saline soil, acid soil and water-locked soil such as canal, river, lagoon and swamp.[1,4]

*Melaleuca cajuputi* is an important economic tree in southern Thailand. It is a multipurpose tree that every part is usable and the local people have been recognized its usefulness for a long time. Stems of *Melaleuca cajuputi* are used for structural post, fuelwood, charcoal production, fence, platform, fishing rod, agricultural pole and stake etc.[2-4]

The leaves of *Melaleuca cajuputi* possess antibacterial, anti-inflammatory and anodyne properties and are reputed to have insect-repellent properties. It is also used as flavor in cooking and as a fragrance and freshening agent in the soap, cosmetic, detergent and perfume. So, leaf essential oil of *Melaleuca cajuputi* is considered to be used as safe alternative botanical insecticide for controlling stored product insects.[3,4]

**Figure 1.** *Melaleuca cajuputi*

Moreover, this essential oil of *Melaleuca cajuputi* has been used as a perfume and a popular remedy for the treatment of colic, cholera, headaches, toothaches, various skin diseases, germicides and in the treatments of several ailments.[3]

It is believed that there are some benefits of essential oil of *Melaleuca*

*cajuputi*. Researchers are interested in studying the components of such essential oil using specialized chemistry techniques such as Column Chromatography, High-performance Liquid Chromatography or HPLC, Thin layer Chromatography and Gas Chromatography–mass Spectrometry or GC-MS etc.[5,6]

However, it was reported that each *Melaleuca cajuputi* essential oil will provide different chemical compositions and different methods of analysis will also provide different components of essential oil.

In Thailand, *Melaleuca cajuputi* can be found in the swamp forest, especially at Kreang(Phu Kuan Kreang) Sub-District, Cha-Uat District, in Nakhon Si Thammarat, south of Thailand. There are a lot of *Melaleuca cajuputi* can be found there.

Therefore, the preliminary study of volatile oil in *Melaleuca cajuputi* by GC-MS uses the collected samples from Kreang (Phu Kuan Kreang) sub-district, Cha-Uat district, Nakhon Si Thammarat province in the south of Thailand.

GC-MS or Gas chromatography-mass spectroscopy is one of the so-called hyphenated analytical techniques. As the name implies, it is actually two techniques that are combined to form a single method of analyzing mixtures of chemicals. Gas chromatography separates the components of a mixture and mass spectroscopy characterizes each of the components individually. By combining the two techniques, an analytical chemist can both qualitatively and quantitatively evaluate a solution containing a number of chemicals.[5]

## 2. Materials and Methods

### 2.1 Materials and equipment

Anhydrous magnesium sulfate and dichloromethane used in the experiment, were analytical grade, purchased from Merck (Germany). Deionized water was purified by Milli-Q purification system (Millipore, USA). GC-MS (Agilent Technologies. Wilmington, DE, USA) was used as an analytical instrument equipped with HP-5MSI capillary column (30 m x 0.25 mm i.d., 0.25 µL film thickness) as separation unit. The oven temperature was programmed as follows: initiated 60 °C increased at 3 °C $min^{-1}$ maintained at 200 °C, increased at 15 °C $min^{-1}$ and maintained at 280 °C then held for 5 min. The injector temperature was set to 250 °C. The MS transfer line temperature was held at 280 °C. Helium was used as a carrier gas with a constant flow rate of 1.0 mL $min^{-1}$. The ionization mode was selected with electron impact at 70 eV.

### 2.2 Sample preparation

*Melaleuca cajuputi* samples (leaves) were collected from Kreang ( Phu Kuan Kreang) Sub-District, Cha-Uat District, in Nakhon Si Thammarat, south of Thailand. The leaves samples were dried at 60 °C for 4 hours (Figure 2) and then were ground to a particle size of 1.00 mm ( for dried leaves samples).

The essential oils were extracted from dried leaves samples and wetted leaves samples. A 1000 mg of the plant sample was freshly cut and extracted using 1000 mL water for 5 hours. The cooled volatile oils were filtrated through filters, dried with anhydrous magnesium sulfate and stored at 4 °C until removed from storage to analytical procedure.

## 3. Results and Discussion

### 3.1 Chemical components of the essential oil

Essential oils isolated from leaves of *Melaleuca cajuputi*, commonly known as cajuput or white samet using steam distillation were analyzed by GC-MS. The compounds identified by mass spectrum were matched with a mass spectral library collection. The chromatograms from fresh and dried leaves of *Melaleuca cajuputi* are shown as major components in Figure 3 and Figure 4, respectively. The percentage of chemical components of *Melaleuca cajuputi* are shown in Table 1.

**Figure 2.** The leaves samples after drying at 60 °C for 4 hours

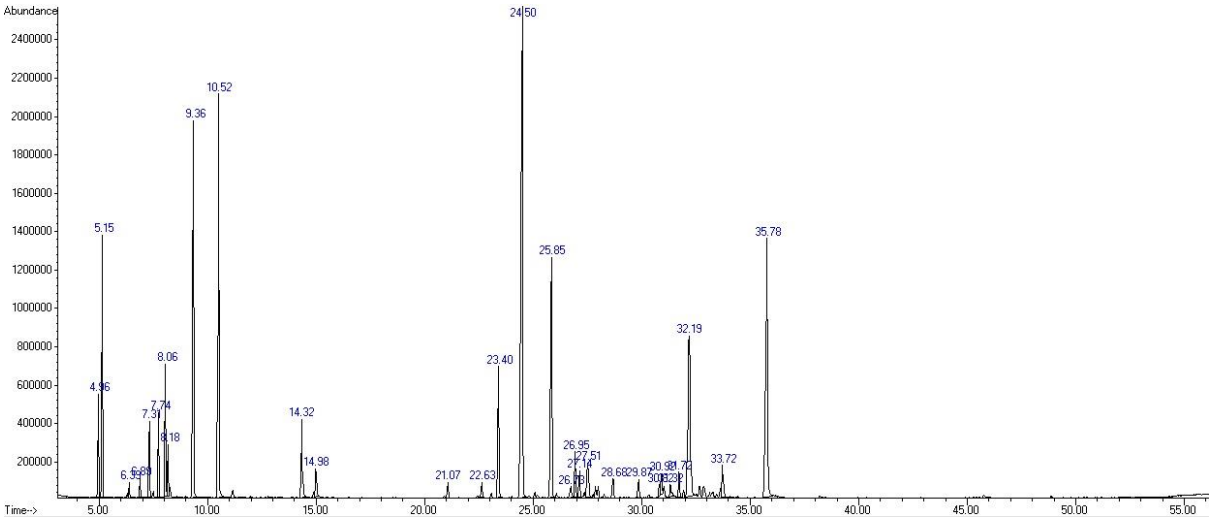


**Figure 3.** Chromatogram of the essential oil from fresh leaves of *Melaleuca cajuputi*

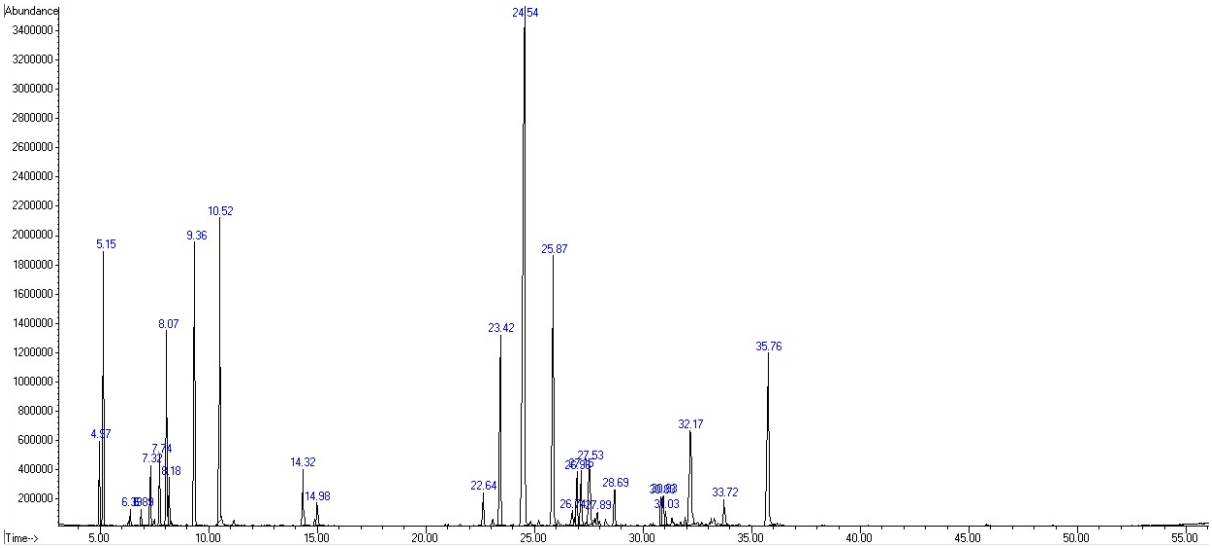


**Figure 4.** Chromatogram of the essential oil from dried leaves of *Melaleuca cajuputi*

**Table 1.** The chemical composition of *Melaleuca cajuputi*

| Compounds | Fresh leaves | | Dried leaves | |
|---|---|---|---|---|
| | RT | %Area | RT | %Area |
| Alpha-pinene | 5.14 | 4.38 | 5.15 | 4.92 |
| Cymene | | | 8.07 | 4.16 |
| gamma-Terpinene/ 1,4-Cyclohexadiene | 9.36 | 9.15 | 9.36 | 6.95 |
| Alpha-terpinolene | 10.52 | 10.05 | 10.52 | 8.04 |
| beta-Elemene | 23.41 | 3.74 | 23.43 | 5.87 |
| Caryophyllene | 24.50 | 18.98 | 24.54 | 9.29 |
| alpha.-Caryophyllene | 25.85 | 7.55 | 25.87 | 9.29 |
| 3,3,6,9,9-Pentamethyl-2,10-diazabicyclo-1-decene-2-oxide | 35.78 | 11.54 | 35.76 | 7.57 |

## 4. Conclusion

The preliminary examination for the volatile oil components from Samet, was performed using Gas Chromatography-Mass Spectrometry (GC-MS) with electron impact (EI). The chemical components of the different oils were identified by retention time and mass spectrum in comparison with a mass spectral library collection. The result of Gas Chromatography-Mass Spectrometry (GC-MS) analysis showed that Samet essential oil consists of 34 components in fresh leaves (Figure 3) and 36 components in dried leaves (Figure 4).


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