

N°817 / OC

TOPIC(s) : Alternative technologies

## Microwaves as an alternative to traditional hydro-distillation of ylang-ylang essential oil

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### PURPOSE OF THE ABSTRACT

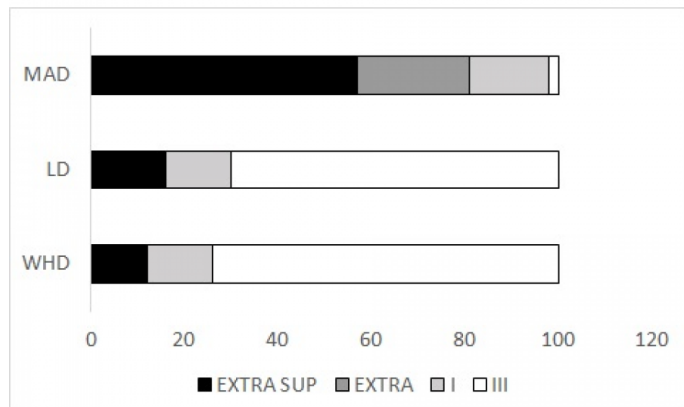
Ylang-ylang essential oil is obtained from the mature fresh flowers of *Cananga Odorata*, a tropical tree of the Annonaceae family mainly exploited in Comoros Islands, Mayotte and Madagascar. Ylang-ylang essential oil is widely used by the cosmetic industry all over the world and its production plays a key role for the economic development of the Comoros Islands. Unfortunately this activity has dramatic consequences for the Comorian eco-system. Essential oil hydro-distillation that requires up to 24 hours and necessitates large quantities of wood for the heating of distillers is one of the main causes of massive deforestation. Moreover a constant supply in water is needed for the coolers which participates to the drying up of rivers.

In this context finding an alternative to traditional hydro-distillation is of great environmental importance. This study aimed at demonstrating that microwave assisted distillation (MAD) could be used as a sustainable alternative to traditional wood-heated hydro-distillation (WHD).

Ylang-ylang essential oil distillation produces different fractions according to distillation time. This fractionation results in five grades of oil with different compositions, leading to different commercial applications. The first fraction, rich in odoriferous volatile oxygenated compounds is intended for perfumery. The last fraction that mainly contains heavier sesquiterpenes has a lower commercial value. We compared the different fractions of essential oils collected using WHD, laboratory scale hydro-distillation (LD) and MAD. Quantitative and qualitative aspects were studied.

The yields of total essential oil collected with MAD was 29% higher compared to WHD and 23% compared to LD whereas the distillation time was significantly reduced. Indeed 20 min were sufficient to obtain 2.3% yield with MAD whereas LD and WHD necessitate 19 h. The grade of the collected fractions were assessed according to density, ester index and refractive index. MAD produced 81% high value EXTRA SUP and EXTRA grade, 16% grade I and 2% low value grade III fractions. WHD and LD produced c.a 15% EXTRA SUP, 15% grade I and 70% grade III fractions. Moreover the EXTRA SUP and EXTRA fraction were collected within 20 min using MAD whereas 40 min were necessary with WHD and LD. At the molecular level 15 compounds were identified with GC-MS according to the ISO standard. These compounds were classified into light oxygenated compounds (LOC), sesquiterpenic hydrocarbons (SH), oxygenated sesquiterpenes (OS) and heavy oxygenated compounds (HOC) and quantified using GC-FID. The results obtained at the molecular scale were correlated with the classification previously made using physico-chemical parameters. A higher amount in odoriferous LOC and a lower amount in SH either in the Extra sup and Grade I fractions collected using MAD confirmed its high qualities. Moreover grade III fraction obtained with MAD demonstrated a high content in oxygenated compounds compared to LD and WHD. Globally, MAD which is a rapid and efficient technique for ylang-ylang essential oil extraction appeared as a sustainable alternative to WHD to prevent the deforestation of the archipelago.

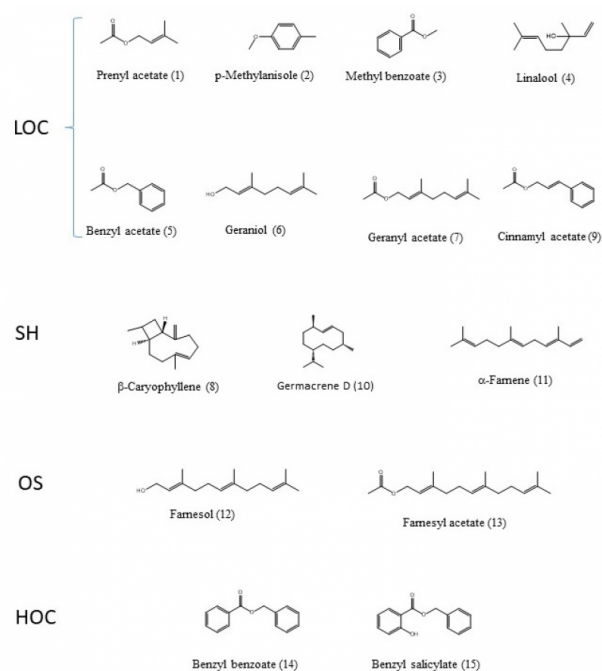
## FIGURES



**FIGURE 1**

Oil grade

Quality of the collected fractions of essential oil with different techniques



**FIGURE 2**

Structures

Main constituents of ylang-ylang essential oil

## KEYWORDS

Ylang-ylang | essential oil | microwave | distillation

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