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## Hydrodistillation and Comparative Report of Percentage Yield on Leaves and Fruit Peels from Different Citrus Plants of Rutaceae Family

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### ABSTRACT

Citrus fruit peels and leaves have always been the imperative attention of different researchers in pharmaceutical and cosmeceutical field. Moreover, the aroma of essential oil gains good reputation in aromatherapy. The volatile oil from leaves and rind of the citrus fruit has been reported by Hydrodistillation and expression methods several times. At this time, in present study, extraction of volatile oil from the leaves and peels of fruit from citrus plants were obtained by hydrodistillation. Total seven Citrus plants *Citrus lemon*, *Citrus medica*, *Citrus aurantium*, *Citrus pseudolemon*, *Citrus sinensis*, *Citrus reticulata* and *Citrus maxima* were selected here for extraction. The percentage yield so obtained was compared.

**Key words:** Citrus, peel, leaves, volatile oil, hydrodistillation

### INTRODUCTION

Citrus fruit peels and leaves have always been the imperative attention of different researchers in pharma and cosmeceutical field. The literature on citrus plants has been reported several times by different researchers for different pharmacological activities (Sharma *et al.*, 2015). Moreover, the aroma of essential oil has gained good reputation in aromatherapy. Aromatherapy the alternative medicinal system describes the healing effect by essential oils from plant origin. The volatile oil from citrus fruit has already been reported by several researchers by hydrodistillation (Vashist and Sharma, 2013; Vashist *et al.*, 2014; Costa *et al.*, 2013; Hamdan *et al.*, 2013) and using supercritical carbon dioxide (Atti-Santos *et al.*, 2005). The volatile oil fraction in citrus peels present in the oil duct, oil gland or oil cells beneath the layer of epithelial cells (Fig. 1). The oil cells when get ruptured the oil starts to ooze out of the cell through the duct, which get formed during rupturing of surrounding cell layers. It has been reported that populations in several countries opt to the preparations obtained from *Citrus* species to treat problems related to the nervous system, especially symptoms of anxiety or insomnia (Costa *et al.*, 2013). This may be because of the less side effects from such preparations, which again underlines the importance of citrus extracts in alternative medicinal system. The extraction of volatile oil from leaves and peels of citrus plants has been reported by cold expression method and steam distillation several times but the water distillation has been selected by very less time. So, the present study represents an approach for the extraction of the volatile oil of citrus peel and leaf essential oil by hydrodistillation method.

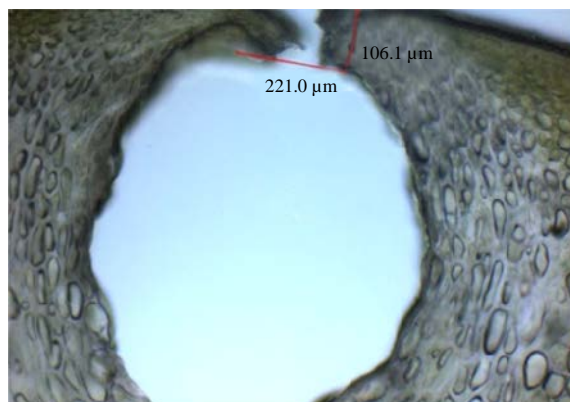


Fig. 1: Volatile oil gland of citrus fruit peels opening duct and its diameter

## MATERIALS AND METHODS

**Plant materials:** Leaves and fruit peels of seven Citrus plants of Rutaceae family namely *Citrus lemon*, *Citrus sinensis*, *Citrus pseudolemon*, *Citrus aurantium*, *Citrus medica*, *Citrus maxicana* were collected from the “Gharsi village” hills of Solan district, HP. whereas, the leaves and fruits peel of *Citrus reticulata* were collected and bought from market. The plant materials were partially dried in shade. The dried leaves and fruit peels were stored and kept intact till its use.

**Apparatus and instruments:** Clevenger apparatus upto 5 mL volume for volatile oil lighter than water, round bottom flask of 250 mL, Condenser and 500 W heating mantles.

**Method:** Volatile oil was obtained by hydrodistillation. The plant materials were coarsely powdered and from that 20 g of powder was taken in 250 mL round bottom flask. Water was added to the flask near to its half. The assembly was fixed and the temperature was adjusted at 60°C. The extraction was continued upto two hours. Volume of oil obtained was recorded and percentage yield of each were calculated and compared.

## RESULTS AND DISCUSSION

### Color of citrus leaves oil:

- *Citrus lemon* (Nimbu) : Light yellow (peels), Yellow (leaf)
- *Citrus medica* : Whitish yellow
- *Citrus aurantium* : Light yellow
- *Citrus pseudolemon* : Light yellow
- *Citrus sinensis* : Yellow
- *Citrus reticulata* : Yellow
- *Citrus maxima* : Light yellow

### Volatile oils from citrus fruit peels (rind):

- *Citrus lemon* : Yellow
- *Citrus medica* (cholang) : Whitish yellow
- *Citrus aurantium* (Khatte) : Yellow

Table 1: Percentage yield of volatile oil from leaf of citrus fruits

Sample names	Quantity taken (g)	Oil obtained in 2 h (mL)	Yield (%)
<i>Citrus lemon</i>	20	0.10	0.50
<i>Citrus medica</i>	20	0.20	1.00
<i>Citrus aurantium</i>	20	0.20	1.00
<i>Citrus pseudolemon</i>	20	0.10	0.50
<i>Citrus sinensis</i>	20	0.20	1.00
<i>Citrus reticulata</i>	20	0.05	0.25
<i>Citrus maxima</i>	20	0.05	0.25

Table 2: Percentage yield of volatile oil from peels of citrus fruits

Sample name	Quantity taken (g)	Oil obtained in 2 h (mL)	Yield (%)
<i>Citrus lemon</i>	20	0.3	1.5
<i>Citrus medica</i>	20	0.2	1.0
<i>Citrus aurantium</i>	20	0.4	2.0
<i>Citrus pseudolemon</i>	20	0.4	2.0
<i>Citrus sinensis</i>	20	0.4	2.0
<i>Citrus reticulata</i>	20	0.3	1.5
<i>Citrus maxima</i>	20	0.4	2.0

- *Citrus pseudolemon* (galgal) : Yellow color
- *Citrus sinensis* (orange) : Yellow color
- *Citrus reticulata* (kinnow) : Yellowish
- *Citrus maxima* (chakotre) : Whitish yellow

The amount and percentage yields of volatile oil has been recorded and tabulated (Table 1 and 2). However, the percentage yield of volatile oil from three citrus plants peel viz. *Citrus aurantium*, *Citrus sinensis* and *Citrus lemon* has been reported by hydrodistillation as 6.6, 4.3 and 3%, respectively by using 30 g drug in three hours (Vashist *et al.*, 2014). Similarly by using 30 g powder of *Citrus sinensis* peel 3.33% of volatile oil has been reported by hydrodistillation for 3 h (Vashist and Sharma, 2013). The extraction of volatile oil from mandarin leaves and peels were hydrodistilled for six hours. The percentage yields were reported as 2 and 0.8% for peels and leaves, respectively (Hamdan *et al.*, 2013). Similarly, fresh 1.5 kg peels of *Citrus reticulata* have been hydrodistilled for three hours, which yielded 0.33% v/w of volatile oil (Das *et al.*, 2014). Here the volatile oil of selected plants was obtained in two hours. The percentage so obtained has been compared. The result revealed that the peels provide more volatile oil than the leaves. Among peels total 2% of volatile oils were obtained from *C. aurantium*, *C. pseudolemon*, *C. sinensis* and *C. maxima* whereas, for *C. lemon* and *C. reticulata* total yield of volatile oil was found as 1.5%. *C. medica* provided least amount as 1%. *Citrus sinensis* peels were not available during the time of experiment hence no result has been reported for it. From the citrus leaves maximum amount of 1% was reported from *C. medica*, *C. aurantium* and for *C. sinensis*. About 0.5% of volatile oil was reported for *C. lemon* and *C. pseudolemon* whereas total amount of 0.25% was obtained for *C. reticulata* and *C. maxima*. From the result it has also been observed that the percentage yield of volatile oil from *C. medica* is same for both leaves and fruit peels.

## CONCLUSION

From the whole experiment it was concluded that the peels of *C. aurantium*, *C. maxima* and *C. pseudolemon* provided maximum percentage of essential oil which could be a rich source of essential oil. Whereas, percentage *C. medica*, *C. sinensis*, *C. aurantium* may be an intermediate source. But *C. maxima* and *C. reticulata* leaves are poor source.

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