# Characterization of Essential Oil of Local Varieties of *Citrus Grandis*

[1]M. N. KHAN, [2]M. A. MUNAWAR, [1]S. MAHMUD, [3]A. K. QURESHI, AND [1]S. REHMAN
[1]*Applied Chemistry Research Center, PCSIR Laboratories Complex Lahore, Pakistan.*
[2]*Institute of Chemistry, University of The Punjab, Lahore, Pakistan.*
[3]*Department of Chemistry, Bahauddin Zakariya University Multan, Pakistan.*

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**Summary**: The essential oil of *citrus grandis* was studied for its chemical composition. The GC and GC/ MS studies revealed the presence of 27 compounds in the essential oil of *citrus grandis*, out of which 18 compounds were identified. Limonene (72.312 %), isosafroal (4.701 %), α-terpinene (2.130 %), terpinolene (2.016 %), trans-sabinenehydrate, (1.987 %), β-citronellol (1.811 %), nerol (1.715 %), Linalool (1.684 %), myrcene (1.643 %), α-terpineol (1.591 %), geraniol (1.315 %), $\Delta^3$-carene (1.213 %), allo-ocimene (1.176 %) and linalyl acetate (1.013 %) were recorded as the principal constituents.

## Introduction

*Citrus grandis* commonly known as pummelos is the largest fruited citrus with large white flowers. It attains a height of 9-13 meters. It is native to Malayan and Polynesian Island and largely cultivated in India. The fruit of *Citrus grandis* is orange yellow in colour with red flesh round shaped and its size ranges from 12 to 18 cm in diameter [1-2]

The fruit is a valuable commodity of consider-ably commercial importance particularly for Paksitan which is a great producer of citrus fruit. *Citrus grandis* yields approximately 4 % of essential oil, which is the principal flavour carrier and contains open chain alcohols, aldehydes, ketones, esters and terpene alcohols such as α-terpenoids [3].

Indian ancient books, Egyptian papyruses, the Bible, the Holly Quran, all of them include such information, from where we learn that fragrant products were used for all imaginable purposes from magic to aesthetic, from medicine to expression of love. Because of their well known disinfectant properties they were considered excellent remedies against infectious and epidemic diseases [4]. Being fragrant the essential oil of *Citrus grandis* is also used in cosmetics. Essential oils derived from the peels of citrus fruits are also used in baking products, squashes, soft drinks, ice creams, chewing gums, beverages and other food products [5-6].

Table- 1: Analysis of essential oil from peels of *Citrus grandis*.

| Peak. No. | Retention Time | Compound Identified | % age |
|---|---|---|---|
| 1. | 4.834 | β-Pinene | 0.817 |
| 2. | 8.467 | $\Delta^3$-Carene | 1.213 |
| 3. | 5.616 | Allo-Ocimene | 1.176 |
| 3. | 6.108 | Limonene | 72.312 |
| 4. | 6.651 | α-Terpinene | 02.130 |
| 5. | 7.845 | Trans sabinenehydrate | 1.987 |
| 6. | 7.501 | L-4-Terpineol | 0.774 |
| 7. | 8.153 | α-Terpineol | 1.591 |
| 8. | 9.269 | Linalool | 1.684 |
| 9. | 8.839 | Terpinolene | 2.016 |
| 10. | 14.384 | β-Citronellol | 1.811 |
| 11. | 14.672 | Nerol | 1.715 |
| 12. | 15.648 | Linalyl acetate | 1.013 |
| 13. | 18.020 | Isosafrol | 4.701 |
| 14. | 18.747 | Geraniol | 1.315 |
| 15. | 19.244 | β-Cubebene | 0.569 |
| 16. | 19.968 | Myrcene | 1.643 |
| 17. | 24.547 | Asarone | 0.0471 |

## Result and Discussion

The peels of *Citrus grandis* contained 4.2 % essential oil. The essential oil here was found to be composed of 27 constituents, of which 18 were identified

Although the oil content and percentage com-position of the essential oil of a species depends upon the soil, climatic conditions, degree of maturity of the plant material [7] harvest time, drying procedure, storage and extraction time [8-9].

The possibility that the plants had developed new strain could not be excluded.

Tentative identification of individual compounds in the essential oil was made by correlation of retention time and composition of GC/ MS spectrum with authentic references and published data. The essential oil from *Citrus grandis* peels contained isosafrol (4.701 %), trans-sabinene-hydrate (1.987 %), allo ocimene (1.176 %) and $\Delta^3$-Carene (1.213 %) were the compounds which have not been reported previously in the literature, whereas compounds like geranyl acetate, dodecanal, 1,8-cineole, $\beta$-sinenal trans 4,5-epoxy (E)-2-decenal and octanol reported by earlier workers [10-11] were found absent.

The chemical composition of the essential oil of the fruit peels indicated the presence of limonene, isosafrol, $\alpha$-terpinene, terpinolene, trans-sabinene hydrate, $\beta$-citronellol, nerol, linalool, myrcene $\alpha$-terpineol, geraniol, $\Delta^3$-carene, allo ocimene and linalyl acetate as major components that constituted the essential oil.

The hydrocarbon fraction that constituted (91.2581 %) of the essential oil of fruit peels was found to be composed of mono and sesquiterpens.

The variation in the chemical composition of the essential oil from peels of *Citrus grandis* may be attributed to differences in regional, climatic and edaphic conditions in which the plants grow.

Presence of cinamene, myrcene, isosafrol L-4-terpineol, α-terpinene and geraniol in the essential oil from the peels accounts for the quality of this essential oil. The oil seems to offer possibilities of its extended use in the preparation of the toiletries, medicinal products, flavouring essences and similar commodities.

## Experimental

*Recovery of the oil*

The fruit was collected from Sargodha and Renala Khurd. The fruit were peeled off. The peels were cut into small pieces in order to rupture the cells to allow maximum yield of essential oils. Weighed amount of the cut peels were subjected to steam distillation using Likens and Nickerson apparatus [12]. Until no further increase in the volume of oil was noted (~6-hr). The oil was collected, dried over anhydrous sodium sulfate and filleted, yielding 4.2 % of the oil.

*Chromatography:*

Gas chromatography (GC) of the oil was carried out on a Shimadzu GC-14 gas chromatograph equipped with flame ionization detector and 25 x 0.22 mm WCOT SE 30 fused silica column. Hydrogen was used as a carrier gas with flow velocity of 26 cm/ sec and split ration 1:100 and sample size 0.2 uL. The column temperature was programmed at 70 °C for 4 min with 4 °C / min rise to 20 °C, while detector and injection temperatures of 300 °C and 250 °C respectively were used. Percentage composition of individual components of the essential oil was calculated on the basis of peak and using Shimadzu C-R4A chromatography – Mass spectrometry (GC-MS) of the constituents of the essential oil was carried out on JEOL model JMS-AX 505 H mass spectrometer combined with Hewlett Packard. 5890 gas chromatograph. The samples of essential oil was injected on WCOT BP5 fused silica column with Helium as the carrier gas, split ratio of 1: 100, E, positive mode, electron energy of 70 eV, ionization current of 300 $\mu$A, 250 °C ionization source temperature, 230 °C interface temperature and column temperature programmed at 60°C for 4 min. with 60 °C/ min rise to 230 °C. Data acquisition and reprocessing were programmed by JEOL JMA-DA 5000 system with library search system.

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