Constituents of Essential Oil from Kinnow Peel

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Summary: Volatile material from peels of kinnow, a hybrid citrus fruit, has been analysed using high resolution, i.e. capillary gas chromatography coupled with mass spectrometry. Limonene is indicated as the major fraction, 93.7%.

Introduction

Kinnow, belonging to tangerine family among citrus fruits is grown only in Pakistan. Essential oils derived from the peels of citrus fruits are the major by - products of the industry making beverages, etc. Extracts from these oils are used as flavours in various food products[1]. Relatively little quantitative analytical information is available on components making up the essential oil of kinnow peels. Kinnow is a popular fruit in Pakistan and its production has increased significantly over the years due to its adaptation to local conditions. This investigation reports the results of quantitative analysis of kinnow peel essential oil using gas chromatography - mass spectrometry[2].

Experimental

Recovery of the oil: Fresh kinnow peels, 1 kg, were broken in a shredding machine. The finely divided peels were packed in a wide glass column which was eluted with hexane, 3 x 300 ml. After removing the solvent, the residue was steam distilled to obtain the essential oil. About 4 ml of essential oil was obtained for 1 kg of peels.

Gas chromatography: Analysis was performed on a Perkin - Elmer sigma 1B gas chromatograph equipped with a flame ionization detector (FID) and split/splitless injector. Collected data were processed by Perkin-Elmer sigma 1 data station. 30 m long fused silica capillary, 0.2 mm ID, coated with OV-1701 was the column used for gas chromatography. Other operating conditions were: injection temperature 270°C; detector temperature 260°C; column initial temperature 70°C; initial time 2 min; column final temperature 240°C; program rate 2°C/min; final time 5 min; He carrier gas with flow rate 2 ml/min; split ratio 1:40; volume injected 1 micro-litre.

GC-Mass spectrometry: Analysis was carried out on a NERMAG R1010 quadrupole instrument. All spectra were obtained at 70 eV in electron impact (EI) mode. Data acquired on a PDP 11/23 computer were processed using SIDAR software.

Results and Discussion

The dark yellow oil had a specific gravity 0.847 at 28°C and a refractive index value equal to 1.4734 at 28°C. These values are comparable to those reported for oils of similar category [3]. Quantitative analytical results for kinnow peel essential oil are listed in Table 1. In all twenty-three components were indicated. Eighteen compounds have been identified. Positive identification of the compounds was made by coinjecting authentic samples. Column 1 in Table 1 gives the peak number which corresponds to that given in the chromatogram shown as Figure 1. Among the compounds identified, monoterpene hydrocarbons, alcohols, aldehydes, oxygenated monoterpenoids and sesquiterpene hydrocarbons are represented. The various components in Table 1 represent 99.7% of the essential oil. In agreement with composition of essential oils of closely related citrus fruits[3], limonene, 93.7%, was found to be the major fraction, followed by β-myrcene, 1.5%. Except for an unknown sesquiterpene, 0.6%, ocimene and n-decanal, each 0.5%, all other compounds were either one tenth or two tenth of one percent. In a related investigation Moshonas and Shaw[4] have

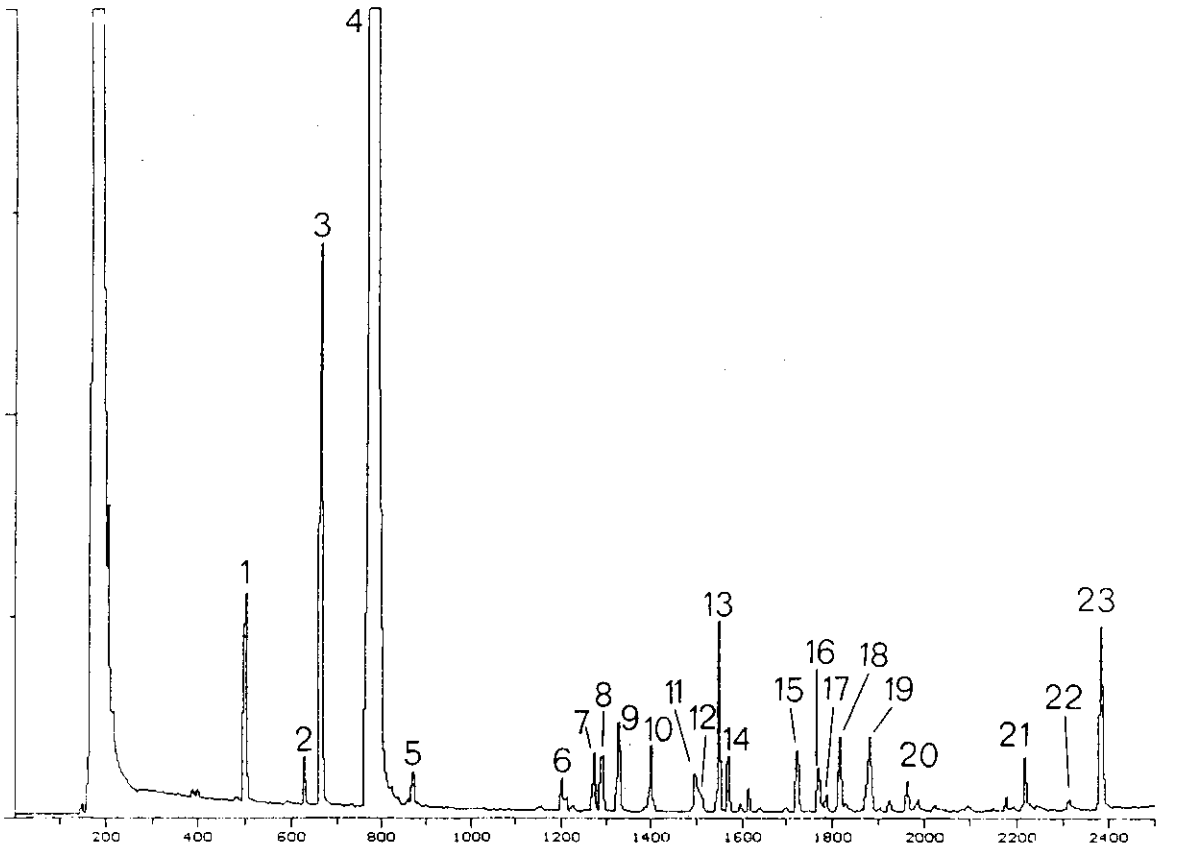

Fig. 1: Chromatogram of essential oil of KINNOW PEEL. Numbering corresponds with that in Table 1.

Table 1: Analysis of oil from kinnow peel

Peak No.	Compound (Molecular weight)	% age
1	Ocimene	0.5
2.	Sabinene	0.1
3	β-Myrcene	1.5
4	Limonene	93.7
5	2-Octene-1-ol	0.1
6	Linalool	0.1
7	Dipentene Oxide	0.2
8	Monoterpenoid, $C_{10}H_{16}O$ (152)	0.2
9	Monoterpenoid, $C_{10}H_{16}O$ (152)	0.2
10	cis - Sabineol	0.2
11	Nerol	0.1
12	Citral	0.2
13	n-Decanal	0.5
14	α-Terpineol	0.2
15	Carveol-I	0.2
16	Carveol-II	0.2
17	α-Copaene	0.1
18	Carvone	0.2
19	α-Ylangene	0.2
20	Sesquiterpene, $C_{15}H_{24}$ (204)	0.1
21	Sesquiterpene $C_{15}H_{24}$ (204)	0.2
22	α-Muurolene	< 0.1
23	Sesquiterpene, $C_{15}H_{24}$ (204)	0.6

reported seventeen components including myrcene, limonene, linalool, decanal and α-terpineol in tangerine peel oil. Limonene, linalool have also been reported[3] in essential oil derived from peels of *Citrus reticulata*. Information on oil composition would be of value to the citrus industry. A number of compounds from both hydrocarbon fraction and oxygenated fraction have been identified.

References:

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4. M.G. Moshonas and P.E. Shaw, *J.Agr. Food Chem.*, **22**, *282 (1974) and references therein.*