

SHORT COMMUNICATIONS

167- PHYSICO-CHEMICAL STUDIES ON THE ESSENTIAL OILS OF CITRUS FRUITS

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Essential oils from citrus peels are an important source of flavouring materials for all kinds of beverages, confectionaries and bakery products. In view of their varied uses, essential oils especially citrus are in a great demand in Pakistan. There are about 120 fruit preservation concerns in Pakistan which do not fully utilise the citrus peels for the manufacture of essential oils. The preparation of these oils is a problem of economic importance to the country. Experiments were, therefore, undertaken to prepare essential oils from citrus peels by various methods and to study its characteristics.

Experimental

Distillation is not a suitable method for the isolation of certain essential oils which undergo destruction on exposure to heat, light and water. In such cases one of the three methods, viz., expression, extraction by means of volatile solvents and absorption in purified fats, is employed. Sponge method¹ described as under was used in the experiments reported in this article.

The fruit was cut in half and the pulp was separated from the peel by means of a special form of spoon with a sharp edge. This was inserted at the junction of the white albedo and the juice sacs. By a quick turn of the wrist the pulp was extracted whole without any liberation of juice. The peel was freed of adhering pulp, dipped in water and allowed to stand for four hours. It was then pressed between sponges in a hand press. The pressure on the peels breaks the oil cells and the oil together with some water spurts out and is collected in an earthenware jar provided with a lip from which the oil is decanted. Absorption by sponge breaks any emulsion that may have been formed by the colloidal substance present in water and the decanted oil is almost clear. During these experiments the mixture collected was centrifuged and

physico-chemical studies on the clear oil were carried out by adopting the methods recommended by Earnest Guenther.² The data is given in Table 1.

Discussion of Results

The data given in the table show that physical constants like specific gravity, optical rotation, refractive index, evaporation residue and solubility are almost identical with those reported by other workers with certain notable variations. It is known² that slight variations in physical properties are caused by the admixture of different species of plants. Aldehyde content of various essential oils except that of bitter orange oil falls within the range cited in the literature.^{2,3} The yield of bitter and sweet orange oils from the local fruit is higher than that reported in the literature for foreign varieties.

Summary and Conclusion

One of the expression methods, viz. sponge method, has been found to be suitable for the preparation of citrus oils. It is felt that small medium size factories could profitably utilise this method for the preparation of citrus oils as a by-product of squash manufacture. The quality of the oil obtained by this method compares favourably with the standards cited in the literature.

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References

1. J.B.S. Braverman, *Citrus Products* (Interscience Publishers Inc., New York, 1949), p. 191.
2. Earnest Guenther, *The Essential Oils*, Vol. I (D. Van Nostrand Co. Inc., New York, 1952), pp. 236-289.
3. *Official Methods of Analysis: Association of Official Agricultural Chemists*, 8th ed. (A. O. A. C. Washington, D.C.), 1955, 19.62, 19.64, 19.68.

Physico-chemical studies on the essential oils of citrus fruits (Contd.)

TABLE I.—CHARACTERISTICS OF CITRUS OILS.

Sr. No.	Name of essential oil	Yield%		Specific gravity at 25°C.		Optical rotation at 25°C.		Refractive index at 20°C.		Aldehyde content as decylaldehyde%			Evaporation residue%		Solubility at 20°C.	
		Obtained	Reported	Observed	Reported	Observed	Reported	Observed	Reported	Observed	Reported	Observed	Reported	Observed	Reported	
1.	Bitter orange oil**	0.76 to 0.9	0.15* 0.33**	0.844	0.845-0.851	+99.9°	+91°0'-+96°21'	1.4740	1.473°-1.4760	1.91	1	4.06	2.2-4.7	Soluble in 7-8 vols. of 90% alcohol.	Soluble in 4 vos. & more of 95% alcohol.	
2.	Sweet orange oil.**	0.531	0.3* 0.277-0.318**	0.842	0.842-0.846	+98° .69°	+96°-+99°	1.4735	1.4723-1.4742	2.1%	0.8-2.1	1.84	1.6-4.5	Incompletely sol. in 10 vols of 95% alcohol.	Incompletely sol. in 95% alcohol up to 10 vols.	
3.	Lemon oil**	0.247	0.35* 0.265-0.3**	0.843	0.849-0.855	+78.18°	+57°-+65°36'	1.4744	1.4742-1.4755	5.206	3.7-5.0	1.86	1.5-2.2	Completely sol. in 0.5 to 1 vol. of 95% alcohol.	Soluble in 3 vols. of 95% alcohol and more.	
4.	Grape fruit oil**	0.427	0.06* 0.07**	0.853	0.8508-0.8532	+86.63°	+91°45'-+94°36'	1.4740	1.4745-1.4778	1.4	1.4-1.6	3.5	5.0 to 8.0 %	Incompletely sol. in 10 vols. of 90% alcohol.	Incompletely sol. in 90% alcohol up to 10 vols. owing to separation of wax.	

*Raymond E. Kirk and Donald. F. Othmer, *Encyclopedia of Chemical Technology*, Interscience Publishers, vol. 9 (1952), pp. 583-595.

**Ernest Guenther, *The Essential Oils*, vol. III (1952), pp. 134-354.