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FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATION

Part - XIX. Fatty Acid Composition of *Citrus grandis* and *Citrus reticulata* (Var. Sangtra)

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The yield of seed oils of *Citrus grandis* and *Citrus reticulata* (Var. Sangtra) was 38.73 and 31.62%t respectively and their refractive indices (1.4683, 1.4658), sp. gravities (0.9331, 0.8806) acid values (0.22, 0.17), iodine values (91.7 & 98.5) and saponification values (178.89, 196.8), were recorded. The GC analysis revealed the presence of $C_{10:0}$ (0 & 2.2%), $C_{12:0}$ (0.5 & 0.8%), $C_{14:0}$ (1.0 & 1.5 %), $C_{16:0}$ (18.7 & 15.0%), $C_{18:0}$ (4.6 & 3.7%), $C_{18:1}$ (28.2 & 26.3%), $C_{18:2}$ (42.2 & 42.8%) and $C_{18:3}$ (4.7 & 7.5%) respectively.

Key words: *Citrus grandis, Citrus reticulata* Var. Sangtra, Seed oil, Fatty acids composition.

Introduction

Citrus fruits are processed in Pakistan for juice extraction. The present annual production of these fruits in Pakistan is estimated to be over two million tonnes [1]. One of the wastes of the *citrus* processing industry is the seeds which on the average amount to nearly 2% of the whole fruit. The *citrus* seeds yield on an average 33% of a fixed oil which is rich with the essential unsaturated fatty acids [2]. Several studies have been conducted on the seed oils of the various *citrus* fruits in order to know their fatty acid composition [3]. The seed oils of *Citrus grandis* (pumelo or shaddok) and *Citrus reticulata* (Var. Sangtra) have, however, so far not been investigated for their fatty acid composition. The present report describes the fatty acid composition of these seeds in continuation of our programme to explore the indigenous materials for new oil resources in the country.

Experimental

Seed oils. Fresh and mature fruits of *Citrus grandis* and *Citrus reticulata* (Var. Sangtra) were procured from the local market. The dried seeds were crushed coarsely and the oil was extracted with n-hexane in a Soxhlet apparatus. Removal of the solvent under vacuum afforded pale yellow oils. The percentage yield, and the physico-chemical properties of the oils, determined according to standard procedures [4] are reported in Table 1.

Analysis of the oils. Weighed quantities of the oils (one gm each) were sponified with 0.5 m methanolic potassium hydroxide (25 ml) and the released fatty acids were esterified with methanol in the presence of boron trifluoride according to the method of Solomon and Hubbard [5]. This resulted in the preparation of methyl esters of the fatty acids in hexane. The fatty acid composition was determined by gas chromatography using a column (1.5 ml length and 4 mm dia) of 10% DEGS on chromosorb (80-100 mesh) at 200° with injection port temperature of 250°. The nitrogen carrier gas flow rate was 40 ml/ min and the detector used was FID. The identification of the component fatty acids was made by comparing their retention times with those obtianed from authentic samples under identical conditions and also by the coinjection technique. The fatty acid composition of the oils, as determined by GC, is reported in Table 2.

TABLE 1. PHYSICO-CHEMICAL PROPERTIES OF *C. GRANDIS* AND *C. RETICULATA* (VAR. SANGTRA).

No.		*C. grandis*	*C. reticulata*
1.	Yield of oil	38.73%	31.62%
2.	Colour	Pale yellow	Pale yellow
3.	Refractive index	1.4683	1.4658
4.	Specific gravity	0.9331	0.8806
5.	Acid value	0.22	0.174
6.	Saponification value	178.89	196.8
7.	Iodine value	91.7	98.5

TABLE 2. PERCENTAGE COMPOSITION OF THE FATTY ACIDS OF SEED OILS OF *C. GRANDIS* AND *C. RETICULATA* (VAR. SANGTRA)

Fatty acid	*C. grandis*	*C. reticulata*
$C_{10:0}$	–	2.2
$C_{12:0}$	0.5	0.8
$C_{14:0}$	1.0	1.5
$C_{16:0}$	18.7	15.0
$C_{18:0}$	4.6	3.7
$C_{18:1}$	28.2	26.3
$C_{18:2}$	42.2	42.8
$C_{18:3}$	4.7	7.5

Discussion

The physico-chemical properties of *Citrus grandis* and *Citrus reticulata* (Var. Sangtra) determined by standard

procedures, compared well with the oils of other *citrus* fruits., The yield of oils on the basis of dry seeds by hexane extraction was found to be 38.73 and 31.62% respectively (Table 1).

The gas chromatographic analysis of the oils showed that the unsaturated fatty acids (75.1 and 76.6%) dominated the fatty acid profile of both the seed oils (Table 2). The oils were rich with respect to linoleic acid, an essential fatty acid (42.2 and 42.8%). From the physico-chemical data and gas chromatographic analysis of the fatty acid composition, it can be concluded that both the seed oils can be classified as moderately unsaturated oils and their fatty acid profile resembles other edible oils.

The operative *citrus* processing industry in the country can yield about 40,000 tonnes of the fruit seeds. Calculations indicate that even this minor source, if exploited, can provide almost 13.2 thousand tonnes (33%) of edible oil. With increasing demand and better agricultural production techniques, more *citrus* fruit will be available for processing in the near future. It is, therefore, strongly recommended that the fruit seeds which are a waste at present, must be sorted out for obtaining the fixed oil.

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