

Technology Section

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THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS

Part XIII. Physico-chemical Studies on the Seed Oils of *Feutral* and *Tangarine* Varieties of *Citrus Reticulata blanco*

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The seed oils of *Feutral* and *Tangarine* varieties of *Citrus Reticulata blanco* obtainable in 34.76% and 41.4% respectively on fresh seed basis, were analysed by gas chromatography to have a fatty acid composition of C 12:O (1.5%, 4.0%), C 14:O (1.9%, 2.1%), C 16:O (26.4%, 27.1%), C 18: O (5.7%, 14.2%) C 18:1 (26.0%, 18.7%), C 18:2 (34.1%, 19.5%), C 18:3 (0.0%, 3.7%) and unknown (3.8%, 0.0%) respectively. The physico-chemical data of the oils was comparable with other citrus seed oils.

Key words: Rutaceae; *Citrus Reticulata blanco*; *Feutral*; *Tangarine*; Seed oils; Fatty acid composition.

INTRODUCTION

Citrus seed oils have been known to be rich with unsaturated fatty acids and these have been classified as linoleic acid oils [1]. Although the manufacture of citrus seed oils is of minor importance, yet it seems to be a well established enterprise at present in several citrus growing countries. These oils have, however, so far received little attention in Pakistan. These oils can be used for edible purposes as well as for soap making.

A knowledge of the physical and chemical properties of citrus seed oils is needed for two main reasons. One of these is concerned with the possible commercial use of these oils when they are recovered in quantity as a by-product of the canning industry. The other reason is due to the possibility that the storage life of the squash (citrus juice) is affected by the presence of small amounts of oils from the crushed seeds that get into it during the juice extraction process.

Considerable amount of physico-chemical data on citrus seed oils is available [2]. So far no research work has been carried out on the seed oils of Pakistani varieties of *Citrus Reticulata blanco* particularly on var. *Feutral* and Var. *Tangarine*. The present communication is an attempt to evaluate the seed oils of minor citrus fruits of Pakistan with a view to find their possible industrial applications.

EXPERIMENTAL

Seeds. *Feutral* fruit was purchased from the local market and a tangarines were collected, when fully ripe from a local nursery. The fruits were cut into small pieces

and the seeds were hand-picked. These were washed thoroughly with water and dried with a cloth. Fresh seeds were used for the oil extraction.

Extraction of the oils. Fresh seeds of the citrus fruits (20 g each) were crushed coarsely and packed in a thimble of Soxhlet apparatus. The seeds were extracted with hexane for 4-5 hr and on removal of the solvent under vacuum, yellow mobile oils were obtained.

Examination of the Oils. The oils were examined for their physical and chemical properties according to standard methods [3] and the results are reported in Table 1. Gas Chromatographic

Analysis of the oils. The oils (1 g. each) were saponified with 0.5M methanolic KOH and the released fatty acids were esterified with methanol in the presence of BF_3 according to the method of Solomon and co-workers [4]. The methyl fatty esters were analysed on Pye-Unicam 204 gas chromatography using 10% DEGS on chromosorb (80-100 mesh column 1.5m x 4mm dia) at 200° with an injection port temp. of 250° . Nitrogen at 40 ml/min flow rate was employed as a carrier gas. The eluting fractions were detected with a flame ionisation detector at 250° . The identification of the constituent fractions were made by comparing their retention times with those obtained from commercially available standard methyl fatty esters and also by co-injection techniques.

DISCUSSION

Feutral and *Tangarine* varieties of *Citrus Reticulata blanco*, classified as loose-skin oranges, are comparatively

Table 1. Physico-chemical properties of seed oils of *Feutral* and *Tangarines*

	<i>Feutral</i>	<i>Tangarines</i>
Yield of oil	34.7%	41.4%
Colour	pale yellow	yellow
Ref. Index (40°C)	1.4635	1.4780
Specific gravity	0.9780	0.8902
Acid value	1.0164	17.52
F.F.A.	0.51	8.8
Saponification value	198.5	221.9
Unsaturated fatty acids	60.6%	42.2%

Table 2. Fatty acid composition of the seeds oils of *Feutral* and *Tangarines* by gas chromatography.

Fatty Acid	C 12:0	C 14:0	C 16:0	C 18:0	C 18:1	C 18:2	C 18:3	C 18:3
<i>Feutral</i>	1.5	1.9	26.4	5.7	26.0	34.1	—	3.8
<i>Tangarines</i>	14.0	2.1	27.1	14.2	18.7	18.7	19.5	3.7

recently introduced species in Pakistan. These belong to the genera citrus of the plant family Rutaceae. Both fruits mature in early December; earlier than other commonly consumed citrus fruits i.e. oranges and 'kinnows'. The juice of *Feutral* is more sweet and less acidic compared to *Tangarine* juice which is less sweet and highly acidic in taste. *Feutral* is 7 to 8 times bigger in size than *Tangarine*. The peel of both the fruits is deep orange or scarlet red in colour.

The seed oil of both varieties of *Citrus Reticulata blanco*, *Feutral* and *Tangarines*, had physico-chemical

properties comparable to other citrus oils [3]. The refractive indexes (1.4635, 1.4780) specific gravity (0.9780, 0.8902) and saponification values (198.5, 221.9) respectively pointed out to good quality vegetable oils except for FFA which was higher in *Tangarine* seed oils. The yield of oils on fresh seed basis were 34.7% and 41.4% respectively (Table 1).

The gas chromatographic analysis revealed the presence of C 16:0, C 18:1 as the major acids in the fatty acid profile of the oils. *Tangarine* seed oil was rich with C 12:0 (14.0%) and C 18:0 (14.2%) as well. C 18:3 was absent in *Feutral* seed oil and it was minor acid (3.7%) in the *Tangarine* oil (Table 2).

The *Feutral* seed oil contained higher percentage of unsaturated fatty acids (60.6%) compared to *Tangarine* seed oil (42.2%) which had more of the saturated fatty acids (57.4%).

From the physico-chemical properties of the oils, one can conclude that compared to *Tangarine* seed oil, *Feutral* seed oil was better from the edible point of view and that crushed seeds of *Tangarines* in its juice will rapidly spoil its quality due to its high FFA contents.

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