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# THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS

# Part IX. Chemical Investigations of *Prunus armeniaca* (Apricot) Fruit Stones – Kernel Oils

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The chemical composition of two samples of fatty oil as well as essential oil of apricot (*Prunus armeniaca*) fruit stone kernels has been determined. The fruit stones were obtained from the northern and southern areas of Pakistan, Peshawar and Quetta. The oil from the kernels of the respective samples

obtained in 45.9 and 45.7 % yield, is composed of myristic (1.2, 5.39 %), palmitic (3.5, 3.04 %), palmitoleic (9.48, 11.07 %), stearic (0.84, 1.95 %), oleic (70.93, 64.68 %), linoleic acid (12.05, 11.83 %) and unsapoifiable matter (1.88, 2.02 %).

#### INTRODUCTION

Apricot trees (*Prunus armeniaca*) and (*Prunus domestica*) grow abundantly in the northern as well as the southern regions of Pakistan. These fruit trees grow from plains to an altitude of 3000 meters (Himalayas, Kilba range forest [1], Bashar, Gilgit Agency and Ziarat). The trees bear fruits in May-October depending upon the climatic region in which they grow. The pulpy portion of the ripened fruit contains (7.5 - 10.5 %) sugar [2]. The ripe fruits also contain almond like seed stones which are dicotyledonous. The seed kernel is generally consumed as an item of food along with other dry fruits.

In a recent survey it has been estimated that 43,700 tons [3] of apricot fruit were produced during 1982-83. In the northern areas of the country, particularly, apricot kernels are not only consumed as an article of food but also expressed in a primitive manner to obtain edible oil. In continuation of the earlier studies [4-11], aiming at screening of indigenous sources the kernel oil from Prunus armeniaca has now been evaluated. The evaluation of the oil from Prunus domestica has already been reported [12]. It has been estimated that almost 500 tons of the edible oil can be obtained from this source alone provided the kernel is, suitably expressed to obtain the oil. Additionally 18 tons of benzaldehyde can also be recovered from the same kernel by steam distillation. It is, therefore, seen that apricot stones can be a good source of an edible oil and an aromatic essence and the seed meal can afterwards be used as an item of food.

#### MATERIALS AND METHODS

Fruit stones obtained from Food Processing Industries (FPI), Peshawar and fruit obtained from Quetta region were broken separately, The kernels were separated and crushed in an iron pestle mortar. The crushed kernels (100 g each) were extracted with petroleum ether (b.p.  $40-60^{\circ}$ ) in a Soxhlet apparatus for 4 hr. The oil was dried over an-hydrous sodium sulphate, filtered and the petroleum ether was distilled off to get pale yellow oils (45.9 g and 45.7 g respectively). Various characteristics of the oils, as determined by standard physico-chemical methods [13, 14], are given in Table 1.

Table 1. Physico-chemical characteristics of the oils.

Sou	irce fordard stations and make	Peshawar	Quetta
1.	Percentage yield of kernels	32.07	27.3
2.	Percentage yield of oil	45.9	45.7
3.	Refractive Index at 25° (Abbe)	1.4710	1.4702
4.	Acid value	1.6	. 1.6
5.	Saponification value	187.7	187.25
6.	Iodine value	92.36	93.5
7.	Maleic anhydride value	6.8	5.7
8.	Sp. gravity at 25°	0.9192	0.9192

Saponification of the oil, liberation and methylation of the fatty acids. The oils (2 g each) were saponified separately with 0.5N ethanolic sodium hydroxide solution (20 ml each) under reflux for  $\frac{1}{2}$  hr. The fatty acids were liberated from the saponified mass by 2N sulphuric acid (1.962 g, or 98.1 % and 1.9596 or 97.98 % respectively). The liberated acids were converted to their methyl esters by reacting with methanol in the presence of concentrated sulphuric acid.

i. Spectrophotometry and chromatography of the methylated acids. The purity of the fatty acid methyl esters was checked by infrared spectrophotometer (Beckman-18 Model 5A) at 1380 cm<sup>-1</sup> (CH<sub>3</sub> bend), 1460 cm<sup>-1</sup> (CH<sub>2</sub> bend), 2860 cm<sup>-1</sup> (CH<sub>3</sub> stretch), 2940 cm<sup>-1</sup> (CH<sub>2</sub> stretch) and 1760 cm<sup>-1</sup> (C = 0 stretch).

ii. Gas chromatography [15]. Methyl esters of the total fatty acids were analysed on a Pye Unicam 104 gas chromatograph with a flame ionization detector using ¼" i.d. 4 ft glass column of 10 percent diethylene glycol succinate, coated on 80-100 mesh celite, column temp. 160°, injection temp. 200°, detector temp. 250° and with nitrogen as the carrier gas at a flow rate of 30 ml/min. The methyl esters were indentified by comparing their retention times and co-injection of standard esters. The percentage of various acids was determined using Pye Unicam DP 88 computing integrator and are recorded in Table 2.

from Peshawar and Quetta were obtained by saponification. The low saponification value (187.25 and 187.7) of the oils indicate the presence of fatty acids having long-carbon chain. The oil contains a high proportion of unsaturated acids (iodine value, 92.36 and 99.5). The maleic anhydride value (6.80 and 5.7) predicts the presence of a low percentage of acids having conjugative structure. The methyl esters of the total fatty acids were subjected to gas chromatography and were found to consist of myristic acid, palmitic acid, stearic acid, palmitoleic acid and oleic acid (Table 2). The major constituents of the two oil samples is oleic acid (70.93 and 64.68 % respectively). Oleic and linoleic acid contents of the two apricot-kernel oils are in close agreement with those of almond oil [17] and Olive oil [18]. Thus apricot kernel oil can be a good supplement of almond oil as well as of olive and can be used for edible purposes.

After removing the fattty oil from the crushed kernels meal the mass was macerated and then steam distilled. Benzaldehyde thus obtained was treated with sodium sulphite and redistilled to get Hydrocyanic acid free natural benzaldehyde (yield, 1.13 %) which has its own undisputable place in food and cosmetic industry.

Table 2. Percentage of various acids present in the fatty portions of apricot oils.

Source	Myristic acid (5)	Palmitic acid (%)	Palmitoleic acid (%)	Stearic acid (%)	Oleic acid (%)	Linoleic acid (%)
Peshawar	1.2	3.5	9.48	0.84	70.93	12.05
Quetta	5.39	3.04	11.07	1.95	64.68	11.83

Recovery of Benzaldehyde [16]. Apricot kernels meal (865 and 1285 g) respectively obtained from the samples from Peshawar and Quetta region was macerated with ten parts of water for about 12 hr. at temperature ranging from  $50^{\circ}$  to  $60^{\circ}$ . The emulsin, thus set free, hydrolysed the glycoside amygdalin to yield the benzaldehyde.

 $C_{20}H_{27}NO_{11} + 2H_2O \rightarrow C_6H_5CHO + HCN + 2C_6H_{12}O_6$ (amygdalin)

The mass was cohobated to get volatile oil consisting entirely of benzaldehyde (8.82 g, 1.02 % and 15.93 g, 1.24 %). The oil was freed from hydrocyanic acid by adding sodium sulphite and redistilling the oil.

#### **RESULTS AND DISCUSSION**

The fatty oil from kernels was obtained by solvent extraction and the fatty acids from two samples obtained

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The present studies are a part of a systematic properties or continer scherely the physical and themical properties or the ait; abtained from the local estimations are being ecomened with a size to producing there locally and redicing or completely stopping their dreat or indiffect imports. This communication descriptivities physico-channiting characteristics of the essional ods from the final part of analyses, stanows and temors along with the oil yield of analyses, stanows and the three oils are also described The terpenet fractions of the three oils are also described and their composition on the basis of ceterprination given

### ATMAMATYA

Extraction of peel cils Anota 2 kg peels of a offits from were crashed finely and the sent-solid material was manuferred along with assistings with (so heres of water to a 5-litter flask. The whole mass was subjected to steam distillation for 4 his. The oily layer was separated from the distillate and the fishesons layer was estrateded from the pure because (2 s 100 ml). The extincted such and layer water continued and dired over antisydrous selations alphate, Most of the solvent was distified from the extract on a water bath and last trace were tendeed at low temperature under vacuum. The resulting give the off from the peels, the generating pield of oils from different fruits has been reported in Table 1.

Separation is the ministerprine, the distance cach, wells reparately absorbed on matter duca get (50 g) and cluted with hexane (200 mit). The dombined hexane enmatts were fixed from the solvent by rotary evaporator to yield offy reactives. TLC examination of chose residues showed that they were simile and materials. The columns (Pergamon Press Oxford, London. Paris, New York, 1981), 1st ed. pp. 127-30.

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#### KOLTOURIUH INO

A variety of citrus fruits, sech as images kinatows and lemona (N.O. Rutscand) are available in Peksetro. The fruits are generally processed for trust juices and squadres and their peels which are a by-product, backs and the ultrus processing inflatory, are opaques for varieus means of the ultrus oils [1]. The need only of these truits no writely used as flavours alone or in constituation with other offs in beverages, ice creame, based foods, pharma-central emulsions, conflectionery and other such products. These exernial ruls

Autong the citrus of a crange, lemon and line peel offs are produced and uarded on large scala in world market. In Pakisten orange and lemon offs are produced on a fautico scale by the citrus processing moustry, Locally produced orange oil is used only in substandard products but her quality products. Terpeneteus orange oil is imported all linese citrus oils are being interacted grasently and then animal direct import roots user over Rs. 25 relifions These are also being imported intractly for relifions of impose as hereing concentrates, for creating and other affield products, where these are any other for relifions of

Atthough extensive research work has been carried out on the fitrus oak in the cantaits world [2], no senous research and development studies have been innearaken in Fakistim. Out country is not will respect to aftrus frame and this availability can be embanced nomifold provided industrial utilization of these frams is shown Recently a process has been developed on pilot plant scale as an ADP project in the PCSR fators for the deterpenation of the locally produced orange of