

## CHARACTERISTICS AND CHEMICAL COMPOSITION OF *CITRULLUS COLOCYNTHIS* SEED OIL

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The seed oil from *Citrullus colocynthis* Schrad (N.O. Cucurbitaceae) was analysed for its physical characteristics and fatty acid composition. The data obtained for the iodine value, saponification value and fatty acid composition compare well with other edible oils. Gas-liquid chromatographic analysis revealed it to be a rich source of both oleic (24.1%) and linoleic acids (51.3%), besides palmitic (12.8%) and stearic acids (9.8%).

**Key words:** Fatty acids, Cucurbitaceae, *Citrullus colocynthis*, Oils.

### Introduction

*Citrullus colocynthis* Schrad, known as "Indrayan" (Urdu) "Tooh" (Sindhi) and "Bitter apple" or "colocynth", belongs to the Cucurbitaceae family. It grows wild in the desert areas of Sindh and Punjab provinces and produces a yellow apple-like fruit which is cathartic, useful in biliousness, constipation, fever and intestinal parasites [1]. The seeds are used by the natives in some dietary preparations. They contain 17% oil which is used in burning of lamps and as a hair dye [2].

Although *Citrullus colocynthis* is abundantly available in Pakistan, no detailed analysis of its oil has been reported in the literature. It was, therefore, decided to undertake the present studies and evaluate the use of oil for edible purposes.

### Experimental

**Examination of the oil.** The seeds of *C. colocynthis* were obtained from desert area of "Thar" district of Sindh. The seeds were crushed in a electric grinder and extracted with hexane in a Soxhlet extractor. The extract was dried over sodium sulphate (anhyd.) and the solvent removed under reduced pressure. The physico-chemical properties of the oil, as determined by AOCS methods [3] are recorded in Table 1.

**Methylation of fatty acids.** The colocynth oil (5 g) was saponified with 0.5 N alcoholic potassium hydroxide (50 ml) for 5 hrs. After removal of the unsaponifiable matter with diethyl ether, the soap solution was acidified with dilute sulphuric acid and the fatty acids extracted with diethyl ether. After removal of the solvent, the fatty acids were converted into their methyl esters by methanol-sulphuric acid and checked by TLC and IR.

**Gas chromatography of methyl esters.** The methyl esters were subjected to gas chromatography using a G.C. -9A Shimadzu gas chromatograph fitted with a flame ionisation detector. Other parameters were as follows:

Column length 2100 mm and i.d. 3 mm, column material GP 3% SP 2310/2% SP 2300 on Chromosorb WAW 100-120 mesh, carrier gas nitrogen, flow rate 30 ml/min., initial column temp. 150° final column temp. 250° rate 5°/min., injector and detector temp. 300°.

The identity and percentage composition of the constituent fatty acids were determined from their retention times and peak areas. Confirmation was made by coinjection of the authentic standard methyl esters.

TABLE 1. PHYSICO-CHEMICAL CHARACTERISTICS AND FATTY ACID COMPOSITION OF *CITRULLUS COLOCYNTHIS*.

	Present studies	Sawaya <i>et al.</i> [6]	Abu Nasr <i>et al.</i> [5]
1. Yield %	18.6	26.1	18.1
2. Acid value	3.20	2.75	1.8
3. Saponification value	188.4	202.45	191.6
4. Ref. index	1.4730 (@20°)	1.4655 -	1.4741 (@25°)
5. Sp. gravity	0.9145 (@32°)	- -	0.9200 (@25°)
6. Iodine value	129.8	123.9	129.1
7. Colour in 10mm lovibond cell	0.8R+10Y	-	-
8. Unsaponifiable matter	2.17	2.15	1.0
<i>Fatty acids composition (%)</i>			
C 14 : 0	0.46	0.40	1.2
C 16 : 0	12.90	13.5	8.9
C 16 : 1	-	-	1.2
C 18 : 0	9.80	10.5	5.6
C 18 : 1	24.10	25.0	17.2
C 18 : 2	31.30	50.5	65.0
C 18 : 3	0.40	-	-

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### Results and Discussion

The physico-chemical characteristics of the oil of *Citrullus colocynthis* seeds are shown in Table 1. The oil had a relatively high iodine value (129.8) thus reflecting a high degree of unsaturation. Other properties i.e. saponification value, acid value, specific gravity and refractive index are also similar to those of corn, soybean and sunflower oils [4].

The GLC analysis of the methyl esters showed over 75% of unsaturation linoleic acid was found to be the dominant fatty acid (51.3%) followed by oleic (24.1%), palmitic (12.9%) and stearic acids (9.8%). Minor quantities of myristic acid (0.46%) and linolenic acid (0.40%) were also detected (Table 1). These results differ completely from those reported by Abu Nasr [5], who found a higher content of linoleic (65.0%) and myristic acids (1.2%) and lower percentage of oleic (17.2%), stearic (5.6%) and palmitic acids (8.9%) than the present studies. They also reported the presence of hexadecenoic acid (1.2%), which has not been hitherto found by any other worker. On the other hand, the fatty acid composition obtained by Sawaya *et al.* [6] is very comparable to this work. They reported palmitic (13.5%), stearic (10.5%), oleic (25.0%) and linoleic acids (50.6), (Table 1). They also indicated that the nutritional value of colocynth oil was similar to that of corn oil and there was no toxic effect on animals (chicks). The difference in fatty acid composition might be due to different soil and climatic conditions.

From the above results it is evident that the colocynth oil falls in the category of linoleic-oleic acid rich group of edible oils e.g. soybean, corn and sunflower oils [7].

Being resistant to drought and high temperatures, it might have a good potential as an edible oil seed crop in desert areas

of Pakistan and other arid and semi arid zones of the world, where it is abundantly available. The plant can be easily cultivated on a commercial basis (in sandy regions) as it does not require much water or care for its propagation.

*Colocynthis citrullus* L. is sometimes mistaken for *Citrullus colocynthis* Schrad. The former is a synonym of *Citrullus vulgaris* i.e. water melon [8].

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