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COMPARATIVE STUDIES ON THE COMPOSITION OF TWO INDIGENOUSLY PRODUCED VARIETIES OF JAMAN (EUGENIA JAMBOLANA) FRUITS

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ABSTRACT

Eugenia Jambolana (Syzigium Cumini) locally known as Jaman, is being used in the indigenous Medicinal system for treatments of various ailments including some related to nutrition. No study appears to have been made previously regarding the composition of these native varieties produced in Northern Pakistan. Two varieties of fruits have been analyzed for physico chemical characteristics and their values compared. The findings indicate that both varieties contain adequate amount of nutrients and minerals; in general, variety I being richer in the former and II in the latter.

Introduction

Eugenia Jambolana Lam (Synonym Syzyguim Cumini L.) commonly known as Jaman (Family: Myrtaceae) is cultivated in the plains of Northern Pakistan (Steward et al, 1972). It is a relatively uncommon fruit but is very important because of its medicinal and allied effects.

Two prominent varieties, based on the type/size of the fruits are grown in Northern Pakistan. The fruit of one variety (I) is big oblong deep purple or bluish in colour having juicy sweet flesh with big oblong seeds. The other variety (II) has small round fruit with sour flesh and small round seeds. Jaman fruit is known to have therapeutic or culinary uses (Mitton 1982). It is said to be one of the most important vegetable source possessing high- blood sugar lowering effect in diabetic patients, (Mitton 1982; Akhtar and Khan 1987, Gopalan et al., 1971; Zaman and Khan 1970, Shortri ct al., 1963). In local medicine system it is also indicated in diarrhoea with gripping while its action is said to be astringent and carminative (British Herbal Pharmacopaea 1976) Dosages, in terms of both, the milled powder and fluid extract as prepared from the seeds, are cited in literature (British Herbal Pharmacopaea 1976; Steinmetz 1961). The utilization of Jaman

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seed in poultry rations of growing chickens (Bosee et al, 1953) and cattle feed (Keharand Schai 1950) has also been investigated and no detrimental effect on growth has been reported. As a relish the fruit is commonly consumed fresh but for medicinal purposes it is generally dehydrated and powdered and taken in appropriate dosages. Inspite of its importance and comparatively large scale recent cultivation in this region, no information regarding its composition and nutritive value, is presently available in literature.

It was, therefore, considered appropriate to undertake an investigation of the chemical constituents of the two varieties of Jaman fruit with *a view* to assessing its nutritional composition and compare it with each other as well as with the composition of fruit grown elsewhere.

Material and Methods

Both the varieties of Jaman fruits were purchased from the local market of Peshawar. After washing physical properties of the fruit were examined for size, weight, edible, portion, seed and moisture etc. For its nutritional constituents etc., the washed whole fruits were crushed in a grating machine. The crushed mass was heated to approximately 70°C before extraction of juice by hand pressing. The juice was filled hot into clean sterilized glass bottles and stored over night in a refrigerator in order to allow any suspended material to settle down and then finally filtered. Ascorbic acid, pH, total soluble solids, citric acid and tannin were determined by the methods described in AOAC (AOAC, 1975). Sodium and potassium were determined by flame photometric method (Baland 1965) Sugar were determined by the standard method as described by Lane and Eynon (Lane and Eynon 1923) and total anthocyanin pigments *were* determined by the method described by Less and Francis (Lees and Francis 1972) as modified by Khyrdiya and Roy (Khurdia and Roy 1985) Calcium, iron, magnesium, Phospphorous potassium and sodium contents of the whole fruits and seeds alone, were also determined. These estimations were made in the ash solutions which were prepared in a manner consistent with that of AOAC.

Results and Discussions

Table 1 shows the physical characteristics of the fruit normally produced in the Northern parts of Pakistan. As can be seen, the large size fruit (I) was about 3 times bigger than the small one (II) and its weight 4-times that of fruit II. Data on percent edible portion and seed of the two varieties revealed that both comprise of about 70% edible portion and 30% seeds and thus were similar. The high percentage of edible portion in both the varieties make them suitable for the extraction of the juice as a major channel of the fruit utilization.

Table 1
Physical characteristics of two local varieties of Jaman fruits

Variety	Average Size[a]		Shape Index[a]	Average Weight per[a]		Edible portion	Edible portion	Seed	Moisture		
	L	D		Fruit	Seed	Fruit	per fruit		Whole fruit	Edible portion	Seed
	cm	g	g	g	%	%	%	%	%	%	%
Big oblong (I)	2.69 ± 0.22 (10)	2.31 ± 1.83 (10)	1.21 (10)	8.80 (10)	2.60 (10)	6.20 (10)	70.45 (10)	29.55 (10)	78.65 (10)	88.39 (10)	55.44 (10)
Small round (II)	1.52 ± 0.18 (20)	1.50 ± 0.19	1.01 (20)	2.25 (40)	0.65 (20)	1.60 (20)	69.77 (20)	30.23 (20)	79.03 (20)	87.19 (20)	60.23 (20)
Big oblong-to small round ratio (I-II)	1.77	1.54	1.20	3.91	4.00	3.88	1.01	0.98	1.00	1.01	0.92

The values represent the mean of several smaples/observations. The figure in parenthesis is the number of smaples/observations.

[a]Mean and Standard deviation are given: L = Length, D = diameter

Table 2

Total soluble solids, acid, sugars and tannin of extracted juice from whole grated fruits (Jaman)

Variety	pH	Total Soluble solids	Acid as Citric	Total soluble solids/ acid ratio	Redu-cing	Sugars Non-Redu cing	Total	Ascorbic acid	Tannin	Total Anthocy-anin pig-ments
		%	%	%	%	%	%	mg%	mg%	mg%
Big oblong (I)	3.38 ± 0.33 (3)	0.9 ± 0.36 (3)	0.7 ± 0.08 (3)	12.9 ± 0.66 (3)	8.16 ±0.08 (3)	N.D.[a] (3)	8.16 ±0.06 (3)	4.0 ± 0.36 (3)	31[b] ± 1.00 (3)	9[b] ± 0.36 (3)
Small Round (II)	3.62 ± 0.28 (3)	11.0 ± 0.30 (3)	1.4 ± 0.26 (3)	7.9 ± 0.62 (3)	8.45 ± 0.13 (3)	N.D.[a] (3)	8.45 ± 0.10 (3)	2.7 ± 0.26 (3)	333 ± 10.54 (3)	71 ± 3.61 (3)
Big oblong-to-small round ratio (I/II)	1.06	0.8	0.5	1.6	0.97	N.D.[a]	0.97	1.5	0.1	0.1

[a]N.D. = Not detected.

b = extracted from pulp only.

Table 3
Mineral constitutents, ash and dry matter of Jaman fruit

Variety	Caldium mg%	Iron mg%	Magne-sium mg%	Phos phorous mg%	Potassium mg%	Sodium mg%	Ash %	Dry matter %
Juice[a]								
Big oblong (I)	-	-	-	-	138.0 ±8.25 (3)	10.3 ± 1.50 (3)	-	-
Small round (II)	-	-	-	-	164.7 ± 4.95 (3)	7.6 ± 1.15 (3)	-	-
Big oblong-to-small round ratio (I/II)	-	-	-	-	0.84	1.36	-	-
Whole Fruit								
Big oblong I	15.9 ± 1.40 (3)	4.8 ± 0.20 (3)	30.0 ± 3.46 (3)	45.1 ± 2.67 (3)	128.6 ± 10.24 (3)	5.5 ±0.56 (3)	0.49 ± 0.07 (3)	21.35 ± 1.21 (3)

Variety	Caldium mg%	Iron mg%	Magnesium mg%	Phosphorous mg%	Potassium mg%	Sodium mg%	Ash %	Dry matter %
Small round II	34.0 ± 2.65 (3)	5.3 ± 0.36 (3)	62.1 ± 7.09 (3)	48.8 ± 3.02 (3)	160.1 ±8.92 (3)	10.1 ±1.15 (3)	0.61 ±0.02 (3)	20.97 ± 1.99 (3)
Big oblong-to-small round ratio (I/II)	0.47	0.91	0.48	0.92	0.80	0.54	0.80	1.02
Seeds								
Big oblong I	23.1 ± 2.18 (3)	5.8 ± 0.40 (3)	48.2 ± 3.41 (3)	76.3 ± 3.64 (3)	290.8 ± 10.83 (3)	16.5 ± 2.40 (3)	0.99 ± 0.13 (3)	44.56 ± 1.47 (3)
Small round II	61.5 ± 3.16 (3)	6.2 ± 0.53 (3)	68.2 ± 4.21 (3)	92.2 ± 4.26 (3)	352.7 ± 13.16 (3)	23.6 ± 2.41 (3)	0.95 ± 0.04 (3)	39.77 ± 1.45 (3)
Big oblong-to-small round ratio (I/II)	0.38	0.94	0.71	0.83	0.82	0.7	1.04	1.12

[a]Extracted from whole grated fruit.

Not much difference was noted in the pH of Juice from the two varieties (Table 2). The man constituents of the soluble solids are the sugars and it is known that the sugar content of the juice increases steadily as the fruit matures on the tree (Lees and Francis 1972). The fruit of variety I, had slightly lees T.S.S. (9.0%) with 0.7% acid and that of II slightly more T.T.S. (11.0%) but with double the acid content and the T.S.S./acid ratio of 13 and 9 respectively (Table 2). In view of the above it was not surprising to note that the fruit of variety l with higher T.S.S./acid ratio was less sour to taste than variety II. The sugar to acid ratio which was 11.7 for I, and 6.4 for II is also in line with above and explain further the taste characteristics of the two varieties. It has been reported that for sweet taste this ratio should be about 40 (Khurdia and Roy 1985). The entire sugar content of both the fruit was found to comprise of reducing sugars i.e., glucose and fructose, while no sucrose was detected (Table 2). In order to check the results, paper chromatography for the detection of individual sugars in the two juices was conducted using arabinose, fructose, galactose, glucose, maltose, man-nose and sucrose as the standard markers. The results indicated only the presence of cructose and glucose. Similar findings have been reported by earlier workers (Bobbio-Adilma et al., 1982; Wali and Hasan 1966; Lewis et al., 1957). The ascorbic acid con-tent of variety (I) was about 30% higher than the variety (Il) which indicate the higher content of this acid in variety (I). It is possible that the difference may be related with the stage of maturity in the two fruits examined. In literature it has been reported that ascorbic acid increases till 58th day after the onset of fruit and declines thereafter (Shukla and Prasad 1980). Tannin in variety (I) and (II) were 31mg% and 33mg% respectively. The increase in temperature during grating/pulping is known to increase tannin besides other constituents (Khurdia and Ray 1985) a difference in heating temperature may as well be partly responsible for the increases in tannin II. Total anthocyanin pigments in 1 was 9.0mg% while in II was 71.0mg%. The extraction of antnocyanin is reported to be temperature and process dependent. In one such report (Khurdia and Ray 1985) anthocyanin pigments ranging from 14mg% to 245mg% to 245mg% have been observed in the Jaman fruit and our finding fall within these range.

Potassium and sodium are important mineral constituents of fruits and fruit juices, and perform vital physiological functions in the body. Sodium which exists abundantly in normal food products, is particularly contra-indicated in some conditions. In foods, the one with sodium content less than 30mg% is considered as low sodium food (Bhutani et al., 1989) and under this criteria Jaman can be listed as a low sodium food. The potassium (Table 3), on the other hand, was found adequate (164.7mg%) and 138.0mg%) which is desirable and beneficial for health under certain conditions such as hypertension etc. Sodium and Potassium have also been examined in whole fruits and seeds alongwith other minerals. It is apparent from Table 3 that like. The Juice and whole fruit, the seeds were also rich in minerals particularly potassium, which happened to be the highest

amongst the minerals studied. The values for other minerals (Fe, P, Mg, Ca and Na etc.) were also appreciable, Reports in literature indicate that Fe accumulates in the fruit upto 52 days after fruit set, followed by a decline thereafter (Lewis et al., 1957).

Other minerals (especially trace-elements like Cr. and Zn) which realportedly have a beneficial role in diabetes, (F.H. Shah Personal communication) could not be assessed at present. However we have a plan of study *for* the determination of these in the local plant sources used in folk medicine, in the near future. It may not be out of place to mention that Jaman seeds and dehydrated fruits powder is used extensively in the folk medicine for the treatment of Diabetes Mellitus in the Indo-Pak subcontinent and it is just possible that the beneficial action may be due to the special mineral composition of the seed and fruit.

In this regard we intend to undertake pharmacological studies in animals in the near future.

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