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COMPOSITION OF GURGURA (REPTONIA BUXIFOLIA) FRUITS AND ITS SEED OIL

ABDUL JABBAR and FAQIR MOHAMMAD

PCSIR Laboratories, Peshawar

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Abstract. The fruit of gurgura *Reptonia buxifolia* was investigated for its constituents. Ascorbic acid and other acidic principles are present in smaller amounts than in other fruits. Amongst the sugars, fructose and glucose has been detected. The seeds of the fruits were analysed and the oil extracted. The characteristics of the oil are reported. A preliminary examination of the pigment showed that the major part of the colouring matter is composed of anthocyanins.

Reptonia buxifolia (Myrsinoceae) is a xerophytic olive-like tree, locally known as gurgura. It grows in abundance in the hilly areas of Peshawar (tribal belt), the trans-Indus hills, the Salt Range (Punjab) and also in the Himalyas at altitudes between 2000–3000 ft. It is found growing in association with olea, saycretia and *Acacia modesta*. It is a small tree with thick obovate leaves, hoasy branches and small yellowish grey flowers. The fruit is of 0.6–0.8 cm dia, round in shape, fleshy in texture, bluish black and contains one or, rarely, two seeds. It is edible and consumed both fresh and in dried forms. The fruit comes to market in late July or early August. Some of the harvest is consumed fresh, the rest of it is sun-dried and available in the market throughout the year. Though the fruit has an appealing taste and flavour and a highly attractive colour, and is highly relished by the local populace, yet little is known about its nutritive value and physicochemical characteristics. Thus the present studies were undertaken to determine the proximate composition of the fruit and the physicochemical characteristics of its oil. The seed of the fruit was also analysed for its chemical composition. The colouring material isolated from the flesh of the fruit and the oil extracted from the seeds were analysed in greater detail.

Material and Methods

Fresh gurgura fruit was purchased from the local market, rinsed with tap water to remove dirt and placed on blotting paper to remove the adhering moisture, packed in polyethylene pouches and stored in a deep freezer at about —12°C.

Preparation of Samples

Ascorbic Acid Determination. The fruits (50 g) were soaked in 200 ml, 1% v/v acetic acid solution for 15 min. The soaked fruit and the extract was transferred to the metallic cylinder of a mechanical stirrer, and stirred slowly and intermittently for 10 min. The fleshy part was completely separated from the seeds. This operation was carried out carefully to avoid any injury to the seed. The content of the cylinder was filtered on a Buchner funnel and the residue washed several times with several portions of 1% acetic acid. The filtrate was transferred to a 500-ml volumetric flask and made up to the mark.

Sugars and Total Acidity Determination. The fruits (50 g) were soaked in about 200 ml distilled water for extraction. After about 1 hr, the contents were transferred to the cylinder of a mechanical stirrer and stirred as described under ascorbic acid. The volume of the extract obtained was made up to 500 ml and 100 ml aliquot was clarified for sugar determination, by the method of Lane and Eynon cited by Ruck.[1] The extract was treated for the determination of % acidity expressed as citric acid.

Oil Extraction from the Seeds. The fruit was soaked overnight in acidified methanol and the extract was utilized for anthocyanin investigation. After screening, the flesh was removed from the fruit manually. The seeds were separated, washed thoroughly in running water and dried in a cabinet dehydrator at 60°C for about 4 hr. The dry seeds were crushed in a grinding mill to about 20 mesh size. The powder was used for the extraction of the oil in a Soxhlet using petroleum ether as a solvent.

Determination of Constituents

Determination of Ascorbic Acid. The extract of the fruit prepared for this purpose is highly coloured and the indophenol method does not work satisfactorily because red and pink pigments obscure the end-point. Therefore, the N-bromosuccinimide method was used. The following procedure was adopted in broad outlines.

The sample was diluted with 1% v/v aq acetic acid until it contained from 0.4 to 1 mg of ascorbic acid per 5 ml of solution. The diluted sample (5 ml) was transferred to a 15 × 2.5 cm test tube. Glacial acetic acid (1 ml) and 5 ml potassium iodide solution were added and mixed. Then 3 ml diethyl ether was added and the mixture was titrated with N-bromosuccinimide solution. The end-point is

indicated by the appearance of the brown colour of liberated iodine in the upper ether layer.

Titratable Acidity. Fresh fruits (10 g) were taken for determining total titratable acidity. This was carried out by titrating an aliquot of the water extract with standard sodium hydroxide to pH 8.1 using a pH meter.[1] Per cent acidity as citric acid was calculated from the total titratable acidity.

Sugars. One hundred ml of the prepared extract were poured into a 500-ml beaker, and about, 1.7 ml of a 22% potassium oxalate solution was just sufficient to precipitate the excess lead acetate completely. The solution was transferred to a 500-ml volumetric flask and the volume made up to the mark. This was then thoroughly stirred and filtered through Whatman filter paper No. 4. A portion of the extract was again tested for Pb and taken for the determination of sugars.

Reducing Sugars. The clarified extract (50 ml) was poured into a 100-ml measuring flask and the volume made up to the mark. This solution was titrated against a standardised Fehling solution.

Total Sugars. The clarified solution (50 ml) was poured into a 250-ml flask, and 5 g citric acid and 50 ml water were added. The mixture was boiled gently for 10 min to invert the sucrose and cooled. The solution was transferred to a 250-ml volumetric flask and neutralised with 20% sodium hydroxide using phenolphthalein as an indicator and the volume made up to the mark. This solution was titrated against 10 ml standardised Fehling solution. After determining the total sugars, the nonreducing sugars were obtained by calculating the difference.

Free Sugars. A portion of the clarified solution was vacuum-concentrated. It was then used for the free sugars identification by the normal chromatographic procedure using butanol–ethanol–water (4:1:5) solvent and allowing the chromatogram to develop for 48 hr. Both silver nitrate and Partridge reagents were used as spraying reagents. The chromatogram was developed with silver nitrate reagent prepared by the procedure of Warsi[2] and Partidge.[3] Fresh gurgura fruit contains moisture, 54.8%; citric acid, 0.202%; ascorbic acid, 6 mg/100 g; reducing sugar, 20.48%; nonreducing sugars, 3.22% and total sugars, 23.77%.

The seeds were subjected to routine analysis for moisture, ash, protein, starch, fibre, carbohydrate, and crude oil constituents, using the methods recommended by A.O.A.C.[4] The data are presented in Tables 1 and 2.

Extraction of Seed Oil

The sample prepared for this purpose was extracted with light petroleum ether (b.p. 40°C) using a Soxhlet. The oil obtained was heated to 100°C and then filtered and dried (Na_2SO_4). The red colouring pigments were removed with charcoal and subjected to a high vacuum at 40°C to eliminate traces of petroleum ether that might have been present. The oil so obtained was stored at room temperature in amber-coloured bottles for further examination.

Characterisation of the Oil

The oil was analysed for specific gravity, refractive index, free fatty acids, acid value, peroxide value, saponification value, insoluble acid (Henner value), per cent unsaponifiable matter, iodine value, thiocyanogen value, according to the methods recommended by A.O.A.C.[4]

Results and Discussions

A general look on the composition of the fresh fruit would reveal that it has considerable nutritional value. The ascorbic acid content is lower than in some other fruits, but taking into consideration the large proportion of seed in the fruit (60%), the amount on a seed-free basis, i.e. 150 mg/100 g, is considerable.

As regards sugars the results show that alongwith reducing sugars, nonreducing sugars are also present, however, the major part is composed of reducing sugars.

The composition of gurgura seed and a comparison with other seeds, such as almonds and soyabeans, is given in Tables 1 and 2.

The seed forms the major part of the furit. It contains 17% oil on a moisture-free basis. Characteristics of the oil are specific gravity, 0.9109 (34.5°C); refractive index, 1.4672 at 34.5°C; free fatty acid, 1.4%; acid value, 0.55; peroxide value, 61.90; saponification value, 188.80; insoluble acids (Henner number), 95.3; per cent unsaponifiable matter, 1.25; iodine value, 118.3; thiocyanogen value, 74.84; saturated acids, 12.27; Reichert–Meissl value, 0.49; Polenske value, 0.29; and unsaturated acids, 97.20. Saponification value and iodine value are compared with those of almond, corn, olive, peanut, poppy seed, sesame and sunflower oil (Table 3). No significant difference is noticeable in the saponification value of these oils. The

TABLE 1. COMPOSITION OF GURGURA SEED.

Sample	Moisture (%)	Ash (%)	Crude oil (%)	Protein (%)	Carbohydrate (%)			
					Total	Available	Starch	Fibre
As such	4·5	1·30	16·90	10·80	66·50	59·03	10·98	7·47
On moisture-free basis		1·36	17·70	11·30	69·63	61·81	11·50	7·82

TABLE 2. COMPOSITION OF GURGURA SEEDS, ALMONDS AND SOYABEANS.

	Gurgura seeds (%)	Almonds (%)	Soyabeans (%)	Basis
Crude oil	17·70	56·60	19·60	Moisture-free
Protein	13·70	45·20[4]	53·20[4]	Moisture and fat-free
Ash	1·65	7·30	6·20	,, ,, ,, ,,
Total carbohydrates	84·60	47·60	9·90[3]	,, ,, ,, ,,
Fibre	9·50	6·40	6·90	,, ,, ,, ,,

TABLE 3. COMPOSITION OF GURGURA SEED OIL AND OTHER OILS.

	Saponification value	Iodine value
Gurgura seed oil*	188·8	118·3
Almond oil[7]	183–196	95·102
Corn oil[7]	190	117
Olive oil[8]	188–196	78–86
Peanut oil[7]	185–192	83–95
Poppy seed oil[8]	188–196	132–142
Sesame seed oil[8]	187–193	104–116
Sunflower seed oil[8]	190	139

*This study

iodine value of gurgura, corn and sesame oil are about the same.

In the chromatographic studies the extract usually showed a spectrum of glucose and fructose on the paper chromatogram, which was reproducible with different solvent systems. The former seems in greater proportion, as judged from the colour intensity of the spots on the chromatogram. The authentic samples of various sugars were applied on the same chromatogram for comparison.

The dense colouration of the fruit indicates that it contains a high concentration of intensely-coloured pigments; preliminary chromatographic studies showed that the majority of the pigments belong to the anthocyanin group. Chromatographic investigations further revealed that three distinct bands could be observed. Glycosides of cyanidin were provisionally identified. Further studies on this subject are underway and a detailed report will be made in our next communication.

References

1. J.A. Ruck, *Chemical Methods for Analysis of Fruit and Vegetable Products* (Canada Department of Agriculture, 1963).
2. S.A. Warsi, Ph. D. thesis, University of Wales, U. K., 1957.
3. S.M. Partridge, Nature, **270**, 1958 (1946); Biochem. F., **42**, 238 (1948).
4. *Official Methods of Analysis* (A.O.A.C., Washington, 1955), eighth edition.
5. A.M. Altschul, *Processed Plant Protein Foodstuffs* (Academic, New York, 1958).
6. G.S. Jamieson and S.I. Gertler, Oil Fat Ind., **77**, 371 (1930).
7. E.W. Eckley, *Vegetable Fats and Oils* (Reinhold, New York, 1954).
8. H.G. Kirschenbauer, *Fats and Oils* (Reinhold, New York, 1960), second edition.