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Some Physico-Chemical Characteristics and Mineral Contents of Gilaburu (*Viburnum opulus* L.) Fruits in Turkey

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***Abstract*—**Gilaburu (*Viburnum opulus* L.) grown naturally in Anatolia. In this study, some physico-chemical (sugar, acid, protein, crude fat, crude fiber, ash etc.) characteristics and mineral composition of Gilaburu fruit have been investigated. The length, width, thickness, weight, total soluble solid, protein, crude ash, crude fiber and crude oil of fruit were found to be 1.12 cm, 1.58 cm, 1.87 cm, 0.87 g, 14.73 %, 0.2 %, 0.11 %, 6.56 % and 0.4 %, respectively. The seed of fruit mean weight, length, width and thickness were determinated as 0.08 g, 7.76 cm, 7.67 cm and 1.66, respectively. In addition 27 mineral elements (Al, Mg, Na, Ba, Ca, Ni, Cd, P, Cr, Pb, S, Cu, Se, Fe, K, Sr, Li, Z, V, Ag, Bi, Co, Mn, B, Ga, In, Ti) were analyzed. Gilaburu (*Viburnum opulus* L.) fruit was richest in potassium (10764.764 ppm), Mg (1289.088 ppm) and P (1304.169 ppm).

***Keywords*—**Gilaburu (*Viburnum opulus* L.), nutritional properties, physico-chemical properties**.**

I. Introduction

Viburnum opulus L. fruit, which is called "Gilaburu" in Turkey. It is known as "Guelder rose", "Crampbark" and "European Cranberry bush". Gilaburu is a member of the *Caprifoliaceae* family and grown in Middle Anatolia region [1, 2]. There are four species of Gilaburu in the flora of Turkey: *Viburnum opulus* L., *V. lantana* L., *V. orientale* Palas and *V. tinus* L. [3, 4]. Gilaburu has been prepared as a traditional drink from the fruits of *V. opulus* L. in Anatolia and some parts of Europe and Asia [2, 5, 6, 7]. Bushy shrub of Gilaburu is 2-4 m high and utilized as dried fruits, pickle and jam. Gilaburu fruits have dark red colour and are collected october or november in Turkey [8]. During the last decade, Gilaburu has gained increasingly interest since they contain compounds that are known to contain triterpenoids, diterpenoids, sesquiterpenes, iridoids and polyphenols [5]. Recent studies have shown that small fruit crops have high contents of antioxidant compounds such as ascorbate, β-carotene, glutathione, α-tocopherol, anthocyanins and other phenolics [9, 10, 11, 12, 13, 14].

Gilaburu fruits, widely used pharmacology, are important because of their nutritive and medical characteristics. Gilaburu fruits have been used to treat high blood pressure, heart troubles, tuberculosis, stomach pain, digestive troubles, duodenal ulcers and bleedings, kidney and bladder affections, coughs and colds [7, 15, 16, 17, 18]. In this study, some physico-chemical characteristics (protein, crude fat, crude fiber, crude ash etc.) and mineral composition (Al, Mg, Na, Ba, Ca, Ni, Cd, P, Cr, Pb, S, Cu, Se, Fe, K, Sr, Li, Z, V, Ag, Bi, Co, Mn, B, Ga, In, Ti) of Gilaburu (*Viburnum opulus* L.) fruits had been investigated.

II. Materials and Methods

A. Sampling

50 fruits of each treatment were used for analyses.

B. Determination of Size

From the samples, 50 fruits were selected at random for determining the physical characteristics. For each fruit and seed, 3 linear dimensions were measured, that is (a) length, (b) width and (c) thickness, using a vernier caliper reading to 0.01 mm. Hence measurement of all size indices was replicated 10 times for fruit. The weight of individual fruit and seed were determined by using an electronic balance to an accuracy of 0.001 g. Each measurement was replicated 10 times.

C. Texture

For texture measurements, the fruits were peeled (very thin layer) in 2 different places in the equatorial region of gilaburu. The texture was measured in a handle penetrometer with crossheads of 0.8 cm of diameter. Texture was expressed by kg/ cm² [19].

D. Total Soluble Solids

The content of total soluble solids was determined using samples of fruit pulp with a hand refractometer, at room temperature (range from 18 to 23°C) [19].

E. Protein

The nitrogen content estimated by the Kjeldahl method and was converted to protein content by using the conversion factor 6.25 [20].

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F. Crude Ash

Crude ash was determined in a muffle furnace at 850 ºC for 8 h [21].

G. Crude Fiber

Crude fibre was determined in the sample using the standard methods of analysis of the [21].

H. Crude Oil

Samples were homogenized and subjected to extraction for 6 h with petroleum ether (boiling range 30–60 ºC) in a Soxhlet apparatus. The extracted oil was dried over anhydrous sodium sulphate and the solvent was removed under reduced pressure in a rotary film evaporator. Oil percentages were determined by weight difference [21].

I. Determination of Mineral Contents

About 0.5 g dried and ground sample was put into burning cup and 10 ml pure HNO_3 was added. The sample was incinerated in MARS 5 microwave oven under the 170 psi at 200 °C temperature and solution diluted to the certain volume (25 ml) with water. Samples were filtered in filter paper and were determined with an ICP-AES [22].

J. Working Conditions of ICP-AES

Instrument: ICP-AES (Varian-Vista; Australia)
RF power: 0.7 - 1.5 kW (1.2 - 1.3 kW for axial)
Plazma gas flow rate (Ar): 10.5 - 15 L/min (radial), 15 L/min (axial)
Auxiliary gas flow rate (Ar): 1.5 L/min
Viewing height: 5 - 12 mm
Copy and reading time: 1 - 5 s (max. 60 s)
Copy time: 3 s (max. 100 s)

III. Results and Discussion

The values of all physical and chemical properties of Gilaburu fruits measured are showed in Table I. The fruit length, width, thickness, weight, total soluble solids, texture, protein, crude ash, crude fiber and crude oil were found to be 1.12cm, 1.58cm, 1.87cm, 0.87g, 14.73%, 3.4 kg/cm², 0.2%, 0.11%, 6.56% and 0.4%, respectively. The seed length, width, thickness and weight were determinated as 7.76 mm, 7.67 mm, 1.66 mm and 0.08 g, respectively. Ozrenk et al. [23] reported that, fruit weight ranged between 0.765 g and 0.768 g, fruit width ranged between 1.02 mm and 1.03 mm; fruit height ranged between 1.04 mm and 1.08 mm; shell thickness ranged between 0.013 mm and 0.014 mm; TSS content ranged between 12 % and 13.4 %; pH ranged between 3.47 and 3.50; seed weight ranged between 0.104 g and 0.112 g; seed height ranged between 0.83 mm and 0.91 mm; seed width ranged between 0.71 mm and 0.82 mm; seed thickness ranged between 0.21 mm and 0.23; total soluble solids content ranged between 12.2 % and 13.1 %; besides, colors of fruit flesh and skin varied dark red. In previous studies of researchers on the determination of pomological characteristics of gilaburu fruits, the fruit weight was identified as 0.7-0.86 g; fruit width as 8.0-11.45 mm; fruit height as 11.83 mm; pH as 3.24-3.9 and content of total soluble solids as 7.81-14.37 % [24, 25, 26]. Similar datums have been reported by Sonmez et al. [8] for gilaburu seed.

TABLE I
Some Morphological, Phenological and Chemical Characteristics of Gilaburu (*Viburnum opulus* L.) Fruits

Traits	Mean
Fruit length (cm)	1.12
Fruit width (cm)	1.58
Fruit thickness (cm)	1.87
Fruit weight (g)	0.87
Total Soluble Solids(%)	14.73
Protein (%)	0.2
Crude Ash (%)	0.11
Seed length (mm)	7.76
Seed width (mm)	7.67
Seed thickness (mm)	1.66
Seed weight (g)	0.08
Texture (kg/cm²)	5.4
Crude Oil (%)	0.4
Crude Fiber (%)	6.56

TABLE II
Some Nutritional Characteristics of Gilaburu (*Viburnum opulus* L.) Fruits

Parameters	Values (ppm)
K	10764.764
P	1304.169
Ca	1228.711
Na	25.697
Mg	1289.088
S	421.588
Pb	0.981
Bi	0.000
Co	0.000
Li	1.368
Se	0.413
Al	12.563
Ni	0.669
Sr	8.486
V	3.451
Cr	1.415
Ti	0.000
Ag	0.000
Li	1.368
Se	0.413
Al	12.563
Ni	0.669
Sr	8.486
V	3.451
Cr	1.415
Ti	0.000
Ag	0.000

We analyzed 27 minerals (Al, Mg, Na, Ba, Ca, Ni, Cd, P, Cr, Pb, S, Cu, Se, Fe, K, Sr, Li, Z, V, Ag, Bi, Co, Mn, B, Ga, In, Ti) of Gilaburu fruit and showed their richness (Table II) in K (10764.764 ppm), Mg (1289.088 ppm) and P (1304.169 ppm), Fe (17.140 ppm), Ca (1228.711 ppm), Mn (2.42 ppm),

Z (1.536 ppm), Al (12.563 ppm), Na (25.697 ppm), Cu (2.986 ppm), Li (1.368 ppm), Ba (5.178 ppm), Sr (8.486 ppm), S (421.588 ppm), B (12.298 ppm), V (3.451 ppm) and Cr (1.415 ppm) was also present. Se, Ni, Pb and Cd were found to be trace. Ozrenk et al. [23] reported that K (2970 ppm), P (1663.62 ppm), Ca (1856 ppm), Mg (1340 ppm), Fe (2.9 ppm), Zn (1.6 ppm), Cu (1.7 ppm) and Mn (0.6 ppm) were present in Gilaburu fruit. Mineral elements in samples of Gilaburu fruit were found to be compatible with previous studies [2, 25]. The results showed Gilaburu is a natural mineral source and an alternative fruit species for fruit juice industry.

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