International Journal of Biological, Life and Agricultural Sciences
ISSN: 2415-6612
Vol:7, No:6, 2013

Some Physico-Chemical and Nutritional Properties of Russion Olive (*Elaeagnus angustifolia* L.) Fruit Grown in Turkey

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***Abstract*—**In this research, several physical and chemical properties and mineral contents of Russion olive (*Elaeagnus angustifolia* L.) fruit grown in Turkey were determined. In the fruit, length, width, thickness, weight were determined as 2.866cm, 1.880cm, 1.870cm, 2.90g; total soluble solids and colour were determined as 13.14% and S_{33} O_{60} Y_{99}, respectively. In the seed, mean length, width, thickness, and weight were found to be 2.420cm, 0.508cm, 0.503cm, and 0.38g, respectively. In the fruit, 28 minerals (K, P, Ca, Na, Mg, S, Pb, Ba, Ga, As, In, Ti, Fe, Mn, Zn, Cu, Co, B, Cd, Se, Li, Sr, Al, Ni, Ag, V, Cr, Bi) were analyzed and 19 minerals were present at detectable levels. Russion olive fruit was richest in potassium (10296.906ppm), Mg (762.314ppm), P (609.694ppm), Ca (547.647ppm), and Na (222.749ppm).

***Keywords*—**Nutritional properties, Physico-chemical properties, Russion olive (*Elaeagnus angustifolia* L.)

I. Introduction

RUSSION olive (*Elaeagnus angustifolia* L.) is a monoecious deciduous tree or a large shrub in the family *Elaeagnaceae* Juss. *Elaeagnus* L. is a genus of 40 evergreen and deciduous species, native to Southern Europe, Asia and North America. Two species, *E. angustifolia* L. and *E. orientalis* L. are native to Siberia, and some were introduced [1]. *E. angustifolia* shows a broad geographical range, occurring widely in Asia and Europe, particularly in Turkey, Caucasia and Central Asia [2]. *E. angustifolia* L. occurs in the Mediterranean, Asia Minor, Iran, the Himalayas, China, Mongolia, and India. In desert and semi-desert, *E. angustifolia* grows in river food plains, often forming extensive thickets; it grows on saline soils and in mountains at up to 700m. Russion olive grows to 10m height and its trunk to 30cm in diameter. The crown is patulous, with reddish brown or silvery branches with down to 3cm spines. The leaves are alternate, simple, linear or lanceolate, grayish green on the upside and silvery on the underside, covered with minute scales. The flowers are fragnant, insect-pollinated, campaniform, silvery on the underside, covered with minute scales. The fruit is an ovate, mealy drupe with a ≤1cm-long seed with longitudinal ridges. The plant is mesophytic, oligotrophic, photophilic, and tolerant to gaseous pollution and saline soils [1]. Russian olive is also reported in Iranian folk medicine to be used for its anti-inflammatory and analgesic effects.

Decoction and infusion of its fruits is considered to be a good remedy for fever, jaundice, asthma, tetanus and rheumatoid arthritis [3]-[7]. Additionally, *E. angustifolia* was found to be a useful bio monitor of the heavy metals investigated [8]. Many studies have been reported on the physical and chemical properties of fruits such as rose fruit [9], Cornelian cherry [10] fresh okra fruit [11], cherry laurel [12], *Juniperus drupacae* fruit [13], orange [14], berries [15] wild plum [16], gumbo fruit [17], and caper fruit [18]. Although the wild fruits are delicious and nutritious, more consumption of such fruits are hazards to our body, so before eating it must be checked weather it contain proper amount of antinutritional factors. The antinutritional factors such as phytic acid, tannin, saponin, oxalic acid, have adverse effect on health through inhibition of protein digestion, growth, iron and zinc absorption [19]-[21]. The purpose of this study was to investigate some physico-chemical properties and mineral contents of Russion olive (*Elaeagnus angustifolia* L.) fruit grown in Turkey.

II. Materials and Methods

A. Materials

The Russian olive fruit samples taken from one selected Russion olive tree in the Selcuk University Campus area in the city of Konya have formed the materials for this study. The research area is Selcuk University Aladdin Campus located within the borders of the Selcuklu District of the province of Konya on the highway between Konya and Afyon. It is 15km from the city centre and is situated at an elevation of 1146m from the sea level. The province of Konya is situated to the south of the Central Anatolia Region, which is in the middle of the Anatolian peninsula, and its southern and south-western sections are included in the Mediterranean Region. Geographically, Konya is positioned between 36041' and 39016' northern latitudes and 31014' and 34026' eastern longitudes. The area of Konya is 38873km^2, which makes it Turkey's largest province in respect of land [22].

B. Methods

1. Sampling

50 fruits of each treatment were used for analyses.

2. 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

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to 0.01mm. 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 0.001g. Each measurement was replicated 10 times.

3. 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) [23].

4. Colour

The colour scale was employed for determination of the fruit juice colour [24].

5. Determination of Mineral Contents

About 0.5g 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 (25ml) with water. Samples were filtered in filter paper and were determined with an ICP-AES [25].

6. 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 - 12mm
Copy and reading time: 1 - 5s (max. 60s)
Copy time: 3s (max. 100s)

III. Results and Discussion

Some physico-chemical and nutritional characteristics of Russion olive (*Elaeagnus angustifolia* L.) were given in Tables I and II.

TABLE I
SOME PHYSICO-CHEMICAL CHARACTERISTICS OF RUSSION OLIVE (*ELAEAGNUS ANGUSTIFOLIA* L.)

Traits	Mean
Fruit length (cm)	2.866
Fruit width (cm)	1.880
Fruit thickness (cm)	1.870
Fruit weight (g)	2.90
Total Soluble Solids(%)	13.14
Colour	S_{33} O_{60} Y_{99}
Seed length (cm)	2.420
Seed width (cm)	0.508
Seed thickness (cm)	0.503
Seed weight (g)	0.38

Some physico-chemical constituents data of Russion olive fruit showed in Table I revealed that the length, width, thickness, weight were 2.866cm, 1.880cm, 1.870cm, 2.90g; total soluble solids and colour were determined as 13.14% and S_{33} O_{60} Y_{99}, respectively. The seed of fruit mean length, width, thickness, and weight were found to be 2.420cm, 0.508cm, 0.503cm, and 0.38g, respectively (Table I). Hussain [26] reported that fruit weight, length, diameter and total solible solids were 18.40g, 4.28cm, 1.96cm and 9.03% in *Elaeagnus umbellate* L., respectively. Other researchers Ozdemir and Kalyoncu [27] researched on the population of oleasters (Russion olive) that were found in Selcuk Universty of Aladdin Keykubat Campus in 2005 to 2006 in order to determine the kinds of candidates of high quality fruits by the selection breeding method. In their survey, a total of 30 kinds of oleaster (*Elaeagnus angustifolia* L.) were examined and 12 kinds of olaester was chosen between them according to their fruit characteristics. The weight, length and width of fruits in the chosen ones were recorded to be between 1.55 and 1.82g, 21.42 and 24.80mm, and 15.44 and 17.72mm, respectively, and the rate of seed/flesh was between 2.31 and 4.20. On the other hand, the rate of vitamin C for the different kinds of oleaster was determined to be between 1.86 and 5.03mg/100g.

TABLE II
SOME NUTRITIONAL CHARACTERISTICS OF RUSSION OLIVE (*ELAEAGNUS ANGUSTIFOLIA* L.) FRUIT

Parameters	Values (ppm)
K	10296.906
P	609.694
Ca	547.647
Na	222.749
Mg	762.314
S	190.444
Pb	0.00
Ba	0.00
Ga	0.00
As	1.49
Fe	3.466
Mn	4.692
Zn	0.540
Cu	2.563
Co	0.00
B	30.51
Cd	0.00
Se	0.277
In	0.00
Li	2.228
Sr	5.477
Al	1.59
Ni	0.302
Ag	0.00
V	1.569
Cr	0.229
Bi	0.00
Ti	0.00

Some nutritional constituents of the fruit of Russion olive presented in Table II. In the fruit, 28 minerals (K, P, Ca, Na, Mg, S, Pb, Ba, Ga, As, In, Ti, Fe, Mn, Zn, Cu, Co, B, Cd, Se, Li, Sr, Al, Ni, Ag, V, Cr, Bi) were analyzed and 19 minerals (K, P, Ca, Na, Mg, S, As, Fe, Mn, Zn, Cu, B, Se, Li, Sr, Al, Ni, V, Cr) were present at detectable levels.

Potassium (10296.906ppm) was present in the highest concentration, followed by Mg (762.314ppm), P (609.694ppm), Ca (547.647ppm), Na (222.749ppm), S (190.444ppm) and B (30.51ppm) were present in higher amounts, and traces of Zn, Li, Se, Al, Ni, V, Cr were also detected. Hussain [26] reported that mineral elements of *Elaeagnus umbellate* L. fruits showed that calcium, magnesium and phosphorus were 6.34mg, 15.10mg and 18.90, respectively. Same researchers also reported that the

results of mineral contents were significantly variable level with in grow localities. Mineral composition depends on several factors such as climate, soil, variety and cultivation techniques [28]. The results presented in this work showed that physico-chemical and nutritional characteristics of Russion olive (*Elaeagnus angustifolia* L.) changes different growing region and variety. In addition, limited studies on *Elaeagnus angustifolia* L. fruits have been performed yet.

IV. Conclusion and Suggestions

Since Russion olive, which is grown over a large area in our country, is not given due importance, it still has not been cultivated. Unfortunately, this choice fruit, which has adapted to all climatic conditions in our country and which can grow in all kinds of soil, has not been cultivated and has not found favour with our farmers. Thus, it has been used only as a border-marking plant (in areas where farming is made), a shade or greenery. However, it has been found that oleaster is not grown in closed orchards in the research area as it is in the whole of our country.

The fact that it can grow even in inappropriate soil and climatic conditions without any cultivation techniques being applied presents a great advantage for agriculture in our country. When a plant that has such characteristics is cultivated, its characteristics will be improved and it will make significant contributions to the socio-economic situation of the farmers in the area, as well as the country's agriculture and economy. Besides our farmers, our researchers also have not paid proper attention to Russion olive. The fact that there is a few studies on Russion olive selection in our country at present is one of the obstacles in the breeding and spread of Russion olive.

Russion olive is one of the fruit varieties that need to be highlighted by virtue of its nutrient content, tree characteristics and its potential in Turkey. Such fruit should be introduced to the market and promoted after they are grown in cultural conditions. Above all, farmers should be encouraged to use certified saplings obtained from selected Russion olives. Russion olive type which is investigated in this study found to be important properties.

References

[1] T. I. Kiseleva, L. N. Chindyaeva, "Biology of Oleaster (*Elaeagnus angustifolia* L.) at the Northeastern Limit of Its Range", *Contemporary Problems of Ecology*, vol. 4, no. 2, pp. 293-299, 2011.
[2] P. H. Davis, "Flora of Turkey and the East Aegean Islands", Edinburgh University Press, vol. 7, pp. 533-534, 1978.
[3] M. Momen Hosseini, "Tohfeh Hakim Momen", Mahmoudi Publication, Tehran, p. 137, 1981.
[4] A. Zargari, "Medicinal Plant", vol. 1. Tehran University Press, Iran, p. 275, 1990.
[5] A. Avecina, "Ghanon of Medicine", vol. 2, 5th edn. Soroush Publication, Tehran, p. 225, 1991.
[6] A. Ansari Shirazi, "Ekhtiyarat Badii", Razi Publication, Tehran, p. 315, 1991.
[7] A. Ahmadiani, J. Hosseiny, S. Semnanian, M. Javan, F. Saeedi, M. Kamalinejad, S. Saremi, "Short communication Antinociceptive and Anti-Inflammatory Effects of *Elaeagnus angustifolia* Fruit Extract", *Journal of Ethnopharmacology*, vol. 72, pp. 287–292, 2000.
[8] A. Aksoy, U. Sahin, "*Elaeagnus angustifolia* L. as a Biomonitor of Heavy Metal Pollution", *Tr. J. of Botany*, vol. 23, pp. 83–87, 1999.
[9] F. Demir, M. Ozcan, "Chemical and Technological Properties of Rose (*Rosa canina L.*) Fruits Grown Wild in Turkey", *J. Food Eng*., vol. 47, pp. 333-336, 2001.
[10] F. Demir, I. H. Kalyoncu, "Some Nutritional, Pomological and Physical Properties of Cornelian Cherry (*Cornus mas L.*)", *J. Food Eng*., vol. 60, pp. 335-341, 2003.
[11] O. K. Owolarafe, H. O. Shotonde, "Some physical Properties of Fresh Okra Fruit", *J. Food Eng*., vol. 63, pp. 299-302, 2004.
[12] S. Calisir, C. Aydin, "Some Physicomechanic Properties of Cherry Laurel (*Prunus lauracerasus* L.) Fruits", *J. Food Eng*., vol. 65, pp. 145-150, 2004.
[13] I. Akinci, F. Ozdemir, A. Topuz, O. Kabas, M. Canakci, "Some Physical and Nutritional Properties of *Juniperus drupacea* Fruits", *J. Food Eng*., vol. 65, pp. 325-331, 2004.
[14] A. M. T. Topuz, M. Canakci, I. Akinci, F. Ozdemir, "Physical and Nutritional Properties of Four Orange Varieties", *J. Food Eng*., vol. 66, pp. 519- 523, 2004.
[15] J. Khazaei, D. D. Mann, "Effects of Temperature and Loading Characteristics on Mechanical and Stress-Relaxation Properties of sea Buckthorn Berries". Part 1. Compression Tests. Agricultural Engineering International: The CIGR Journal of Scientific Research and Development, Manuscript FP 03 011, 2004.
[16] S. H. Calisir, M. O. Haciseferogullari, D. Arslan, "Some Nutritional and Technological Properties of Wild Plum (*Prunus* spp.) Fruits in Turkey", *J. Food Eng*., vol. 66, pp. 233-237, 2005.
[17] R. Akar, C. Aydin, "Some Physicalproperties of Gumbo Fruit Varieties", *J. Food Eng*., vol. 66, pp. 387-393, 2005.
[18] A. Sessiz, R. Esgile, S. Kizil, "Moisture-Dependent Physical Properties of Caper (*Capparis* spp.) Fruit", *J. Food Eng.*, vol. 79, pp. 1426-1431, 2005.
[19] I. E. Liener, M. L. Kkade, "Protease Inhibitor. In Liener, I.E.(ed).Toxic Constituents of Plants Foodstuffs". Academic Press. New York, 1980.
[20] M. Larsgon, L. Rossande-Hulthen, B. Sandstome, A. Sandberg, "Improved Iron and Zinc Oats with Reduced Phytate Content", *British J. Nutr*., vol. 76, pp. 677-688, 1996.
[21] V. S. Rathod, S. R. Valvi, "Microbiology Antinutritional Factors of Some Wild Edible Fruits from Kolhapur District", *Recent Research in Science and Technology*, vol. 3, no. 5, pp. 68-72, 2011.
[22] Anonymous,"http://www.konya.gov.tr/goster.asp?baslik=Genel%20Co%F0rafya%20ve%20Yery%FCz%FC%20%DEekilleri", 2013.
[23] B. Cemeroglu, J. Acar, "Fruit and Vegetable Processing Technology", *Turkish Association of Food Technologists*, Publ. no. 6, p. 508, 1986.
[24] H. Küppers, "DerGrobe Küppers-Farbenatlas Varlag Gearg D. W. Collwey GmbH", München, p. 224, 1987.
[25] S. Skujins, "Handbook for ICP-AES (Varian-Vista). A short Guide To Vista Series ICP-AES Operation. Varian Int. AG, Zug, Version 1.0", *Switzerland Soc. Food Sci. Technol.*, vol. 29, pp. 221-227, 1998.
[26] I. Hussain, "Physiochemical and Sensory Characteristics of *Elaeagnus umbellata* (Thunb) Fruit from Rawalakot (Azad Kashmir) Pakistan African", *Journal of Food Science and Technology*, vol. 2, no. 7, pp. 151-156, 2011.
[27] G. Ozdemir, I. H. Kalyoncu, "A Selection Study on Oleaster (*Elaeagnus angustifolia* L.) Grown in the Campus Area of Selcuk University in Konya, Turkey", *African Journal of Biotechnology*, vol. 10, no. 77, pp. 17726-17736, 2011.
[28] H. Greenfield, D. A. T. Southgate, "Food Composition Data, Production, Management and Use", pp. 243, Elsevier, London, 1992.