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Some physic-chemical and nutritional properties of *Elaeagnus angustifolia* L. Fruit grown in Gilgit Baltistan

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Abstract
Elaeagnus angustifolia commonly known as Russian olive belongs to the family Elaeagnaceae and is a wild plant grows in Himalayan regions of Pakistan, China and India. Its fruit are rich source of soluble sugars, essential oils, vitamins and minerals. Keeping in view these advantageous characteristics of *Elaeagnus angustifolia* a study was conducted to evaluate this for physicochemical and nutritional characteristics. *Elaeagnus angustifolia* which is obtained from the region of Gilgit Baltistan was investigated in terms of physicochemical and nutritional characteristics. For physical characteristics fruit and seed was evaluated for parameters like weight, length and diameter. For chemical analysis fruit was analyzed for parameters like total soluble solid (TSS), total sugars, acidity, pH, ash determination, moisture content, vitamin C, and for mineral contents calcium, magnesium and phosphorus. *Elaeagnus angustifolia* has great potential as a raw material for food industries and for economic activities to the disadvantageous communities of the mountainous regions of Pakistan.

Keywords: physico chemical, nutritional properties of elaegnus angustifolia grown in gilgit baltistan

1. Introduction
In Europe and Asia Russian olive (*Elaeagnus angustifolia* L.) has been used for centuries as food as well as for medicinal properties. The place of its origin is Iran. This plants belongs to the genus Elaeagnus (Elaeagnaceae) which are widely distributed in Himalayas, northern region of Asia and Europe (Ahmadiani *et al*., 2000) [1]. In the hilly areas of Gilgit and Baltistan, Russian olive is wildly found. On commercial scale there is no utilization of this botanical source. Its physical and chemical analysis should be characterized it for physical and chemical characteristics.Russian olive 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, while some were introduced (Kiseleva and chindyaeva, 2011). E. *angustifolia*L.geographical range is Asia and Europe, particularly in Caucasia, Central Asia and Turkey (Davis *et al*., 1988). Its origin is found in Asia Minor, Iran, The Himalayas, China, India and Mangolia (Kiseleva and Chindyaeva, 2011). In desert and semi desert, E. angustifolia L. grows in river flood plains, often forming extensive thickets; it grows on saline soils and in mountains at up to 700 m. Its trunk is with the diameter of 30 cm and height up to 10 m. It has reddish brown or silvery branches with 3 cm spines and patulous crown. Its leaves are alternate, simple, linear or lanceolate, grayish green on the upside and silvery on the underside, covered with minute scales. Its flowers are fragrant, insect-pollinated, campaniform, silvery on the underside, covered with minute scales. Its fruits are an ovate, mealy drupe with a ≤1cm-long seed with longitudinal ridges. This plant is mesophytic, oligotrophic, photophilic, and tolerant to gaseous pollution and saline soils (Kiseleva and Chindyaeva, 2011).

2. Materials and methods
2.1 Collection of Samples
Fruits of Russian olive (*E. angustifolia* L.) were collected from different surroundings of Skardu city, Gilgit Baltistan, Pakistan. The collected fruit samples were transported in polypropylene bags and kept at room temperature. The samples were sorted, remove the damaged ones and selected the healthy samples to carry out the research project. These selected samples were packed and sealed in polyethylene bags for further studies. Each sample was analyzed for different physicochemical and nutritional properties tests to estimate the quality parameters. The major physicochemical tests were total soluble solids, ash content, acidity, ph, total sugar, moisture content, ascorbic acid, mineral content, polyphenolic content, Flavonoid content and antiradical activity.

2.2 Statistical analysis
The data obtained from the experiments was statistically analyzed using suitable statistical techniques (Steel *et al.*, 1997)

3. Results & Discussion
i) Physical analysis: Weight of different parts of *E. angustifolia* L. fruit collected from different Areas of Gilgit Baltistan is presented in the Table 1. The weight of its whole fruit collected from different Areas of Gilgit Baltistan varies from 1.37 to 1.65g. The analysis of variance for whole fruit weight shows that there is a significant variation in the weight of fruit collected from

different geographical regions of northern Areas of Pakistan. This variation in weight may be due to different soil conditions and localities where this plant is grown, as the fertility status of soil affects the weight of fruits. This variation in the fruit weight may also be due to the genetic differences of plant. The maximum weight of fruit was observed in the of Area A1 while minimum weight of fruit was observed in Area A4. Volume and mean mass of fruit were determined as 2.55 cm^3 and 1.45 g, respectively (Zare *et al*, 2012) [25].

The weight of fruit peel varies from 0.2667 to 0.3169 g collected from different Areas of Gilgit Baltistan. The analysis of variance for peel weight of *E. angustifolia* L. is presented in Table 3, which shows that there is no significant variation in the weight of fruit peel. The maximum weight of peel was observed in the fruits of Area A1 (0.319) while minimum weight of fruit peel was observed in Area A4 (0.2667).

The weight of fruit pulp varies from 0.76 to 0.97 g. The analysis of variance for pulp weight of *E. angustifolia* L. shows that there is no significant variation in the weight of pulp. The maximum weight of pulp was observed in the fruits of Area A1 (0.97g) while minimum weight of fruit pulp was observed in Area A4 (0.76).

The weight of seed of *E. angustifolia* L. fruit varies from 0.3433 to 0.36 g. The analysis of variance for the weight of its seed shows that there is no significant variation in the weight of its seed. The maximum weight of its seeds was observed in the fruits of Area A3 (0.36g) while minimum weight of fruit seed was observed in Area A1 (0.3433).

ii) **Ash content:** Ash content of *E. angustifolia* L. fruit collected from different Areas of Gilgit Baltistan. The ash content of its whole fruit varies from 1.6767 to 2.1700 g. The analysis of variance for ash content of its fruit shows that there is a significant variation in the ash content of its fruit. This variation in ash content could be due to varying soil conditions of different localities as the fertility status of soil affects the weight of fruits. The maximum ash content of fruit was observed in the fruits of Area A1 (2.1700) while minimum ash content of fruit was observed in Area A3 (1.6767).

iii) **Mineral Determination:** Ash was further analyzed for the presence of Na, Ca and K. The results obtained are presented in the Table 2, The amount of Na present in the ash of Russian olive fruit varies from 167.76 to 215.04 ppm. The analysis of variance for ash content of fruit is presented in Table 7, which shows that there is a significant variation in the amount of Na present in the ash of fruits collected from different geographical regions. This variation in Na content of ash may be due to different soil conditions and localities where the plant is grown as the fertility status of soil affects the weight of fruits. The maximum Na content was found in the ash of fruit from the Area A1 (215.0400) while minimum Na content was found in the ash of fruits from Area A3 (167.76).

The amount of Ca present in the ash of its fruit varies from 496.07 to 532.15 ppm. The analysis of variance for ash content of fruit is presented in Table 6, which shows that there is a significant variation in the amount of Ca present in the fruits ash. This variation in Ca content may be due to varying soil conditions of different localities where the plant is grown because the fertility status of soil affects the Ca of its fruits. The maximum Ca content was found in the fruits of Area A3 (532.15 ppm) while minimum Ca content was observed in Area A2 (496.07 ppm). The amount of K present in the Russian olive fruit varies from 496.07 to 532.15 ppm. The analysis of variance for K content in the fruit is presented in Table 6, which shows that there is a significant variation in the amount of K present in the ash of fruits. This variation in K content may be due to different soil conditions and localities where the plant is grown because the fertility status of soil affects the K of its fruits. The maximum K was found in the fruit of the Area A3 (1011.57 ppm) while minimum K content in fruit was observed in Area A4 (920.53 ppm).

Among all the three elements analyzed in the ash of Russian olive maximum amount of K was observed which was followed by Ca. Minimum amount of Na was observed in the ash content of its fruit.

iv) **Polyphenolic content:** Flavonoids are polyphenolic plant secondary metabolites which impart organoleptic properties to the plant products and may also contribute to plant protection against insects and other microorganisms. Different studies showed that flavonoids act as antimicrobial, antiviral, antifungal and anticancer agents. Flavonoids are also responsible for radical scavenging activity and antioxidant properties of plants products which contribute to health promoting effects. The flavonoid content was measured by spectroscopic technique and result obtained is presented in the Table 3. The amount of flavonoid in fruits ranged between 141.96

v) **Antiradical activity**: DPPH is a stable radical that may be helpful to examine the potential of chemical substance to contribute hydrogen atom in order to scavenge free radicals. Flavonoids inside plant products are usually seen being robust inside vitro antioxidants which manage to contribute hydrogen atom or even electrons which act as antioxidant agent.

The antioxidant activity of fruits was measured by DPPH reagent and the result obtained. The antioxidant activity of fruits ranged between 35.557% to 45.493 QEQ. Analysis of variance for antioxidant activity, ($p<0.05$) which showed that there is significant difference in the antioxidant activity of fruits. Maximum amount of antioxidant activity was observed in fruits collected from A2 (45.493%) while minimum amount was observed in the fruit collected from A3 (35.557%).

Table 1: Physical analysis of Russian olive

Area	Fruit Weight (g)	Peel weight (g)	Pulp weight (g)	Seed weight (g)
A1	1.65a	0.3169a	0.97a	0.3433a
A2	1.57ab	0.2876a	0.85a	0.3547a
A3	1.59ab	0.2748a	0.93a	0.3600a
A4	1.37b	0.2667a	0.76a	0.3490a

Table 2: Ash content and mineral profile of Russian olive

Area	Ash	K	Na	Ca
A1	2.1700a	1009.0a	215.04a	527.10a
A2	1.8567b	931.41b	186.56b	496.07b
A3	1.6767b	1011.57a	167.76c	532.15a
A4	1.7533b	920.53b	176.33bc	519.55ab

Table 3: Phenolic, flavonoid and antioxidant activity of Russian olive

Area	TPC Mg/g GAE	Flavonoids Mg/g RTE	DPPH (%)
A1	190.44b	156.01b	37.680b
A2	207.65a	169.70a	45.493a
A3	170.74c	148.08bc	35.557b
A4	183.18b	141.96c	36.501b

4. Conclusions

Its fruit is rich source of soluble sugars, essential oils, vitamins and minerals. Keeping in view these advantageous characteristics of *E. angustifolia* L., its physicochemical and nutritional characteristics were determined. The average weight, length and diameter of Russian olive were found to be 1.57g, 2.02 cm and 1.37 cm, respectively. For chemical analysis fruit was analyzed for parameters like total soluble solid (TSS), total sugars, acidity, pH, ash determination, moisture content, vitamin C, and for mineral contents calcium, magnesium and phosphorus. The ash content was found to be 1.85 mg/g which consist of primarily K (931 mg/g), Na (176 mg/g) and Ca (527 mg/g). Sugar and ascorbic acid content of Russian olive was found to be 7.2% and 10.13 mg/g respectively. Titratable acidity, pH and ascorbic acid were found to be 12.52, 2.72 and 11.13 mg/100 g, respectively. For the analysis of bioactive compounds, total phenol content and total flavonoid content was determined. The antioxidant activity was found to be 183.18 mg/g GAE, 153.3 mg/g RTE and 39 % DPPH.*E. angustifolia* L. has great potential as a raw material for food industries and for economic activities to the disadvantageous communities of the mountainous regions of Pakistan.

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6. Reference

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