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Full Length Research Paper

Physiochemical and sensory Characteristics of *Elaeagnus umbellata (*Thunb) fruit from Rawalakot (Azad Kashmir) Pakistan

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Elaeagnus umbellata (Thunb) commonly known as autumn olive belongs to the family Elaeagnaceae and is a wild plant grows in Himalayan regions of Pakistan. China and India Its fruit (berries) are rich source of vitamin C, essential oils and minerals. Keeping in view these beneficial characteristic of Elaeagnus umbellate a study was conducted to evaluate this for physiochemical and sensory characteristics. Five localities of Elaeagnus umbellata from variable surroundings of Rawalakot Azad Kashmir were investigated in terms physiochemical and sensory characteristics. For physical characteristics fruit and seed was evaluated parameters like weight, length diameter and pulp recovery from fruit. For biochemical analysis fruit was analyzed for parameters like total soluble solid (TSS), acidity, pH, acid sugar ratio, vitamin C, fat content, calcium, magnesium and phosphorus For sensory evaluation fruit was evaluated for flavour, tats, mouth feel and overall acceptability .The results showed that all the parameters for physical characteristics like weight, length diameter and pulp recovery from fruit ranged from 18.40 to 17.54g, 4.28 - 3.78cm, 1.96-1.68 cm, and 63.80 to 65.98% respectively Weight of 100 seed ranged from 6.00 to 6.66g. Seed size in terms of length and diameter ranged from 2.60 -2.86 and 1.24-1.36 cm, respectively Chemical constituents of the fruit TSS ranged from 9.03 to 11.76%, acidity 2.20-2.94%, pH 3.30-3.90, ascorbic acid 7.65-10.10 mg/100g and TSS: acidity ratio from 3.08 to 5.32% in different genotypes autumn olive. Fat content in pulp ranged from 4.78 to 5.04%, and fat content in seed ranged from 5.30-5.48%. Sugar content in fruit ranged from 7.40 to 7.70%, and moisture content in fruit ranged from 78.49-81.71%. The results regarding to the minerals elements of autumn olive fruits showed that calcium ranged from 6.37 to 6.70mg magnesium 15.10-15.41mg, phosphorus 18.90-19.10 mg. Sensory evaluation results revealed that the score for flavor, taste, mouth feel and overall acceptability of berries ranged from 6.00 to 6.60, 6.10 -6.60, 5.90-6.40 and 6.00 to 6.53 respectively were significantly variable at (p<0.05) level with in five localities. Elaeagnus umbellate has great potential as a raw material for food industries and for economic activities to the disadvantageous communities of the mountainous regions of Pakistan.

Key words: Autumn olive, Physiochemical. Sensory, berries, investigation

INTRODUCTION

Autumn olive (*Elaeagnus umbellate* Thunb.) is native to Southern Europe and Central Asia and was introduced to the US in the 1830s from East Asia as an ornamental plant (Dirr, 1983). Autumn olive shrubs grow from 18–20 feet tall and have been found from Maine to Virginia, and west to Wisconsin. The plant has been reported to develop a nitrogen fixing association with *Frankia spp.* (Hensley, 1984) and is widely tolerant of varying environmental conditions (Potter, 1995). Autumn olives produce an abundance of small deep-red colored, sweettart fruit which are considered suitable for human consumption and which are highly attractive to birds. Autumn olive fruit can be used for preserves, condiments, fruit rolls, juice, flavoring, and other food products (Fordham, 2001).

Autumn olive was introduced to the U.S. from Japan and China in 1830. It was originally planted for wildlife habitat, shelterbelts, and mine reclamation, but has escaped cultivation. It is dispersed most frequently by birds and other wildlife, which eat the berries (Swearingen, 2002). Autumn olive (*Elaeagnus umbellate Thunb.*) is a valuable plant of the Himalayas with inherent ability to grow under natural conditions. It is a member of the family Elaeagnaceae and is also called cardinal olive or autumn (Dirr, 1983). Elaeagnus umbellata is Elaeagnus abundantly found in Himalayan regions of Pakistan (Hensley, 1984) and is quoted as native to China, Japan, and Korea, and is also found in Afghanistan and India (Potter,1995) It is a common shrub growing wild at a height of 4500 to 6000 ft above sea level in Azad Kashmir (Ahmad, 2005).

Autumn olive fruit berry is an excellent source of vitamins and minerals, especially vitamin A, C, and E, flavonoids, other bioactive compounds and essential fatty acids (Matthews, 2002). Many studies have been reported on the physical properties of fruits such as rose fruit (Demir and Ozcan, 2001), Cornelian cherry (Demir and Kalyoncu, 2003) fresh okra fruit (Owolarafe et al., 2004), cherry laurel (Calisir and Aydin, 2004), Juniperus drupacae fruit (Akinci et al., 2004), orange (Topuz et al., 2004), berries (Khazaei and Mann, 2004) wild plum (Calisir et al., 2005), gumbo fruit (Akar and Aydin, 2005) and caper fruit (Sessiz et al., 2007). No detailed study concerning physical properties of barberry fruit was found in the literature. The purpose of this study was to investigate the physical, nutritional and orgonoleptic properties of autumn olive (Elaeagnus umbellate Thunb.) grown in targeted area.

MATERIAL AND METHOD

Fruits were collected from five localities of *Elaeagnus umbellata* from variable surroundings of Rawalakot Azad Kashmir, Pakistan from east, west, north south and central Rawalako in August/Sptember, 2008. The fruits samples awarded their respective code, transported in polypropylene bags and were kept at room temperature.

The fruits were cleaned by a combination of manual and mechanical means to remove all foreign matter and crushed and

unripe fruits.

Physical Properties

For determination of size of the fruits, 10 groups of samples, each of which consists of 100 fruits, were selected randomly. Ten fruits from each group were taken, and their width length and diameter of berries and seed were measured. Mass (*m*) of the 100 berries and seed, pulp ratio was measured with an electronic balance with accuracy of 0.001 g. (Jain and Bal, 1997; Mohsenin, 1970). The projected area of the fruits was determined by using a digital camera (Canon PowerShot A200 model, Canon Inc., Malaysia) and Sigma Scan Pro software (Jandel Scientific, San Rafael, CA) (Trooien and Heermann 1992; Ayata *et al.* 1997).

Chemical Analysis

The total soluble solids by use of hand refrectometer, pH by use of pH meter, acidity by titration method and moisture content (oven dry method) were determined according to AOAC (2000). Sugars (total sugars) were determined by methods of Lane and Eyon as described by Ranganna (1995).Oil contents from the berries/fruits of different plants were used for the analysis of lipid content according to the standard methods (AOAC 2000). Samples were dried in an oven at 105 °C for 6–12 hours. 10 g of dried sample was used for extraction of oil in Soxhlet apparatus (30–40 °C) for 6 hours using diethyl ether as solvent. The solvent was removed under vacuum and the residual oil was dried over anhydrous Na₂SO₄. Experiment was repeated three times.

Ascorbic acid content of berries

Ascorbic acid was determined using phenol indophenol dye method (AOAC 1984). 10 g of the fresh berries/fruits were blended with metaphosphoric-acetic acid extracting solution. 5 ml of the filtrate extract were then titrated with standard indophenol to pink end point. Experiment was repeated three times.

Mineral Determination

Two grams of the dried samples were used in the determination. The sample was ignited in a muffle furnace at a temperature of 600 °C. The ash was dissolved in 10ml of 5M HCI. Acid digestion of the ash was then carried out on a steam plate and the digested sample was carefully washed with distilled water and filtered using Whitman's filter paper and diluted up to certain volume. The samples and blanks were then directly analyzed for the following minerals (magnesium, calcium and phosphorus) at wavelengths of 285.2, 422 and 640 nm respectively (James, 1995) using the Atomic Absorption Spectrophotometer (SOLAR 929 Unicam A.A. Spectrophotometer, UK).

Sensory evaluation

The sensorial evaluation of various using 9 point hedonic scale as described by Larmond (1977). Ten panelists were selected on the basis of their ability to discriminate and scale a broad range of



Figure 1. (a) autumn olive flower on branch (b) Fruits on branch (c) Fruits



Figure 2. Map of Rawalakot, Azad Kashmir, Pakistan, indicating the Places of populations of autumn olive

different attributes. An orientation program was organized for the panel members to brief them of the objectives of the study. Sensory analysis was completed in two consecutive days under the identical environmental conditions. The judges randomly tested the flavour, taste, mouth feel and overall acceptability for samples of *Elaeagnus umbellata (Thunb)* from five localities. The judges were provided with prescribed questionnaires to record their observation. The information contained on the performa was 9 = Like extremely; 8 =Like very much; 7 = Like moderately; 6 = Like slightly; 5 = Neither like nor dislike; 4 =Dislike slightly; 3 = Dislike moderately; 2 = Dislike very much; 1 = Dislike extremely. The panelists expectorated the pulp and rinsed mouth using distilled water

between samples. Sensory testing was made in the panel room completely free of food/chemical odour, unnecessary sound and mixing of daylight.

Statistical Analysis

Results are presented as mean values and standard deviations. Data were subjected to analysis of variance (ANOVA) where applicable and a difference was considered to be significant at ($p \le 0.05$).Means were separated using Duncan's multiple comparison tests.

		Berry L.	Berry dia		100 seed Wt.	Seed L.	Seed dia.
Locality	100 berries Wt. (g)	(cm).	(cm).	Pulp (%)	(g)	(cm)	(cm)
RE	18.40±1.03 ^a	4.28±.30 ^b	1.94±0.50 [°]	63.80±1.80 ^ª	6.66±1.22 ^ª	2.86±.40 ^b	1.36±.20 ^ª
RW	18.28±1.60 ^b	4.20±.90 ^c	1.92±0.97 ^b	64.00±1.60 ^b	6.58±1.46 ^b	2.84±.60 ^c	1.32±.50 ^b
RC	18.20±2.06 [°]	4.10±1.02 [⊳]	1.96±1.20 [°]	64.83±1.50 [°]	6.40±1.59 [°]	2.80±30 ^b	1.30±.40 ^b
RN	17.92±1.90 ^b	3.90±1.50 ^ª	1.82±1.60 ^ª	65.40±1.70 ^a	6.20±1.38 ^ª	2.70±.80 ^a	1.28±.30 ^ª
RS	17.54±2.04 ^ª	3.78±1.90 ^a	1.68±.80 ^b	65.98±1.40 ^c	6.00±1.79 ^c	2.60±.95 ^a	1.24±.70 ^c

Table 1: Physical Properties of Autumn Olive Fruits

Observations: RE= Rwalakot East, RW= Rwalakot West, RC= Rwalakot Central, RN= Rwalakot North, RS= Rwalakot South.

RESULTS AND DISCUSSION

The fruit is considered to be a very rich source of vitamins and minerals and other bioactive compounds and good source of essential fatty acids, which is fairly unusual for a fruit. It is being investigated as a food that is capable of reducing the incidence of cancer and also as a means of halting or reversing the growth of cancers.

Physical data of autumn olive (Elaeagnus umbellate Thunb.) fruit showed in Table 1 revealed that the weight of 100 berries ranged from 18.40 to 17.54g with in five localities. Fruit size in terms of length and diameter ranged from 4.28 -3.78cm and 1.96-1.68 cm. respectively. Pulp recovery from fruits ranged from 63.80 to 65.98% with in five studied localities. Seed weight and seed size also varied due to genotypes and localities variations. Weight of 100 seed ranged from 6.00 to 6.66g. Seed size in terms of length and diameter ranged from 2.60 -2.86 and 1.24-1.36 cm, respectively. The results of physical parameters were significantly variable at (p<0.05) level with in five localities .Chemical constituents of the fruit of autumn olive (*Elaeagnus umbellate Thunb*) presented in Table 2 showed the great variation within genotypes. TSS ranged from 9.03 to 11.76%, acidity 2.20-2.94%, pH 3.30-3.90, ascorbic acid 7.65-10.10 mg/100g and TSS: acidity ratio from 3.08 to 5.32% in different genotypes autumn olive (Elaeagnus umbellate Thunb) fruits.

Fat content in pulp ranged from 4.78 to 5.04%, and fat content in seed ranged from 5.30-5.48%. Thus, the pulp of *Elaeagnus umbellata* had greater quantity of fatty oil as compared to the seed. Sugar content in fruit ranged from 7.40 to 7.70%, and moisture content in fruit ranged from 78.49-81.71% in different genotypes autumn olive

(*Elaeagnus umbellate Thunb*) fruits collected from different localities of 20 km.

The results of chemical constituents were significantly variable at (p<0.05) level with in five localities. The fruit samples from five localities were also analyzed for the minerals element like calcium magnesium and phosphorus. The results regarding to the minerals elements of autumn olive (*Elaeagnus umbellate Thunb*) fruits showed that calcium ranged from 6.37 to 6.70mg magnesium 15.10-15.41mg, phosphorus 18.90-19.10 mg. The results of mineral contents were significantly variable at (p<0.05) level with in five localities. Earlier studies indicated 12.04 mg of vitamin C per 100 gram of fruit (Graham, 1964) which was little lower as compared to our investigation. This variation may also be due to the variation in populations or the climatic factors. The presence of essential oils in fruits and flowers has been indicated in the earlier literature (Potter, et al., 1995) but the actual amount has not been mentioned. The present investigation indicated larger amount of oil in seed as well as in the pulp of the fruit. The Plant oil and the phytosterols are known to have anticoagulant properties which are highly suitable for lowering the blood cholesterol and angina (Fordham et al., 2001).

Autumn olive (*Elaeagnus umbellate Thunb.*) berries were also studied for sensory evaluation by panel of ten trained judges like flavour, taste, mouth feel and overall acceptability and results showed in Table 3 revealed that the score for flavor of berries ranged from 6.00 to 6.60 with in five localities. Score for taste and mouth feel ranged from 6.10 -6.60 and 5.90-6.40, respectively. Score for overall acceptability fruits ranged from 6.00 to 6.53 with in five studied localities. The results of sensory evaluation were significantly variable at (p<0.05) level
 Table 2: Biochemical Analysis of Autumn Olive Fruits

				Ascorbic		Fat in	Fat in	Sugars	Moisture	Calcium	Magnesium	Phosphorus
Locality	TSS	Acidity	рН	acid	TSS: Acid	Pulp (%)	Seed(%)	(%)	(%)	mg/100g	mg/100g	mg/100g
RE	11.76±0.40 ^a	2.23±0.23 ^a	3.86±0.20 ^a	10.10±2.20 ^c	5.30±0.37 ^a	5.04±0.38 ^a	5.48±0.56 ^a	7.61±0.23 ^a	78.69±1.20 ^b	6.70±0.33 ^a	15.41±0.35 ^a	19.10±1.23 ^a
RW	11.43±0.35 ^ª	2.30±0.50 ^b	3.84±0.40 ^b	10.02±1.86 ^b	5.03±0.74 [°]	5.00±0.59 ^b	5.43±0.76 ^b	7.53±0.51 [♭]	78.59±1.68 ^ª	6.60±0.56 ^b	15.32±0.63 ^b	19.20±1.49 ^b
RC	11.60±0.30 ^a	2.20±0.30 ^a	3.90±0.30 ^a	9.90±1.48 ^a	5.32±0.59a ^b	4.90±0.29 ^a	5.50±0.45 ^ª	7.70±0.73 ^c	81.71±1.94 ^a	6.56±0.78 ^c	14.90±0.83 [°]	19.00±1.71 [°]
RN	9.61±1.76 ^b	2.80±0.40 ^b	3.30±0.60 ^c	7.80±2.23 ^c	3.41±0.27 ^a	4.83±0.78 ^b	5.40±0.87 ^c	7.40±0.91 [°]	78.49±2.21 [°]	6.42±0.42 ^b	15.20±0.92 [°]	18.94±1.95 [°]
RS	9.03±0.23 ^c	2.94±0.70 ^c	3.35±0.50 ^b	7.65±1.68 ^b	3.08±0.24 ^a	4.78±0.97 ^c	5.30±0.39 ^a	7.42±0.45 ^b	78.50±2.39 ^c	6.37±0.89 ^c	15.10±0.51 ^ª	18.90±1.11 ^ª

Observations: RE= Rwalakot East, RW= Rwalakot West, RC= Rwalakot Central, RN= Rwalakot North, RS= Rwalakot South.

 Table 3.
 Sensory Evaluation of Autumn Olive Fruits

Locality	Flavor	Taste	Mouth feel	Over all acceptability
RE	6.60±1.5 ^ª	6.50±1.32 ^a	6.40±1.7 ^b	6.50±2.0 ^c
RW	6.50±2.0 ^c	6.60±1.66 ^b	6.30±1.3 ^ª	6.46±1.3 ^ª
RC	6.60±1.3 ^a	6.50±1.97 ^b	6.50±1.9 ^b	6.53±1.6 ^a
RN	6.20±2.4 ^c	6.10±2.3 ^c	6.00±2.04 ^c	6.10±2.5 [▷]
RS	6.00±2.7 ^b	6.10±2.5 ^c	5.90±1.4 ^a	6.00±1.98 ^c

Observations: RE= Rwalakot East, RW= Rwalakot West, RC= Rwalakot Central, RN= Rwalakot North, RS= Rwalakot South

with in five localities. Organoleptic evaluation shows that berries sample collected from Rawalakot central preferred by the panelists

CONCLUSION

This study shows that fruits autumn olive (*Elaeagnus umbellate Thunb*) from Rawalakot Azad Kashmir, Pakistan contain chemical, functional and sensory qualities. *Elaeagnus umbellata* has great potential as a raw material for food industries for processing of juice jam and

functional foods in form of powder drink. This will be providing new opportunities for economic activities in this mountainous area.

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