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Physico-chemical characteristics of wild pomegranate fruits in different locations of Himachal Pradesh

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ABSTRACT

Wild pomegranate is not a cultivated fruit but found in wild form in certain pockets of six districts of HP viz Shimla, Sirmour, Solan, Mandi, Kullu and Chamba. Present studies were carried out to study the quality characteristics of this fruit in different locations of these districts where it is available in abundance in forests, wasteland, bunds and pastures. Among the physical characteristics, fruit size and weight and number of arils in fruits were found to be highest at Bathri in Chamba district closely followed by Narag in Sirmour distirct. The visual colour of mature fruits from all six locations was found to be yellowish green, whereas, the colour of arils was observed as red purple in all the locations with slight variations in the intensity. However, maximum aril:pomace ratio was observed at Basantpur (Shimla), Largi (Kullu) and Alsindi (Mandi). Among the chemical characteristics of the fruits no specific trend was observed at any particular location that means no single parameter was found dominating at multiple locations.

Keywords: Wild pomegranate, location, district, aril:pomace ratio

INTRODUCTION

Wild pomegranate (*Punica granatum* L) is one of the most important wild fruits, which resembles to cultivated pomegranate for various morphological characters (Sharma and Sharma 1990). Due to its wild distribution, no systematic data on area and production of this fruit is available. Pomegranate is believed to be originated in South-West Asia probably in Iran and some adjoining countries (Decandolle 1967). However, the wild and semi-wild pomegranates still exist in North Syria in Gilead and on Mount Carmel. Wild pomegranate is widely distributed in drier and sub-marginal land of mid-hill regions of outer Himalaya, where slightly hot climate characterized by dry summer and fairly pronounced winter prevails. In India, it is found in vast tract of the hill slopes of Himachal Pradesh, Jammu and Kashmir and Uttrakhand at an altitude of 900 to 1800 m above mean sea level. In Himachal Pradesh, it is distributed in some pockets of Solan, Sirmour, Mandi, Shimla, Kullu and Chamba districts (Bhrot 1998). One of the most important centres of wild pomegranate

in Himachal Pradesh is Darlaghat, which is about 50 km from Shimla.

The arils of wild pomegranate are a rich source of organic acids apart from having appreciable amount of sugars, anthocyanins, phenols, ascorbic acid etc. It also contains good amount of minerals like phosphorus, calcium, potassium and iron (Parmar and Kaushal 1982). Citric acid is present in sufficient quantity in the fruit, besides, other acids like malic, succinic and tartaric acid (Saxena et al 1987). This fruit has also got various medicinal properties like it is laxative, diuretic and used for curing vomiting, sore throat, earache, chest troubles, brain diseases, scabies, spleen complaints, bronchitis, liver and kidney disorders (Kirtikar and Basu 1935). Although it is distributed in certain pockets of six districts of the state, yet the quality of the fruits varies from location to location. Seeing the importance of this fruit, it was essential to study its quality characteristics.

MATERIAL AND METHODS

Wild pomegranate fruits, harvested at optimum maturity, were procured from six districts of Himachal Pradesh like Solan (Darlaghat), Sirmour (Narag), Shimla (Basantpur), Kullu (Largi), Chamba (Bathri) and Mandi (Alsindi) and brought to the department of Postharvest Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh. After thorough washing in water, the fruits were used for physico-chemical analysis. The randomly selected 15 fruits were analyzed for physical characteristics. The size (length and diameter) of the fruits was determined with the help of vernier callipers. The weight of fruits was measured on top pan balance individually and the colour was observed visually. The arils from 1 kg of fruits were weighed on top pan balance and average arils per kg of fruits were taken into account. The arils of fruits were counted individually. The colour of arils from randomly selected fruits was observed visually by comparing with colour cards of Royal Horticulture Society, London. The aril and rind portions of fruits were weighed separately on a top pan balance and aril:pomace ratio was calculated by dividing weight of aril by the rind.

Loss in weight of sample after drying represented the moisture content. The total solids content was estimated by drying the weighed sample to a constant weight in hot air oven at 60 ± 5^{0}C. The dried samples were then cooled to room temperature in a desiccator prior to weighing and total solids in terms of percentage were calculated. The titratable acidity of fruits was expressed as per cent citric acid (AOAC 1984). The pH of the juice was determined by using a digital pH meter (CRISON Instrument Ltd, Spain). Before estimating the pH of the sample, pH meter was standardized

with standard buffers of 4, 7 and 9. TSS of samples was measured by Erma brand hand refractometer and results were expressed as ^{0}Brix. The readings were corrected by adding and subtracting the appropriate correction factor. Total anthocyanins, sugars and ash contents of the sample were estimated as per the standard procedures given by Ranganna (1997). Ascorbic acid content was determined as per AOAC (1984) method using 2, 6-dichlorophenol indophenols dye. The phenols or tannin contents were determined by the Folin-Ciocalteu procedure given by Singleton and Rossi (1965). For estimation of pectin, modified Carre and Hanes (1922) method as described by Ranganna (1997) was followed. Data on all physico-chemical characteristics of fruits were analyzed by using Completely Randomized Design (CRD) as described by Mahony (1985).

RESULTS AND DISCUSSION

Physical characteristics

Perusal of data mentioned in Table 1 show that length and breadth of fruits varied from 45.40 to 62.80 mm and 41.70 to 54.20 mm, respectively, at different locations. However, maximum fruit length was recorded at Chamba (Bathri) and minimum at Solan (Darlaghat). However, the location Chamba (Bathri) was statistically at par with Sirmour (Narag) with respect to fruit length. Further, weight of fruits from various locations ranged from 53.40 to 83.50 g and maximum was recorded at Chamba (Bathri) and minimum at Solan (Darlaghat). The visual colour of mature fruits from all six locations was found to be yellowish green, whereas, the colour of arils was observed as red purple, with slight variations in the intensity. Significantly, highest (372) number of arils per fruit was found at Chamba (Bathri). Weight of arils/ fruit was found maximum at Chamba (48.70g) which was closely followed by Sirmour (Narag) (46.40 g) and minimum (31.00 g) at Solan (Darlaghat). The aril:pomace ratio of fruits ranged from 1.40 to 1.50 at different locations. However, maximum ratio was observed at Shimla (Basantpur), Kullu (Largi) and Mandi (Alsindi) and minimum at rest of the locations.

The variations in the various physical parameters of the fruits might be due to normal crop load on the plants, good vigour of the plants, good soil moisture and fertility conditions at various locations. Nearly similar results for these parameters of wild pomegranate fruit have also been reported by Parmar and Kaushal (1982), Kher (1999) and Bhat (2007). Colour of fruits and arils were recorded to be yellowish and red purple, respectively, at all the locations. Almost similar results have also been reported by Sharma and Sharma (1990), Kher (1999) and Bhat (2007). Aril:pomace ratio of fruits of various locations ranged from 1.40 to 1.50 which was due to the variation in arils percentage

of fruits at different locations. These results are in accordance with the values reported by Anon (2006) and Bhat (2007).

Chemical characteristics

Data on chemical characteristics of wild pomegranate fruit presented in Table 2 indicate that highest moisture content of fruits in Mandi (Alsindi) location was found to be 74.60 per cent, which was at par with Chamba (Bathri), and lowest (73.20%) at Solan (Darlaghat). The maximum (26.80%) total solids of fruits were found at Solan (Darlaghat) followed by Shimla (Basantpur) (26.00%) and minimum (25.40%) at Mandi (Alsindi). TSS of fruits was found to be significantly maximum (16.50^0B) at Shimla (Basantpur), which was at par with Solan (Darlaghat) (16.10^0B), and minimum (15.40^0B) was observed at Sirmour (Narag). Reducing sugars of fruits ranged from 6.85 to 7.78 per cent at different locations. The maximum reducing sugars were observed at Sirmour (Narag) which were statistically at par with Shimla (Basantpur) (7.75%) and Solan (Darlaghat) (7.52%) and minimum (6.85%) at Chamba (Bathri). Simultaneously, total sugars of fruits were recorded maximum 8.55 per cent at Shimla (Basantpur) which were at par with Solan (Darlaghat) and Mandi (Alsindi), whereas, minimum (7.85%) total sugars were observed at Chamba (Bathri). Titratable acidity of the fruits from different locations varied from 3.20 to 3.65 per cent, which was highest at Sirmour (Narag) closely followed by Shimla (Basantpur) and lowest (3.20%) at Solan. The pH value of fruits at different locations ranged from 2.80 to 3.15. It was recorded minimum at Sirmour (Narag) which was at par with Shimla (Basantpur) and Chamba (Bathri) and maximum (3.15) at Solan (Darlaghat). Data pertaining to ascorbic acid content of fruits reveal that it ranged from 16.83 to 21.14 mg per 100 g of fruits in different locations. The highest ascorbic acid was found at Kullu (Largi) and lowest at Sirmour (Narag) which was at par with Mandi (Alsindi) and Shimla (Basantpur). Anthocyanin content of fruits at different locations varied from 15.12 to 20.05 mg per 100 g of fruits, with maximum at Sirmour (Narag) which was statistically at par with Mandi (Alsindi) and lowest (15.12 mg/100 g) at Chamba (Bathri). The pectin content of fruits varied from 0.30 to 0.40 per cent at different locations. It was recorded highest (0.40) at four different locations viz Shimla (Basantpur), Solan (Darlaghat), Sirmour (Narag) and Chamba (Bathri) and lowest (0.30%) in rest of the locations. The phenols content of fruits ranged from 108.50 to 116.30 mg per 100 g of fruits at different locations with highest found at Shimla (Basantpur) and lowest (108.50 mg /100g) at Solan (Darlaghat). The ash content of fruits varied from 0.69 to 0.73 per cent with maximum at Kullu (Largi) closely followed by Mandi (Alsindi) and minimum (0.69%) at Chamba (Bathri). Among the chemical characteristics of fruits, no specific trend was observed at any particular location. That means, no single

Table1. Physical characteristics of wild pomegranate fruits of different locations

Location	Size		Weight (g)	Colour of fruit	Colour* of arils	Number of arils/fruit	Weight of arils/fruit (g)	Arils: pomace ratio
	Length (mm)	Breadth (mm)						
Shimla (Basantpur)	46.90	44.60	55.10	Yellowish green	Red purple (60A)	271	33.00	1.50
Solan (Darlaghat)	45.40	41.70	53.40	Yellowish green	Red purple (62A)	252	31.00	1.40
Sirmour (Narag)	61.90	51.30	80.30	Yellowish green	Red purple (62A)	339	46.40	1.40
Kullu (Largi)	55.30	51.00	68.00	Yellowish green	Red purple (62A)	285	40.70	1.50
Mandi (Alsindi)	57.50	51.00	70.90	Yellowish green	Red purple (60A)	294	42.30	1.50
Chamba (Bathri)	62.80	54.20	83.50	Yellowish green	Red purple (62A)	372	48.70	1.40
$CD_{0.05}$	1.04	0.92	0.79	-	-	10.75	2.38	0.07

*Colour compared with the colour cards of Royal Horticultural Society, London

Table 2. Chemical characteristics of wild pomegranate fruits of different locations

Location	Moisture (%)	Total solids (%)	TSS (^{0}B)	Reducing sugar (%)	Total sugars (%)	Titratable acidity (%)	pH	Ascorbic acid (mg/100g)	Anthocyanins (mg/100g)	Pectin (%)	Phenols (mg/100g)	Ash (%)
Shimla (Basantpur)	74.00	26.00	16.50	7.75	8.55	3.60	2.82	19.35	16.59	0.40	116.3	0.70
Solan (Darlaghat)	73.20	26.80	16.10	7.52	8.35	3.20	3.15	19.05	15.86	0.40	108.5	0.70
Sirmour (Narag)	74.00	26.00	15.40	7.78	8.10	3.65	2.80	16.83	20.05	0.40	110.6	0.71
Kullu (Largi)	74.30	25.70	15.80	7.28	8.16	3.38	3.12	21.14	17.24	0.30	109.2	0.73
Mandi (Alsindi)	74.60	25.40	15.90	7.35	8.24	3.46	3.04	19.25	19.28	0.30	111.2	0.72
Chamba (Bathri)	74.30	25.70	15.60	6.85	7.85	3.55	2.86	17.90	15.12	0.40	114.0	0.69
$CD_{0.05}$	0.53	0.97	0.44	0.32	0.33	0.05	0.11	1.89	2.03	0.02	1.95	0.01

parameter was found dominating at multiple locations. It is assumed that the variations in various chemical characteristics of fruits in different locations may be due to localised conditions, age of the trees and climatic conditions of the area besides other factors like tree, soil and nutrition. These findings are near to the values recorded by Parmar and Kaushal (1982), Chauhan et al (1994), Kher (1999) and Bhat (2007). However, Pant (1995) has recorded slightly lower values for all the characteristics except acidity.

CONCLUSION

Among the physical characteristics, visual colour of mature fruit at all six locations was found to be yellowish green, whereas, the colour of arils was observed as red purple at all the locations with slight variations in the intensity. The fruit size, weight and number of arils in fruits were found to be maximum at Bathri of Chamba district closely followed by Narag of Sirmour distirct and lowest at Darlaghat of Solan district. The maximum aril:pomace ratio was observed at Shimla (Basantpur), Kullu (Largi) and Mandi (Alsindi) and minimum at rest of the locations. Among the chemical characteristics of the fruit, no specific trend was observed at any particular location that is no single parameter was not found dominating atmultiple locations.

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