Research Paper

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Studies on Biochemical Characters of Some Ber (*Zizyphus mauritiana* Lamk.) Genotypes

Horticulture

KEYWORDS : Acidity, ascorbic acid, ber, biochemical characters, phenols, sugars

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ABSTRACT

The present investigation of biochemical characters was carried out at Instructional-cum-Research Orchard of Arid Zone Fruit Project, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 2012 to 2014 on nineteen different genotypes of ber which were grafted on the local rootstock. The results showed much variation among the different ber genotypes, the maximum TSS (°Brix) was observed in Rahuri-3 (26.00°Brix) while it was found minimum in Umran (12.50°Brix), while highest acidity was recorded by genotype Kaithili (0.38 %) and lowest in Kopargaon Selection and Rahuri-1 (0.30 %). The maximum ascorbic was recorded by genotype Chemeli (92.95 mg/100g) and lowest in Kadaka (9.46 %). Total sugars were recorded maximum in Kadaka (9.46 %) while total phenols were found maximum in Kala Gola (75413.70 µg/g).

INTRODUCTION

King of Arid Zone Fruits, Ber or Indian jujube (*Zizyphus mauritiana* Lamk.) is one of the ancient and common fruit in India (Rai and Gupta, 1999) relished for its sweet and sour fruits. It belongs to Buckthorn family Rhamnaceae. It is one of the most nutritious fruit. Ber is richer than apple in protein, phosphorus, calcium, carotene and Vitamin-C (Bakhshi and Singh, 1974) and oranges in phosphorus, iron, Vitamin-C and carbohydrates and exceeds them in calorific value. Fresh fruits provide energy 24.76 kj (5.92 kcal), Carbohydrates, 17 g , Sugars 5.4-10.5 g, Dietary fiber 0.60 g, Moisture % 81.6-83.0 g, Protien 0.8 g, Fat 0.07 g, Calcium 25.6 mg, Phosphorous 26.8 mg, Iron 1.1 mg (USDA Nutrient Database, 2013) Vitamin-A units in 100g 70, Vitamin-C (mg/100g of edible portion) 50-150 (Singh *et al*., 1967). It is said that "three jujubes per day keeps doctor away" and would fulfill the requirement of Vitamin-C and B-complex recommended by FAO/WHO (Anonymous, 1974). At present, nearly 90 per cent of its production is consumed as fresh fruit. Although there seems to be good potential for use of fruits in processing industry and different parts of tree in pharmacology, these have still not been exploited. Fruits are used for preparation of candy, pickles, preserve, canned ber, chutney, murabba, ber powder and chhuhara pulp is used for making jam, bases for squash nectar and ready to serve beverage The jujube fruit or red date has been described as the "fruit of life" and is a rich source of vital functional components such as polysaccharides, phenolics, flavonoids and saponins responsible for various biological activities. Amongst these, phenolics serve as powerful antioxidants by virtue of the hydrogen-donating properties of their phenolic hydroxyl groups, as well as by donating electrons to stop free radical chain reactions emerging from oxidative stress (John and Shahidi, 2010). A variety with good acid sugar blended with more appealing flavour, good size and shape and high content of total phenols will be greatly appreciated by the consumers. The information about the health-promoting anti-oxidants could lead to a better understanding and an increased consumption of this fruit in fresh form of improved nutrition and increased food supply. So present investigation is under to study all these aspects of ber fruit at Instructional Cum Research Orchard of Arid Zone Fruit Project, Department of Horticulture, MPKV., Rahuri during the year 2012-14 for their quality assessment.

MATERIALS AND MEATHODS

The experiment was conducted in orchard selecting 57 plants, which were screened for various morphological and biochemical characters during 2012-2014. The nineteen cultivars of Ber (i.e. Umran, Chhuhara, Gola, Kaithili, CIAH Selection-1, CIAH Hybrid-1, Goma Kirti, Narendra Ber-1, Narendra Ber -2, Seb, Kala Gola, Kadaka, Mehrun-1, Jalgaon, Chemeli, Rahuri-1, Rahuri-2, Rahuri-3 and Kapargaon Selection.) were assessed for the present studies. The experiment was carried out in a randomized block design (RBD). The total soluble solids was recorded with the help of Erma hand refractometer (0-32 ^{0}Brix). T.S.S./Acid ratio was estimated mathematically by dividing the value of percent T.S.S. with titrable percent acidity and the data so obtained was expressed as T.S.S./Acid ratio. The titrable acidity of the pulp was determined by titrating 10 ml juice against 0.1 N NaOH using phenolphthalein as an indicator as per the procedure suggested by Ranganna (1999). The percent acidity was expressed as citric acid in percentage. Ascorbic acid content was estimated by the procedure described by Ranganna (1999) by using 2, 6 dichlorophenol dye as an oxidizing agent for titration. The ascorbic acid content of the pulp was estimated on fresh weight basis and expressed as mg/100g pulp of fruit. The total sugars and Reducing sugars of the pulp were determined by volumetric method as advocated by Lane and Eynon (1960) as reported by Ranganna(1999). The content of total phenolic compounds was determined using Folin-Ciocalteu procedure. Standard curve was prepared by using Catechol as reported by Singleton *et al.*(1999).

RESULTS

Among the nineteen genotypes the maximum T.S.S content was found to be in Rahuri-3 (26^{0}Brix) while minimum in Kaithili (12.00^{0}Brix). The variation in T.S.S among the genotype may be mainly due to differential maturity period or genetical characters. The T.S.S/Acid ratio was found to be maximum in Rahuri-1 (77.00) and minimum in Kaithili with (31.57) and the mean T.S.S/acid ratio was found to be (51.53). The maximum acidity content was observed to be highest in Kaithili (0.38 %) followed by CIAH Selection-1 while minimum in genotype Rahuri-1 and Kopargaon Selection (0.30). The variation in acidity content of the genotype may be due to the effect of T.S.S and Sugars biochemical changes at the time of maturity. The sugar content *viz.* total sugars and reducing sugars were found to range between 9.46 per cent in Kadaka to 7.73 per cent in Kala Gola and 5.03 per cent in Jalgaon to 3.68 per cent in CIAH hybrid, respectively. These findings are quiet in line with Barman *et al.* (2007) Obeed *et al.* (2008), Ram *et al.* (2008), Yadav (2009) and Dhanumjaya Rao and Subramanyam (2010).

There was significant difference in ascorbic acid content among *Zizyphus* genotypes. The content ranged from 91.18 mg/100g in Rahuri-2 to 92.99 mg/100 g in Chameli. Variation in ascorbic acid content among genotypes could be due to the existing differences in growing conditions and maturity levels. The values

are in agreement with the previous reports of (Abbas *et al.,* 1988 and Zhang *et al*., 2010). The extent of ascorbic acid content was found to be higher as compared to other fruit crops commonly consumed in Indian diet such as mango papaya and guava The range of ascorbic acid (mg/100g) was 60.5 in mango, 92.9 in papaya, and 72.2 in guava (Luximon-Ramma *et al*., 2003 and Thaipong *et al*., 2006). Ascorbic acid acts as a reducing and a chelating agent and has been shown to scavenger free radicals and is an important component of the antioxidative defence mechanism in cells and tissues. Increased levels of ascorbate also protect the lungs against the oxidizing agents present in cigarette smoke (Bendich *et al*., 1986). It also helps to detoxify hazardous effects of stannous chloride commonly used as a preservative in soft drinks (Yousef *et al*., 2007). Phenolic compounds are important contributors to functional quality and have important role to play in counteracting reactive oxygen species (ROS), thus minimizing molecular damage. Total phenolic content was also found to vary significantly among the genotypes and ranged from 75413.7 µg/gram fresh weight in Kala Gola to 7727.4 µg/gram fresh weight in Kopargaon Selection depicting almost nine-fold variations. Variation in total phenols may be explained on the basis of difference in genotypic background of *Zizyphus* which shows large genetic diversity almost arising from natural cross pollination and self-incompatibility Bhargava *et al*., (2005). Our results are in agreement with the earlier reports of Kaur and Kapoor (2005) and Kamiloglu *et al.* (2009). It is interesting to note that total phenols in Indian jujube was found to be comparable with fruits already reported to be high in total phenols (mg/100 g) e.g. 126-247 in guava, 125-373 in plums Thaipong *et al.* (2006). Plant phenols have multifunctional properties and can act as singlet oxygen quenchers and scavengers free radicals, thus presence of substantial amounts of phenolics in Indian jujube indicate that they are a significant source of anti-oxidants which may provide health promoting advantages to the consumers.

1. Observations for biochemical characters

Sr. No.	Genotypes	Total soluble solids (°Brix)	TSS/Acid Ratio	Acidity (%)	Ascorbic acid (mg/100g)
1	Umran	13.50	40.90	0.33	91.67
2	Chhuhara	15.00	46.87	0.32	91.98
3	Gola	15.60	43.33	0.36	91.81
4	Kaithili	12.00	31.57	0.38	92.14
5	CIAH Selection-1	18.10	48.91	0.37	91.66
6	CIAH Hybrid	16.30	45.27	0.36	91.65
7	Goma Kirti	15.60	43.33	0.36	91.91
8	NarendraBer-1	15.60	43.33	0.36	92.16
9	NarendraBer-2	16.60	47.42	0.35	92.24
10	Seb	12.60	39.37	0.32	92.49
11	Kala Gola	22.50	68.18	0.33	92.40
12	Kadaka	14.80	41.11	0.36	91.55
13	Mehrun-1	20.40	56.66	0.36	92.64
14	Jalgaon	18.80	53.71	0.35	92.34
15	Chameli	20.00	58.82	0.34	92.99
16	Rahuri-1	23.10	77.00	0.30	92.83
17	Rahuri-2	24.00	75.00	0.32	91.18
18	Rahuri-3	26.00	76.47	0.34	91.87
19	KopargoanSelection	12.70	42.33	0.30	91.70
	S.E±	1.18	3.96	0.01	0.69
	CD at 5%	3.52	11.77	0.05	2.06

Table 1 Contd….

Sr No:	Genotypes	Reducing sugars (%)	Total sugars (%)	Total Phenols (micro grams/gram)
1	Umran	3.95	8.65	27856.80
2	Chhuhara	4.03	8.94	61676.10
3	Gola	3.92	8.71	29955.60
4	Kaithili	4.12	9.02	28858.50
5	CIAH Selection-1	4.05	8.96	33628.50
6	CIAH Hybrid-1	3.68	8.57	60292.80
7	Goma Kirti	4.02	8.94	15168.60
8	NarendraBer-1	4.01	8.68	17982.90
9	NarendraBer-2	3.99	9.22	35822.70
10	Seb	4.05	8.82	20654.10
11	Kala Gola	3.89	7.73	75413.70
12	Kadaka	4.16	9.46	29764.80
13	Mehrun-1	3.93	8.50	38541.60
14	Jalgaon	5.03	9.19	14882.40
15	Chameli	4.25	8.16	19175.40
16	Rahuri-1	4.11	8.19	68354.10
17	Rahuri-2	4.11	8.65	9349.20
18	Rahuri-3	4.97	8.64	20945.05
19	Kopargoan Selection	4.03	8.90	7727.40
	S.E±	0.18	0.10	1450.11
	CD at 5%	0.55	0.31	4308.48

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