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Bio-Chemical Characterization of Guava Cultivar's Under Semi-Arid Ecosystem of Haryana

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Abstract

Guava varieties for different bio-chemical parameters were evaluated at Guava Demonstration Centre, Bhuna (Fatehabad) and in Postgraduate Laboratory of the Department of Horticulture, CCS Haryana Agricultural University, Hisar during the year 2018-19 for both the season *i.e.* rainy and winter. Qualitative characters of fifteen guava varieties with distinct variation were observed. Among these characters TSS, Titratable acidity, TSS:Acid and Ascorbic acid were critical observed. During rainy and winter season the highest (11.1 °Brix and 12.5 °Brix, respectively) TSS content was found in Hisar Safeda. TSS: Acid ratio and ranged from 16.8-27.8. Maximum ascorbic acid (mg/100 g) content was recorded in L-49 (189.1 mg/100 g and 242.5 mg/100 g, respectively) in rainy and winter season.

Keywords: Bio-chemical, correlated, highest, qualitative, rainy and winter season, varieties.

I. Introduction:

Guava (*Psidium guajava* L.) is a plant of the myrtaceae family. Its fruits are high in nutritional and health-promoting properties (Teaotia, 1967; Singh, 2008). Vitamin C level in fruits is a natural promising quality with a wide range. Aside from that, guava

has a wide range of soil and climatic tolerance. Teaotia, 1967; Singh, 2003; Mahour *et al.,* 2012, report that distinct varieties/cultures are growing in different parts of India. In terms of area (2.65 lakh acres) and production (40.54 lakh metric tonnes), it is the fifth largest in India (Anonymous, 2018a). Maharashtra, Madhya Pradesh, Uttar Pradesh, Bihar, Andhra Pradesh, West Bengal, Punjab, and Gujarat are the top guava-producing states. It is also a significant fruit crop in Haryana. Haryana produces 1.37 million metric tonnes of fruit from a 0.12 million hectare area (Anonymous, 2018b). Guava has a lot of commercial potential because of its exquisite taste, aroma, sweet flavour, and fine balance of acid, sugar, and pectin (Mitra *et al.,* 2007), as well as its high vitamin A and B content and exceptional vitamin C content (Rai *et al.,* 2010). Pectin, calcium, and phosphorus are also abundant in the fruit. The pectin and vitamin C levels of the winter crop is higher than that of the wet season. Fruits are consumed both raw and cooked. When mature or ripe, when picked straight off the tree, guava has a delicious flavour. The ripe fruit's shell is used to make a delicious salad and pudding. It can be canned, preserved, or made into jams, jellies, or nectar. Air dehydrates guava slices.

II. Materials and Methods:

The field experiment was carried out at the Guava Demonstration Centre in Bhuna (Fatehabad), Haryana, which is located at an altitude of 222 metres above mean sea level and has coordinates of 29°32'11 North and 75°42'39 East of Haryana. Forty-five uniformly grown plants were randomly selected, and all agronomic practises were carried out as per the recommended package of practises. During the research period, all types were kept in the same orchard management conditions. The ages of the varieties (Aishwariya, Allahabad Safeda, Arka Kiran, Arka Mridula, Banarsi Surkha, Baraf Khana, Hisar Safeda, Hisar Surkha, Lalit, L-49, KG Guava, Pant Parbhat, Punjab Pink, Pant Red, Shweta) were 7 years old at a spacing of 6x3 metres. The qualitative parameter such as TSS was measured by hand refractometer in the range of 0-32°°Brix. The juice was extracted from selected fruits by squeezing through muslin cloth with the hands from each replication and reading was noted by just putting the drop of juice on the prism of the hand refractometer. The refractometer was calibrated with the help distilled water after each reading and the value was expressed in°Brix. For estimation of titratable acidity The method suggested by A.O.A.C. (Association of Official Agricultural Chemists - 1990) was followed with using of reagents:

1) Sodium hydroxide 0.1 N
2) Phenolphthalein indicator 1%

The procedure for it contains five grams of the fruit pulp was mashed with small amount of distilled water. Pipette 2 ml of filtrate into a beaker. Put 2-3 drops of phenolphthalein as an indicator and titrate against N/10 sodium hydroxide. The appearance of light pink color indicates the end point.

The total soluble solids to acid ratio was calculated by dividing the value of total soluble solids by per centage acidity. Ascorbic acid of guava fruit was estimated by procedure given in A.O.A.C. (2000).

Statistical Analysis:
Analysis of variance (ANOVA) for randomized block design was done and significant (≤0.05) differences between treatments were determined using least significant difference (LSD0.05). The software program used for the analysis was Statistical Software Package for Agricultural Research Workers (Sheoran *et al.,* 1998).

III. Results and Discussion:
A add up to of fifteen assortments was assessed for bio-chemical parameters including TSS, Titratable acidity, TSS:Acid and Ascorbic acid. These bio-chemical parameters were assessed in both rainy and winter season. The total soluble solids varied significantly among the different varieties of guava during rainy season. TSS values of different varieties varied from 9.28 °Brix to 11.1 °Brix. The highest (11.1 °Brix) TSS content was found in Hisar Safeda, which was statistically at par with Hisar Surkha (11.0 °Brix) and KG Guava (10.6 °Brix) (Table 1). However, in winter season the TSS values for different varieties ranged between 10.1-12.5 °Brix. It was observed that the highest (12.5 °Brix) TSS was found in Hisar Safeda, which was statistically at par with Hisar Surkha (12.4 °Brix) (Table 1). Although, from investigation it is found that the winter season guava had maximum TSS value. Similar type of variations was observed by Jana *et al.,* (2009) in guava, Singh, (2000) found that the maximum TSS were in winter season guava followed by spring and rainy season guava and Sahoo *et al.,* (2017) found highest TSS in Pant Parbhat. Singh *et al.,* (2002) observed that there is increase in TSS in winter season. The variations in TSS content might be due to the occurrence of rainfall during fruit maturity which might have increased the moisture content in the fruit and dilution of carbohydrates. During rainy season the lowest titratable acidity (0.40 %) was recorded in Hisar Safeda, which was statistically at par with Hisar Surkha (0.41%) and KG Guava (0.42 %), whereas, the highest (0.55 %) was observed in Arka Kiran (Table 1). Similarly, in winter season lowest titratable acidity (0.36 %) was observed in Hisar Safeda which was statistically at par with Hisar Surkha (0.37 %) and highest titratable acidity of 0.50 % was recorded with Banarsi Surkha (Table 1). However, Pant Red had no change in titratable acidity (0.46 %) during both the season. It was found that in rainy season the titratable acidity was maximum as compared to winter season but this was contradict to Singh, (2000) who found that the maximum acidity were in winter season guava followed by spring and rainy season guava, but, Sahoo *et al.,* (2017) observed that in some varieties titratable acidity was maximum in rainy season, whereas, in other varieties it was found in winter season. The Variations in titratable acidity might be due to different ripening stages (Upadhyay and Tripathi, 1985) and due to prevailing climatic conditions i.e. low temperature, lesser sunshine, high humidity. However, there was no change observed of acidity in Pant Red variety during both the seasons and it may also due to genetic background, climatic condition and nutritional status of the fruit. TSS: Acid ratio and ranged from 16.8-27.8. During rainy season, the lowest (16.8) TSS:Acid was found in Arka Kiran and highest (27.8) was observed in case of Hisar Safeda which was statistically at par with Hisar Surkha (26.9) (Table 2). Similarly, from it was clearly showed that the highest TSS:Acid ratio of 34.7 was observed in case of Hisar Safeda which was statistically at par with Hisar

Surkha (33.7) and the lowest (20.2) in case of Banarsi Surkha during winter season (Table 2). These variations might be due to genetic characteristics of particular germplasm. It is also observed that the less acidity give rise to higher TSS:Acid ratios *i.e.* if a variety has low acidity then it give high TSS:Acid ratios. These type of variations is also found by Dubey *et al.,* (2009) that Allahabad Safeda had less acidity giving rise to maximum TSS/acid ratio closely followed by Safed Jam, whereas, Ghosh *et al.,* (2013) observed that the TSS/acid ratio was best in Banarasi followed by Khaja and Sahoo *et al.,* (2017) also observed that Pant Parbhat had highest TSS: Acid in winter season followed by Shweta. The Ascorbic acid content was found maximum during both the season in L-49 (189.1 mg/100 g and 242.5 mg/100 g in rainy and winter season respectively) (Table 2), whereas, it was minimum in Aishwariya (144.4 mg/100 g and 160.9 mg/100 g in rainy and winter season respectively) during both the seasons (Table 2). These types of variations was also found by Singh *et al.,* (2008) that cultivar L-49 during both the season has maximum ascorbic acid content followed by cultivar Allahabad Safeda. The variations in the ascorbic acid content of guava varieties at different locations may be attributed to different agro climatic conditions as well as different conditions during the ripening and harvesting period. Morever, it was also evident that ascorbic acid was found maximum in winter season as compare to rainy season. Such type of evident was hence proved by Jana *et al*., (2014) that ascorbic acid content was maximum in winter season followed by summer and rainy season, Singh, (2000) that the maximum vitamin C content were in winter season guava followed by spring and rainy season guava, whereas, Jana *et al*., (2009) and Sahoo *et al.,* (2017) observed that cultivar L-49 showed higher ascorbic acid content in winter season as compare to rainy season.

Table 1: TSS and Titratable acidity of different guava varieties under semi-arid condition of Haryana

Varieties	Rainy season		Winter season	
	TSS (˚Brix)	Titratable acidity (%)	TSS (˚Brix)	Titratable acidity (%)
Aishwariya	10.0	0.47	10.6	0.45
Allahabad Safeda	9.49	0.53	10.3	0.47
Arka Kiran	9.28	0.55	10.3	0.48
Arka Mridula	10.0	0.50	10.9	0.43
Banarsi Surkha	9.63	0.52	10.1	0.50
Barf Khana	9.76	0.51	10.3	0.49
Hisar Safeda	11.1	0.40	12.5	0.36
Hisar Surkha	11.0	0.41	12.4	0.37
KG Guava	10.6	0.42	11.6	0.38
Lalit	10.0	0.49	11.2	0.42
L-49	10.3	0.44	11.4	0.41
Pant Parbhat	10.4	0.43	11.6	0.40

Pant Red	10.1	0.46	10.4	0.46
Punjab Pink	9.48	0.54	10.8	0.44
Shweta	10.2	0.45	11.6	0.39
C.D. at 5%	0.5	0.02	0.5	0.01
Ranges	9.28-11.1	0.40-0.55	10.1-12.5	0.36-0.40

Table 2: TSS: Acid and Ascorbic acid content of different guava varieties under semi-arid condition of Haryana

Varieties	Rainy season		Winter season	
	TSS:Acid	Ascorbic acid (mg/100 g)	TSS:Acid	Ascorbic acid (mg/100 g)
Aishwariya	21.3	144.4	23.3	160.9
Allahabad Safeda	18.0	157.3	22.1	171.6
Arka Kiran	16.8	158.2	21.5	178.5
Arka Mridula	19.8	164.8	25.3	167.1
Banarsi Surkha	18.5	151.7	20.2	168.2
Barf Khana	19.2	167.3	21.0	222.9
Hisar Safeda	27.8	161.2	34.7	178.6
Hisar Surkha	26.9	159.8	33.7	175.3
KG Guava	25.1	161.3	30.6	170.8
Lalit	20.6	173.9	26.2	186.7
L-49	23.1	189.1	27.9	242.5
Pant Parbhat	24.0	158.9	29.2	214.5
Pant Red	22.0	160.3	22.6	163.5
Punjab Pink	17.6	165.3	24.4	169.0
Shweta	22.6	163.6	29.8	221.9
C.D. at 5%	1.6	5.7	1.6	7.4
Ranges	16.8-27.8	144.4-189.1	20.2-34.7	160.9-242.5

Conclusion

The present study concluded that the highest TSS content was found in Hisar Safeda during both the seasons, whereas, it was recorded lowest in Arka Kiran and Banarsi Surkha during rainy and winter season, respectively, similarly, highest TSS:Acid ratios and lowest acidity was found in Hisar Safeda during both the seasons, while, L-49 contains highest ascorbic acid content during both the seasons.

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