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Evaluation of Physico-Chemical Parameters of different Varieties of Guava (*Psidium guajava* L.) under Sub-tropical Condition of Garhwal Himalaya (Uttarakhand), India

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Abstract

The present investigation was carried out at Horticulture Research Centre, Department of Horticulture, H.N.B. Garhwal University (Uttarakhand), India during 2015. Guava fruits were randomly collected and cleaned in tap water to remove surface dust and leaves before weighing, sorting. This study was limited to five guava varieties viz., Lucknow- 49, Allahabad Safeda, Pant Prabhat, Lalit and Sangam. The sample was taken in cotton bag allotted a varieties number/treatment and then brought to departmental laboratory for analysis and then stored in cool place until the measurement had taken. The maximum fruit weight (158.08 gm) and volume of fruit (160.87ml) was found in the **T_1** (Lucknow-49) varieties. The highest no. of leaves/shoot of Guava (43.49) was found in T_2 (Allahabad Safeda). The maximum acidity (0.69%) and no. of seeds/100gm of guava fruit (195.61gm) was found under **T_5** (Sangam). The maximum TSS: acid ratio (44.29%) and vitamin-c (ascorbic acid) 230.44mg/100gm) was found under **T_3** (Pant Prabhat).

Keywords: Psidium guajava, variety, Physical, Chemical, Parameters, yield.

1. Introduction

Guava (*Psidium guajava* L.) is a member of the large Myrtaceae family, believed to be originated in Central America and the southern part of Mexico (Somogyi *et al.* 1996). Guava fruit has a characteristic flavor, to which its acidity (pH 4.0 to 5.2) contributes (Jagtiani *et al.* 1988). It is claimed to be the fourth most important fruit in terms of area and production after mango, banana and citrus. India is the largest producer of guava in the world (Jagtianiet *et al.* 1998). It has been in cultivation in India since early 17th century and gradually became a crop of commercial importance. It is available throughout the year except during the summer season. Guava fruit is known for its 'vitamin-C', minerals like calcium, iron and phosphorous with pleasant aroma and flavour (Dhaliwal and Dhillon, 2003). Guava is quite hardy, prolific bearer and highly remunerative even without much care. Guava leaf tea is commonly used as a medicine against gastroenteritis (dysentery). Keeping in the view these problems and economic importance of guava in developing economy of Uttarakhand. However, thorough investigation is needed to study their growth behavior, flowering, fruit setting and quality. It is widely grown all over the tropics and sub-tropics including India viz., Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu, West Bengal, Assam, Orissa, Karnataka, Kerala, Rajasthan and many more states. Main Varieties grown in India are Lucknow- 49, Allahabad Safeda, Pant Prabhat, Lalit and Sangam.

The present study entitled "Evaluation of physico-chemical parameters of different varieties of guava (*Psidium guajava* L.) under sub-tropical condition of Garhwal Himalaya" was undertaken with the following objectives :

1. To evaluate the physico-chemical parameters of Guava varieties *viz.*, Lucknow- 49, Allahabad Safeda, Pant Prabhat, Lalit and Sangam.
2. To find out the most economic and nutritious varieties of guava available in H.N.B. Garhwal University region

2. Materials and Methods

The present investigation was carried out at Horticulture Research Centre, Department of Horticulture, H.N.B. Garhwal University

(Uttarakhand), India during 2015. Fresh ripened guavas of similar maturation grade were procured from the HRC. Guava fruits were randomly collected and cleaned in tap water to remove surface dust and leaves before weighing, sorting. This study was limited to five guava varieties viz., Lucknow- 49, Allahabad Safeda, Pant Prabhat, Lalit and Sangam. The age of the trees under study was 7-8 years. During the month of March-April 2015, mature and ripe fruits of guava were collected randomly from selected plant in Horticultural Research Centre. The sample was taken in cotton bag allotted a varieties number/treatment and then brought to departmental laboratory for analysis and then stored in cool place until the measurement (ten fruits per replication from each treatment) had taken. The quality character of plant includes fruit physical characters such as Fruit weight (gm), Fruit length (cm), Diameter of fruits (cm), No. of leaves/shoot, No. of seeds/100gm fruit weight, Volume of fruit (ml), Specific gravity of fruit (ml) and chemical characters such as TSS(^{0}Brix), acidity(%), TSS: acid ratio, pectin (%), vitamin-C (mg/100gm), total sugar (%) and Dietary fibre content (%).

The data were analyzed according to the procedure of analysis of randomized block design with five replications (Snedecer and Cochran, 1968). The significance of variation among the treatments was observed by applying analysis of variance (ANOVA) and critical difference (C.D.) test at 5% probability level

3. Results and Discussion

The maximum fruit weight of guava (158.08 gm) was found in the **T_1** (Lucknow-49) varieties and minimum fruit weight (94.9 gm) was founded in **T_5** (Sangam). Maximum length of guava fruit (6.10cm) was found in the **T_1** (Lucknow-49) cultivar, while minimum length of fruit (4.94 cm) was recorded in **T_3** (Pant Prabhat) varieties. Singh (1988) evaluated 25 guava cultivars under Basti (U.P.) conditions and found that the fruit weight ranged from 51.6gm in *cv*. Florida Seedling to 220gm in *cv*. Barafkhana. Mitra *et al*. (1983) evaluated eleven guava cultivars and reported that fruit length ranged between 5.8cm (*cv*. Lucknow-49 and Behat Coconut) and 4.2cm (*cv*. Seedless) under West Bengal conditions. These finding also agree with the findings of Chundawat *et al*. (1976) in guava.

The maximum diameter of guava fruit (6.45cm) was recorded under **T_1** (Lucknow-49) cultivar, while the minimum diameter of fruit (5.33cm) was recorded in the **T_4** (Lalit). Pandey *et al*. (2007) reported that among 11 guava cultivars, Pant Prabhat showed higher fruit diameter (7.13cm), followed by IIHR Hybrid-21 (6.75cm).

Among all varieties the maximum no. of leaves/shoot of Guava (43.49) was found in T_2 (Allahabad Safeda) variety, while the minimum No. of leaves/shoot (40.85) recorded in the T_4 (Lalit). Patel R. K. *et al*. (2011) evaluate 11 guava genotypes and find the highest number of leaves/shoots in RCG-3 (45.50) followed by RCGH-1 (44.83), whereas the number of leaves/shoots was lowest in RCGH-4 (36.83).

The maximum no. of seeds/100gm of guava fruit (195.61gm) was recorded in T_5 (Sangam) variety, while the minimum no. of seeds/100gm of fruit (133.45) was founded under T_3 (Pant Prabhat). Dolkar *et al*. (2014) noticed the highest number of seeds per fruit in Arka Amulya (380.25) followed by Pant Prabhat (300.50), whereas the seed number was lowest in Lalit (205.75).

The maximum volume of guava fruit (160.87ml) was recorded in **T_1** (Lucknow-49) variety, while the minimum volume of fruit (109.14ml) was founded under **T_3** (Pant Prabhat) variety. Under Bangalore conditions fruit volume ranged from 119.40ml in TG selection 6/8 to 69.20ml in TG selection 5/5 among ten seedling progenies of Taiwan guava (Biradar and Mukunda, 2007). The findings of present study are similar to the findings of Aulakh (2005) and Raghav and Tiwari (2008) in guava.

The maximum specific gravity of guava fruit (0.99) was found in the **T_3** (Pant Prabhat) cultivar, while minimum was recorded (0.98) in **T_4** (Lalit) variety. Miano *et al*. (2010) worked on effect of different packaging materials and storage conditions on physico-chemical characteristics of guava (var. Allahabadi) in Pakistan. He reported that the results of analysis pertaining to specific gravity of fruit shows non-significant difference among all the treatments at room temperature and fridge temperature, days of storage had also no effect on this parameter. However, the maximum specific gravity of 1.244 and 1.246 was recorded in fridge under tissue papers after 4 days and 8 days storage at green stage of maturity as compare to room temperature (1.227), respectively. The present findings are similar to the findings of Deshmukh *et al*. (2013) in guava (table 1), also S.K. Mehta *et al*. (2015) find the similar findings.

Among all provenances the data indicated that the various concentration of TSS showed difference among the provenances. The maximum total soluble solid (11.82°Brix) was recorded under **T_3** (Pant Prabhat) guava fruits, while minimum total soluble solid was found in the (9.42°Brix) **T_4** (Lalit) variety. Babu *et al*. (2002) reported TSS in RCG-11 (11.88%) followed by RCGH-7 (10.20%) and the lowest in Lalit (9.35%).

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Table- 1 : Physical parameters of Guava varieties.

Varieties	Fruit weight (gm)	Fruit length (cm)	fruits Diameter (cm)	No. of leaves /shoot	Number of seeds/100gm fruit weight	Volume of fruit (ml)	Specific gravity of fruit (ml)
T_1 (Lucknow- 49)	158.08	6.1	6.45	41.44	139.72	160.87	0.98
T_2 (Allahabad Safeda)	148.06	5.95	6.1	43.49	146.51	152.12	0.97
T_3 (Pant Prabhat)	108.18	4.94	5.43	43.14	133.45	109.13	0.99
T_4 (Lalit)	116.90	5.22	5.33	40.85	179.16	119.23	0.94
T_5 (Sangam)	94.9	5.1	5.4	42.72	195.61	130.29	0.96

Table- 2 : Chemical parameters of Guava varieties.

Varieties	TSS (^{0}Brix)	Acidity (%)	TSS : Acid ratio	Pectin (%)	Vitamin-C (mg/100gm)	Total Sugar (%)	Dietary fibre (%)
T_1 (Lucknow- 49)	10.16	0.53	19.19	0.97	195.62	7.16	2.92
T_2 (Allahabad Safeda)	10.14	0.61	16.92	0.93	179.36	6.98	3.12
T_3 (Pant Prabhat)	11.82	0.27	44.29	0.98	230.44	7.38	2.83
T_4 (Lalit)	9.42	0.61	31.45	1.05	178.43	6.85	2.98
T_5 (Sangam)	9.61	0.69	20.61	0.96	190.41	6.9	2.61

The data of acidity content in Guava fruit showed difference among all the varieties. The maximum acidity (0.69%) was found under T_5 (Sangam) variety, while minimum acidity (0.27%) was recorded in T_3 (Pant Prabhat) variety. Gupta *et al*. (1979) observed the acidity in guava fruits increased up to 4 days of storage under room temperature condition and decreased thereafter. The findings of Aslam *et al*. (2014) in guava match these results with respect to acidity.

The data of TSS: acid ratio in guava fruits showed difference among all the varieties. The maximum TSS: acid ratio (44.29%) was found under T_3 (Pant Prabhat) variety while minimum acidity (16.92%) was recorded in T_2 (Allahabad Safeda) variety. The phenotypic and genetic constituents of the hybrids and cultivars might have enhanced the utilization of nutrients and accumulation of more carbohydrates into the fruits, which may be responsible for developing high value for quality traits. The present study substantiated the earlier findings of Aslam *et al*. (2014) in guava. The prevailing agro-climatic conditions of mid-hills are more favorable for quality fruit development.

The data of pectin content in Guava fruits juice showed significant difference among all the cultivars. The maximum pectin content (1.05%) under T_4 (Lalit) variety, while the minimum (0.93%) was recorded in T_2 (Allahabad Safeda) var. The above finding also agrees with the finding of Deshmukh *et al*. (2013) in guava.

The maximum vitamin-c (ascorbic acid) in guava fruits (230.44mg/100gm) was found in the T_3 (Pant Prabhat) variety, while minimum (178.43mg/100gm) was found in T_4 (Lalit) variety. The data pertaining to ascorbic acid indicated that there were differences in guava fruits from different varieties and their genetic makeup. Bisen *et al*. (2014) noticed that the ascorbic acid (mg/ 100gm) of the fruit pulp was increased at the time of harvesting to 2 DAH and thereafter, it decreased during further storage period in 2009-10 and 2010-11, respectively. The above findings also agree with the finding of Bashir and Abu-Goukh (2002) in guava.

The data of total sugar content in guava fruits juice showed difference among all the varieties. The maximum total sugar content (7.38%) was recorded under T_3 (Pant Prabhat) variety, while the minimum (6.85%) was recorded in T_4 (Lalit) variety. Shukla *et al*. (2009) investigated the effect of integrated nutrient management under high density planting of guava (*cv*. Sardar) in Rajasthan. The combined application of 50 per cent dose of recommended NPK + 50 kg FYM + 250gm Azotobacter (T_7) gave significantly higher fruit weight (153.30gm), TSS (14%), ascorbic acid (198.30mg/ 100gm pulp), reducing sugar (4.77%) and total sugars (8.10%).

The maximum dietary fiber in guava fruits (3.12%) was found in the T_2 (Allahabad Safeda) variety, while minimum (2.61%) was found in T_5 (Sangam) variety. Patel R. K. *et al*. (2011) evaluate 11 guava genotypes and find the highest number of leaves/shoots in RCG-1 (4.70) followed by RCGH-2 (4.25%), whereas the number of leaves/shoots was lowest in RCG-11 (2.38).

4. Conclusion

In the view of the economical and nutritional importance of the guava under the valley condition of Garhwal, Uttarakhand, there is a need to develop and identify the promising cultivars either through selection or hybridization among the existing cultivars of the superior genotype by involving the suitable cultivars. In the present investigation, the varieties Lucknow-49 and Pant Prabhat has been found superior with respect to physical and chemical parameters, respectively.

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