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## *Full Length Research Article*

# STUDIES ON SEASONAL VARIATION OF SOME IMPORTANT CHARACTERS OF GUAVA UNDER EASTERN PLATEAU AND HILL REGION

**[1,*]Jana, B. R., [2]Munsi, P. S. and [3]Manna, D. C.**

[1]ICAR Research Complex for Eastern Region, Research Center, Ranchi, Jharkhand, India
[2]Department of CIHAB, PSB, Sriniketan, Visva Bharati-731236
[3]Program Co-ordinator, Rathindra KVK, PSB, Sriniketan, Visva Bharati-731236

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**ABSTRACT**

Eastern plateau and hill regions of India are a potential zone for guava cultivation. Thirty-two varieties of guava were taken in respect of yield and physic-co-chemical characters and these were changed with different seasons. The main objective of this research work was to find out suitable commercial cultivars and their respective seasons to grow in this particular agro- climatic zone of India. Fruit weight and fruit size were gradually increased from summer to rainy season and thereby winter season. TSS was low in rainy season, medium in winter season and high in summer season (13.7 $^{0}$B, cv. Seed Drop). However, ascorbic acid content was maximum in winter season (358 mg/100g pulp, cv. Kairala Seedling) followed by summer and rainy season. In case of pulp: seed ratio the average low value was observed in rainy season whereas summer season exhibited medium value. The maximum pulp: seed ratio was found in case of winter crops in all cultivars. The cultivar Allahabad Safeda accounted for the highest pulp: seed ratio in winter season (124.48). The maximum yield was observed in rainy season (27.39 kg/tree, cv. Allahabad Safeda) followed by winter and summer season in this ecosystem.



## INTRODUCTION

Guava (*Psidium guajava* L.), the champion fruit from family Myrtaceae, is known as poor-man's apple due to low fetching prices and one of the most referred and legendary fruits because of its hardy (Dhaliwal and Singla, 2002) and prolific bearing nature. In the world, guava is one of the most important fruit crops. It is believed to be originated in tropical America stretching from Mexico to Peru. India contributes 45% of world production of guava after China (10%) and Thailand (6%). In India it is cultivated in an area of 219.7 th ha with a total production of 2571 th MT of fruit (NHB Database, 2010). In India, the main production area is concentrated on UP (Negi *et al*., 2000) and its adjoining states like, Bihar, Jharkhand Madhya Pradesh and West Bengal. Guava is successfully grown over a wide range of climatic conditions due to its greater adaptability. Maintenance of superior genotypes in respect of fruit and growth characters for further crop improvement program is essential.

***Corresponding author: Jana, B. R.,** *ICAR Research Complex for Eastern Region, Research Center, Ranchi, Jharkhand, India*

The ease in cultivation and precociousness of guava under Jharkhand condition makes it a suitable option for increasing the paddy equivalent yield of existing agriculture production system in this low soil fertility zone. In this region guava bears three crops in a year like rainy, winter and summer season guava. To evaluate commercial guava growing season and better performed varieties, the study of seasonal variations in fruit characters and quality is required. A study in that direction will provide ample opportunity to the researchers to understand different guava genotypes. Yield and fruit physico-chemical characters have been taken in the present experiment at ICAR RCER, Research Center, Ranchi with joint supervision of Visva Bharati University.

## MATERIALS AND METHODS

The experiment was conducted at ICAR Research Complex for Eastern Region, Research Center, and Ranchi during 2008-09. This area is situated 620 m above mean sea level (msl) and at 23$^{0}$ 25' N latitude and 85$^{0}$ 20' East longitudes experiencing an average annual rainfall of 110-140 cm. Here guava is cultivated under rain-fed ecosystem. No irrigation is

provided but life saving irrigation of 1-2 spells may be provided during May –June at an one month intervals to establish young plants at their initial establishment as well as mature plants for flowering and fruiting. The climate is sub-humid and subtropical type (Table 1). High humidity (78.14%-84.14 %) and low evaporation rate is experienced after June and continues up to onset of winter (Singh, 1999). Soil is acidic and pH range from 5.0-6.5, which is ideal for guava cultivation. Thirty two guava genotypes were studied on their important physic-chemical parameters and yield. In this climatic regions we got six varieties for rainy, winter and summer crops whereas rest 26 varieties having rainy and winter crops. Fruit botanical descriptions were measured by standard methods. Titratable acidity was estimated by titrating the fruit extract with 0.1 N NaOH using phenolphthalein as an indicator and expressed as per cent citric acid equivalent. Reducing and total sugar was estimated by Lane and Eynon method (Ranganna, 1977). Ascorbic acid was estimated by 2, 6 Dichlorophenol- indophenol visual titration method (Ranganna, 1977).

**Table 1. Meteorological data of the year 2008 and 2009 of ICAR-RCER, RC, Plandu Ranchi**

| 2008 | Minimum | Maximum | Humidity | Rainfall |
|---|---|---|---|---|
| | Temperature ($^0$C) | Temperature ($^0$C) | (%) | (mm) |
| January | 9.34 | 21.76 | 79.23 | 7.40 |
| February | 10.64 | 22.88 | 81.88 | 10.00 |
| March | 16.84 | 30.92 | 77.96 | 9.00 |
| April | 20.61 | 35.11 | 76.50 | 19.60 |
| May | 22.70 | 34.59 | 78.50 | 72.00 |
| June | 23.86 | 30.07 | 90.80 | 378.00 |
| July | 23.55 | 28.25 | 90.92 | 471.00 |
| August | 23.76 | 27.80 | 91.20 | 246.00 |
| September | 22.96 | 28.61 | 91.11 | 239.00 |
| October | 17.78 | 27.52 | 89.52 | 33.00 |
| November | 13.78 | 24.00 | 88.65 | 0.00 |
| December | 10.33 | 22.95 | 89.12 | 0.00 |
| 2009 | Minimum | Maximum | Humidity | Rainfall |
| | Temperature ($^0$C) | Temperature ($^0$C) | (%) | (mm) |
| January | 11.11 | 23.73 | 87.51 | 27.00 |
| February | 12.60 | 26.28 | 82.27 | 0.00 |
| March | 16.57 | 31.03 | 81.46 | 0.00 |
| April | 21.03 | 36.19 | 77.58 | 0.00 |
| May | 22.52 | 34.00 | 89.30 | 86.00 |
| June | 24.23 | 31.96 | 88.82 | 60.00 |
| July | 24.55 | 29.05 | 91.85 | 343.00 |
| August | 24.32 | 28.68 | 91.88 | 210.00 |
| September | 23.42 | 29.53 | 91.19 | 319.00 |
| October | 17.61 | 27.50 | 90.80 | 95.00 |
| November | 14.24 | 26.52 | 89.36 | 24.00 |
| December | 9.84 | 22.60 | 87.44 | 34.00 |

## RESULTS AND DISCUSSION

Guava bring forths fruits in current season growth and it bears fruits through out the year, perticularly in eastern plateau and hill region. Therefore, fruit charcters and quality differs from season to season and cultivars to cultivar. The results are compared with yield as it is important in developping country like India. Seasonal variation in average fruit weight of guava have been depicted in Fig. 1. It is evident from the Fig. 1 that the increase in fruit weight during rainy season over that of summer season was gradual increase whereas a sharp increase in fruit weight was recorded during winter season. This informationn was supported by Sing *et al.*, 2002, Jana *et al.*, 2009 under eastern plateau and hill region.

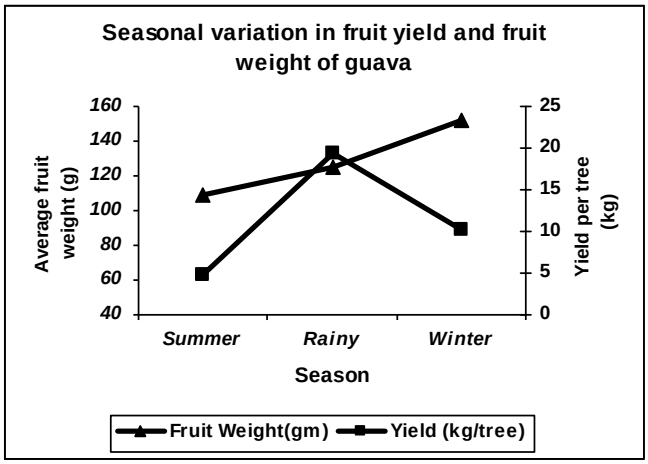


**Fig. 1. Seasonal variation in yield and fruit weight of guava**

The similar trend was recorded in case of seasonal variation in yield and fruit size (Fig. 2) of guava.

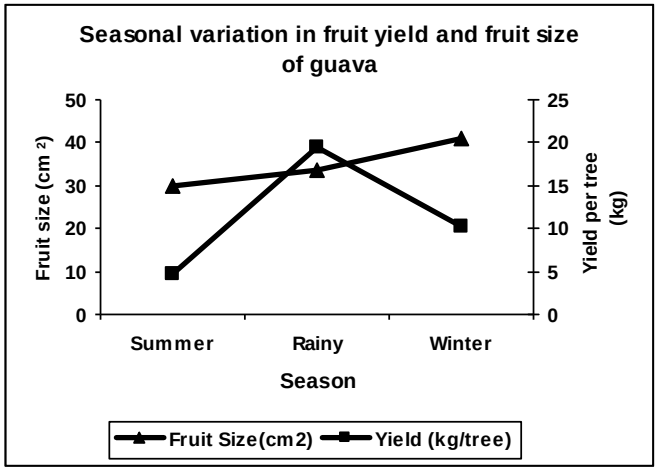


**Fig. 2. Seasonal variation in fruit yield and fruit size of guava**

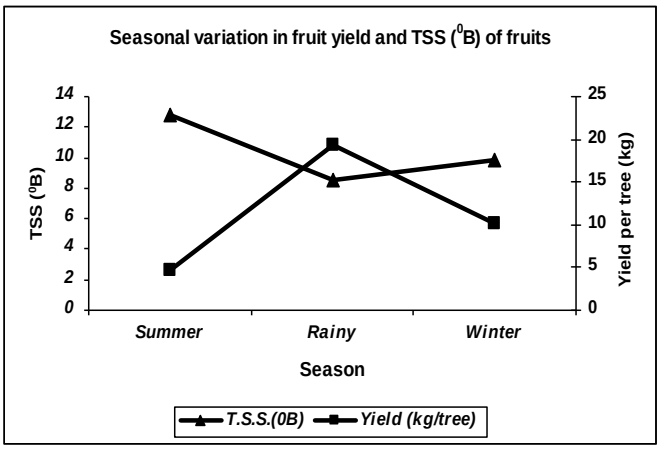


**Fig. 3. Seasonal variation in fruit yield and TSS of guava**

Seasonal variation in average TSS of fruit of guava have been presented in Fig -3. The maximum average TSS of fruit was recorded during summer season and the minimum average TSS was recorded during rainy season . A gradual increase in TSS was recorded during winter season over that of rainy season. The changes in the ascorbic acid content was more or less similar to that recorded in case of TSS (Fig-4). This study was corroborated by Jana *et al*., 2005.

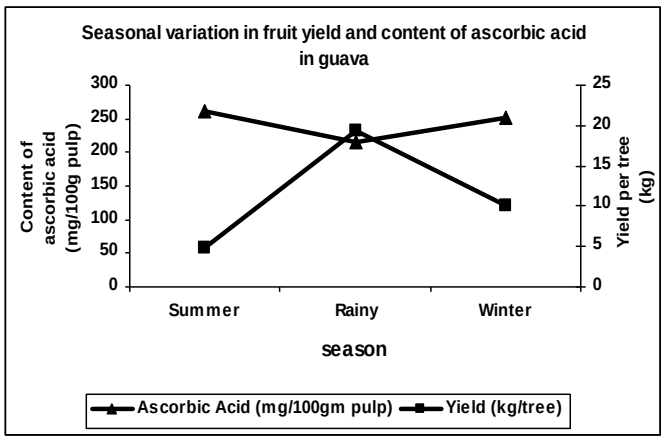


**Fig. 4. Seasonal variation in fruit yield and ascorbic acid in guava**

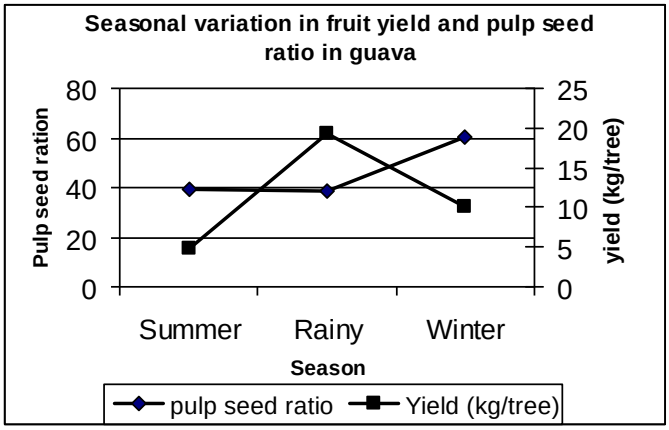


**Fig. 5. Seasonal variation in fruit yield and pulp: seed ratio of guava**

Seasonal variation in average pulp: seed ratio have been depicted in Fig-5. As evident from the Fig. 5 that the decrease in pulp: seed ratio during rainy season over that of summer season was gradual decrease whereas a sharp increase in pulp: seed ratio was recorded during winter season. The fruit which set during August and mature during winter season attained more size and weight than harvested during rainy and summer seasons. The probable cause may be that the winter season fruit set occurs during August when plenty of food material is avilable in comparision to fruit set in April. Apart from food materials, climatic factors such as temperature and humidity prevailing during winter season are also favourable for development of fruits. Number of fruits per tree is also less in winter season (Ojha *et al*.,1987 and Singh and Joon,1984). TSS was low in rainy season, medium in winter season and high in summer season.

This may be due to low water content and high soluble solids in the fruits during summer season. Ascorbic acid content was found maximum in the summer season. High ascorbic acid content in the summer season under the present study, is probably due to genotype x season interactions. Rainy season fruit contains less vitamin-C, TSS and sugar. This might be due to cloudy weather and presence of relatively more moisture in soil which must have moved in to the fruit and diluted the organic metabolites particularly sugars. In case of pulp: seed ratio the average low value was observed in rainy season whereas summer season exhibited medium vaue. Low pulp: seed ratio indicates the fruit having more seeds. In the present investigation rainy season fruits produced more seeds. This may be due to inherent nature of plant to produce more number of seeds for propagation under favourable weather conditions. The maximum pulp: seed ratio was found in case of winter crop. The genotype Allahabad Safeda accounted for the highest pulp:seed ratio in rainy and winter seasons. This may be due to less number of seeds and soft seeds which contibuted less weight after drying. Low temperature during ripening period of winter season crop in guava rctard the excessive loss of respiratory substrates and also increase translocation of photosynthates from leaves to fruits (Sigh and Joon 1984). Another important factor which contribute to better quality of fruit during winter season is the coincidence of lower temperature with phase 3 of fruit growth. Furthermore, it seems that temperature play an important role. It governs the enzymatic systems involved in biogenesis and catabolism of ascorbic acid. Rathore (1972) stated that in addition to increasing the availability of metabolites, the lower temperature during winter season also helps in the accumulation of more metabolites which is responsible for improving fruit quality. The similar result was observered by Chundawat *et al*. (1976) and Haji *et al*. (2012) when studied at cv.Allahabad Safeda at Allahabad condition of India.

## Conclusions

From Two years study of 32 genotypes of guava and growing in summer, rainy and winter seasons, we concluded that winter season crops had higher fruit size and weight TSS, and total sugar and yield. But the highest TSS and Ascorbic acid content were found in summer crop though the yield was very less.

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