

## BIOCHEMICAL CHANGES DURING FRUIT RIPENING OF *PSIDIUM GUINEENSE* SWARTZ. (MYRTACEAE) – AN ENDEMIC WILD GUAVA OF TRIPURA, INDIA

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Biochemical analysis of the fruit of wild guava showed distinct variation in ascorbic acid and total soluble sugar contents during the course of fruit maturation and ripening. The acidity level along with total soluble protein and free phenolics were measured and analyzed as well. The fruit maturity was defined in terms of changes of colour from green to yellow. The result revealed that the ascorbic acid content increased from  $1.15 \pm 0.05$  mg/g to  $2.30 \pm 0.12$  mg/g fresh weight while the fruit titrable acidity decreased from  $0.82 \pm 0.01$  to  $0.60 \pm 0.01$  milli – equivalent of (N)  $\text{Na}_2\text{CO}_3$ /g in *P. guineense*. Superiority in ascorbic acid and sugar content was recorded in *P. guineense* in comparison to *P. guajava* while protein and phenol content was much higher in *P. guajava*.

**Keywords:** Biochemical analysis; Endemic; *Psidium guineense*; Wild guava.

### Introduction

The genus *Psidium* L. of the family Myrtaceae, a tropical American genus of over 100 species is mostly represented by evergreen trees or shrubs with edible berries<sup>1</sup>. In India, the genus is represented by three introduced species of which *P. guineense* Sw. is endemic to Tripura state<sup>2,3</sup>. Fruit nutritional value and palatability of common guava, known as ‘poor man’s apple’, is well studied and emphasized by different workers<sup>4,6</sup>. In spite of the known endemism and ethnobotanical significance, the biochemical character of wild guava fruit (*P. guineense*) is not studied in the context of nutritional point of view. Therefore, present study is aimed to analyze certain biochemical characters and nature of changes in such characters during ripening of the fruit maturity of *P. guineense* in the context of cultivated *P. guajava*.

### Materials and Methods

Fruit samples of *P. guineense* and *P. guajava* were collected for biochemical analysis from plants growing in the University Garden. The biochemical parameters were studied at 6 stages of maturity and the extent of fruit colour change from green to yellow was considered as a measure of maturity. Estimation of ascorbic acid, soluble sugar, protein and phenolics were carried out following standard biochemical methods<sup>7-10</sup> and the estimates were expressed in mg/g of fresh tissue. Titrable acidity was also determined and expressed as milli-equivalent (N)  $\text{Na}_2\text{CO}_3$ /g of fresh

tissue by titrating with 0.01 (N)  $\text{Na}_2\text{CO}_3$  using phenolphthalein as indicator<sup>6</sup>. The percentage of moisture content was also determined as per AOAC method<sup>11</sup>. Biochemical data recorded in the present two taxa (*P. guineense* and *P. guajava*) were compared. Data were suitably analyzed by analysis of variance (ANOVA) and Fisher’s Least Significant Difference (LSD) was used to compare the means.

### Result and Discussion

Biochemical analysis of the fruit of wild guava (*P. guineense*) during different stages of ripening clearly indicated variation in biochemical characters (Table 1). A significant variation of ascorbic acid content at different stages of maturation was registered and highest value was recorded in 100% yellow fruit ( $2.30 \pm 0.12$  mg/g fr. wt.). The maximum ascorbic acid value and the total soluble sugar content recorded in the present study were found to be very high as compared to *P. guajava* (Figs. 1 & 2). There is a trend of increasing ascorbic acid and total soluble sugar content during fruit maturation of *P. guineense* and the findings corroborate with earlier works on *P. guajava*<sup>6,12</sup>. However, in the present study no such increasing trend in the contents of ascorbic acid and sugar during fruit maturation was recorded in *P. guajava* cultivar used as standard. Further, the measure of titrable acidity in *P. guineense* decreases with gradual maturity of the fruit and the highest value ( $0.82 \pm 0.01$  mg/g fr. wt) was

Table 1. Variation of Biochemical parameters with respect to stage of fruit ripening in wild guava (*Psidium guineense* Sw.)

Stage of fruit ripening	Weight of fruit (g)	Moisture (%)	Ascorbic acid (mg/g fr.wt.) *mean $\pm$ SD	Titration Acidity (milli equivalent of(N) Na <sub>2</sub> CO <sub>3</sub> /g. fresh wt.) mean $\pm$ SD	Free soluble sugar (mg/g. fr. wt.) mean $\pm$ SD	Total soluble protein (mg/ g.fr. wt.) mean $\pm$ SD	Total free phenol (mg/ g.fr.wt) mean $\pm$ SD
100% green	8.05	67.02	1.15 $\pm$ 0.05	0.82 $\pm$ 0.01	12.57 $\pm$ 2.04	7.92 $\pm$ 0.13	0.93 $\pm$ 0.08
40% yellow	10.43	72.25	1.11 $\pm$ 0.06	0.60 $\pm$ 0.00	44.36 $\pm$ 1.27	8.34 $\pm$ 0.27	1.36 $\pm$ 0.05
60% yellow	13.41	72.21	1.45 $\pm$ 0.05	0.53 $\pm$ 0.01	69.47 $\pm$ 5.89	6.57 $\pm$ 0.29	1.41 $\pm$ 0.05
80% yellow	10.56	72.74	1.74 $\pm$ 0.06	0.40 $\pm$ 0.04	75.98 $\pm$ 6.81	6.99 $\pm$ 0.59	0.42 $\pm$ 0.03
90% yellow	10.85	73.27	2.16 $\pm$ 0.02	0.39 $\pm$ 0.02	76.72 $\pm$ 4.53	7.06 $\pm$ 0.20	0.61 $\pm$ 0.09
100% yellow	11.19	72.29	2.30 $\pm$ 0.12	0.60 $\pm$ 0.01	80.89 $\pm$ 6.11	7.68 $\pm$ 0.04	0.76 $\pm$ 0.08
LSD 5%	—	—	0.254	0.541	7.166	0.091	0.103

Table 2. Variation of Biochemical parameters with respect to stage of fruit ripening in cultivated guava (*Psidium guineense* Sw.)

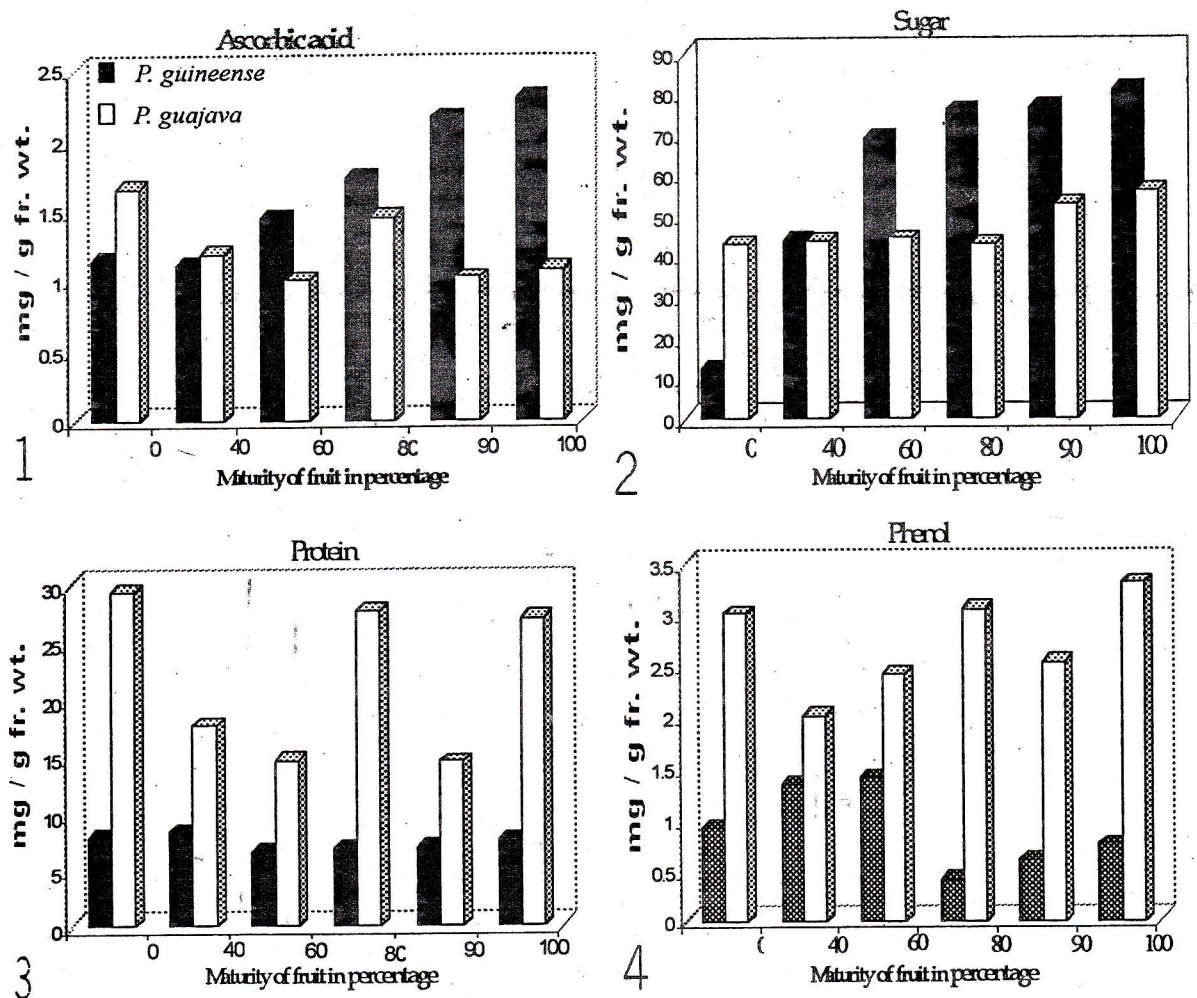
Stage of fruit ripening	Weight of fruit (g)	Moisture (%)	Ascorbic acid (mg/g fr.wt.) *mean ± SD	Titration Acidity (milli equivalent of(N) Na <sub>2</sub> CO <sub>3</sub> /g. fresh wt.) mean ± SD	Free soluble sugar (mg/g. fr. wt.) mean ± SD	Total soluble protein (mg/ g.fr. wt.) mean ± SD	Total free phenol (mg/ g.fr.wt.) mean ± SD
100% green	24.30	77.33	1.66 ± 0.16	0.092 ± 0.00	43.20 ± 3.02	29.34 ± 0.78	3.02 ± 0.07
40% yellow	47.43	79.00	1.19 ± 0.03	0.082 ± 0.00	44.06 ± 1.47	17.70 ± 0.06	2.02 ± 0.04
60% yellow	81.30	83.33	1.01 ± 0.02	0.063 ± 0.00	44.61 ± 0.26	14.60 ± 0.23	2.42 ± 0.10
80% yellow	95.31	87.00	1.46 ± 0.07	0.045 ± 0.00	43.17 ± 2.06	27.70 ± 0.47	3.06 ± 0.10
90% yellow	65.20	86.67	1.02 ± 0.03	0.046 ± 0.00	52.80 ± 1.12	14.52 ± 0.24	2.54 ± 0.08
100% yellow	60.55	89.00	1.08 ± 0.02	0.046 ± 0.00	56.20 ± 0.29	27.10 ± 0.70	3.32 ± 0.08
LSD 5%	—	—	0.111	0.00	3.575	0.748	0.118

\* Mean of 5 replications

**Table 3.** Analysis of variance showing significant difference in the total soluble protein contents between *P. guineense* and *P. guajava*.

Source of variation	Degree of freedom	Sum of squares	Mean sum of squares	F ratio	T value
Between species	1	1950.50	1950.50	8.23**	6.6
Between stages of fruit ripening	5	200.75	40.15	0.163 <sup>NS</sup>	5.1
Residual	5	1185.57	237.11		

\*\* Highly significant at 5% level; NS – Not Significant



**Fig. 1 - 4.** Comparative variation of biochemical parameters between *Psidium guineense* and *P. guajava* with respect to different stages of fruit maturity. Fig. 1. Ascorbic acid; Fig. 2. Sugar, Fig. 3. Protein, Fig. 4. Phenol.

recorded in 100% green young fruit. Similar variation in fruit acidity among the various stages of maturation of *P. guajava* was recorded (Table 1 & 2). The higher sugar and the lower acidity content of the fruit makes sweeter and tasty in *P. guineense* whereas, *P. guajava* revealed relatively low sugar and acidity value. This proposition of biochemical characters is known to be of better quality<sup>13-14</sup>. Increased sugar level with low acidity during fruit ripening recorded in the present study could possibly be due to transformation of organic acids into sugars<sup>15-16</sup>. Estimation of total soluble protein of *P. guineense* did not differ much in their contents and the variation was not significant at different stages of fruit maturation (Table 1). Higher level of protein and phenolics was also recorded in *P. guajava* as compared to *P. guineense* (Figs. 3 & 4). The level of protein content in *P. guajava* was much higher as compared to *P. guineense* and the difference is very significant (Table 3). However, level of variation of protein in different stages of maturation was not significant. Thus, wild fruit of *P. guineense* is found to be the potential source of ascorbic acid as vitamin C with low level of phenolics. Present study highlights better nutritional value of *P. guineense* in terms of ascorbic acid and sugar contents and could be utilized for commercial purpose.

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