

PHYSIO-MORPHOLOGY AND YIELD POTENTIALITY OF SOME GUAVA VARIETIES ON HILL ELEVATION

M .C. Saha, Monoranjan Dhar, M. N. Islam, M. A. Satter and
A. K. M. Amzad Hossain

*Agricultural Research Station, BARI
Khagrachari Hill Tracts
Bangladesh*

Abstract

Physio-morphological features and yield potentiality of four guava varieties (Kanchannagar, Kazipiara, Mukundapuri and Swarupkathi) were studied on hill elevations (25-30%) during the period from April, 1990 to March, 1991. Kazipiara had the longest internode, petiole and lamina and also had the maximum number of vein pairs (17.24 ± 0.21). Tallest and widely spreaded plants were observed in Kanchannagar. Maximum petal number were recorded (8.62) in Kanchannagar but the largest size was observed in Kazipiara. Average stamen number varied from 362.18 to 464.56, the maximum in Kanchannagar and the minimum in Swarupkathi. Ovary and fruit size of Kazipiara were the largest. Kazipiara also produced the heaviest fruit (268.56 g/fruit). Mukundapuri had the highest T.S.S. content (10.55%). On an average 270.64, 312.42, 318.04 and 232.62 seeds were found in Kanchannagar, Kazipiara, Mukundapuri and Swarupkathi fruit, respectively. Seeds of Kazipiara were found distinctly larger and heavier over others. Kanchannagar produced maximum number of both main season (376.59) and off season (68.45) fruits as well as yield per plant (kg/plant).

Key words : Physio-morphology, Guava varieties, Hill elevation.

Introduction

In Bangladesh 93% people are suffering from Vitamin C deficiency. Guava is a rich and cheap source of Vitamin C and protein (Anonymous, 1980). Kanchannagar, Kazipiara, Mukundapuri and Swarupkathi are leading guava varieties in this country. The hill tracts region comprises about one-tenth of total area of Bangladesh (Anonymous, 1985), which has the greatest potentiality for growing fruits.

Guava can easily be cultivated on the hill elevations. Morphological features render a good understanding about a variety. These basic informations help in many ways specially for developing a breeding programme. Detailed morphological features and yield potentiality of the said guava varieties are not properly assessed except in some sporadic works.

The present study was therefore undertaken to give a detailed account of some important

morphological features along with yield potentiality of the abovementioned popularly grown guava varieties on the hill elevations under the agro-ecological situation of Chittagong Hill Tracts.

Materials and Methods

The study was conducted at the Agricultural Research Station, Khagrachari Hill District during the period from April, 1990 to March, 1991. The guava varieties used were Kanchannagar, Kazipiara, Mukundapuri and Swarupkathi. The plants were planted in August, 1985 and were spaced 4m apart in contour lines of 4.0m width on hill slopes of about 25-30%. The crop was fertilized with 400, 300 and 400 g of Urea, TSP and MP per plant per year, respectively. All other cultural operations were practiced alike. The studied morphological features were stem, leaf, flower, fruits and seed characters. Leaves were selected between 3rd to 6th nodes from the tip of freshly growing branches. Fifty samples of each item studied randomly for recording different morphological characters in main season. Yield data were recorded from each plant separately. Five plants of each variety constituted one replication and 4 replications were arranged in a

randomized complete block design. Mature fruits were harvested during the period from June to August, 1990 and January to February, 1991 for main season and off-season crop respectively. Total soluble solid (TSS) content of main season fruits were determined by a hand refractometer directly at edible maturity. Data obtained from the study were analysed as per standard statistical procedures.

Results and Discussion

Stem and leaf characters are presented in Table 1. The longest internode was observed in Kazipiara (5.46 ± 0.11 cm) and smallest in Swarupkathi (2.82 ± 0.08 cm). Internode diameter was highest in Kanchannagar followed by Kazipiara, Mukundapuri and Swarupkathi. The petiole length and diameter followed the same pattern as that of internode. The largest lamina (14.93 ± 0.18 cm) was recorded in Kazipiara but the broadest one (6.55 ± 0.09 cm) in Kanchannagar variety. Kazipiara had the maximum number of vein pairs (17.24 ± 0.21) than the rest varieties. The highest base girth (45.04 ± 1.44 cm) was recorded in Mukundapuri, as most of the primary branches arose from the base of the plants. Kanchannagar produced the tallest plants which also spreaded

Table 1. Plant, stem and leaf characters of four guava varieties.

Variety	Base girth (cm)	Plant height (m)	Plant spread-ing (east-west) (m)	No. of primary branches /plant	Inter-node length (cm)	Inter-node diameter (cm)	Petiole length (cm)	Petiole diameter (cm)	Lamina length (cm)	Lamina breadth (cm)	No. of vein pairs
Kanchannagar	32.03 ± 0.72	4.16 ± 0.08	4.89 ± 0.12	2.64 ± 0.10	3.96 ± 0.13	0.43 ± 0.01	0.81 ± 0.02	0.40 ± 0.01	13.50 ± 0.18	6.55 ± 0.09	16.68 ± 0.20
Kazipiara	30.64 ± 1.05	3.36 ± 0.07	3.55 ± 0.08	2.38 ± 0.08	5.46 ± 0.11	0.42 ± 0.01	0.91 ± 0.02	0.35 ± 0.01	14.93 ± 0.18	6.41 ± 0.08	17.24 ± 0.21
Mukundapuri	45.04 ± 1.44	3.59 ± 0.70	3.72 ± 0.08	4.36 ± 0.21	3.56 ± 0.10	0.39 ± 0.01	0.73 ± 0.02	0.35 ± 0.01	14.37 ± 0.20	6.45 ± 0.09	12.74 ± 0.14
Swarupkathi	33.48 ± 1.10	3.67 ± 0.11	4.23 ± 0.09	2.64 ± 0.09	2.82 ± 0.08	0.36 ± 0.01	0.60 ± 0.01	0.33 ± 0.01	11.67 ± 0.10	5.57 ± 0.07	15.90 ± 0.17

Figures presented are the mean values of 50 samples with the standard error of the means.

widely. Kazipiara exhibited the poorest growth. Mukundapuri had the maximum number of primary branches (4.36 ± 0.21) per plant. All other varieties had almost the same number of primary branches per plant. The floral characteristics of different varieties are presented in the Table 2. In all the varieties flowers were either solitary or in cymes of 2 or 3. During early bud stage the sepals remain united but at the time of opening of flower they split irregularly. The sepal number and size did not vary widely among the varieties. The petals were white and the number varied from 5.54 (Swarupkathi) to 8.62 (Kanchannagar). Sandhu *et al.* (1987) reported 4 sepals and 8-9 petals in 3 guava varieties. The longest (1.88 ± 0.03 cm) and the broadest (1.15 ± 0.03 cm) petal was found in Kazipiara. Petals of Kanchannagar were comparatively smaller than other varieties. Large variation was recorded in the number of stamens among the varieties. The maximum number of stamens were observed in Kanchannagar (464.56 ± 9.97) and the minimum in Swarupkathi (362.18 ± 7.14). Kahlon *et al.* (1987) reported 382 and 406 of stamen in two guava varieties Safeda and Lucknow-49 in Allahabad. Average stamen length was highest in Kazipiara. The longest style was found in Kanchannagar. The style diameter did not vary much among the studied varieties. Ovary of

Kazipiara was distinctly larger than the rest varieties. Kanchannagar has the longest pedicel followed by Kazipiara, Swarupkathi and Mukundapuri. Pedicel diameter did not vary much (Table 2).

Fruit and seed characteristics of different guava varieties are presented in Table 3. Fruits of Kazipiara were found distinctly heavier (268.56 ± 16.40 g) and larger in size (8.63×7.98 cm) than the other varieties. Biswas *et al.* (1989) reported Kazipiara fruit of 232.76 g having the size of 7.65×7.57 cm. Fruits of Swarupkathi were the lightest (95.71 ± 3.71 g) and smallest (5.47×5.29 cm) in size. Kazipiara also had maximum mesocarp and endocarp thickness while Swarupkathi had the minimum. The highest total soluble solid content ($10.55 \pm 0.09\%$) was recorded in Mukundapuri fruits followed by Kazipiara ($9.64 \pm 0.17\%$), Swarupkathi ($8.95 \pm 0.22\%$) and Kanchannagar ($8.62 \pm 0.24\%$). Teotia *et al.* (1968) reported the range of TSS from 9.37 to 17.58% in red flesh guava fruits.

Large variation in the number of seeds per fruit were noticed among the varieties studied. Mukundapuri produced the highest number of seeds per fruit (318.04 ± 14.82) followed by Kazipiara (312.42 ± 15.25) with the lowest in Swarupkathi (232.62 ± 9.44). Kazipiara has

Table 2. Floral characters of four guava varieties.

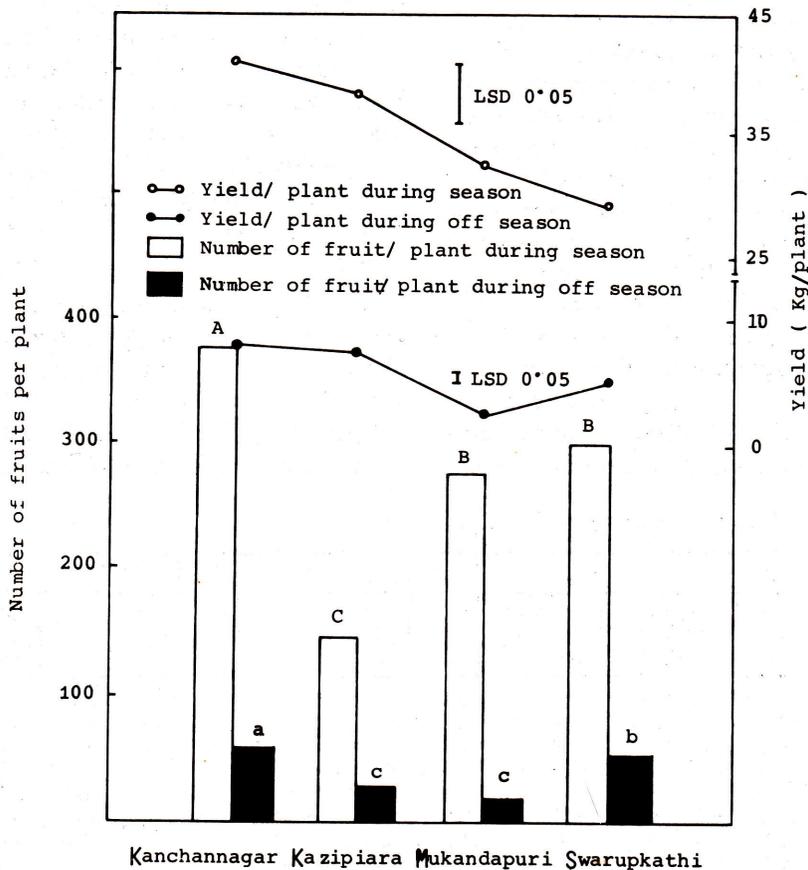
Variety	Sepal			Petal			Stamen		Stigma+ style length (cm)	Style dia. (cm)	Ovary		Pedicel	
	Number	Length (cm)	Breadth (cm)	Number	Length (cm)	Breadth (cm)	Number	Length (cm)			Length (cm)	Dia (cm)	Length (cm)	Dia (cm)
Kanchannagar	4.12 ± 0.09	0.97 ± 0.03	0.81 ± 0.03	8.62 ± 0.28	1.51 ± 0.04	0.90 ± 0.04	464.56 ± 9.97	0.11 ± 0.06	1.63 ± 0.01	0.11 ± 0.01	0.82 ± 0.01	0.46 ± 0.01	2.48 ± 0.15	0.22 ± 0.01
Kazipiara	4.46 ± 0.09	0.99 ± 0.02	0.74 ± 0.02	5.68 ± 0.15	1.88 ± 0.03	1.15 ± 0.03	407.44 ± 8.02	1.18 ± 0.04	1.33 ± 0.02	0.12 ± 0.01	0.93 ± 0.01	0.49 ± 0.01	1.97 ± 0.09	0.21 ± 0.01
Mukundapuri	4.10 ± 0.07	0.95 ± 0.02	0.86 ± 0.04	7.16 ± 0.24	1.83 ± 0.05	1.09 ± 0.05	385.88 ± 10.47	1.12 ± 0.02	1.50 ± 0.02	0.12 ± 0.01	0.79 ± 0.01	0.46 ± 0.01	1.89 ± 0.11	0.22 ± 0.01
Swarupkathi	4.36 ± 0.11	0.92 ± 0.03	0.64 ± 0.02	5.54 ± 0.11	1.86 ± 0.04	1.13 ± 0.04	362.18 ± 7.14	1.09 ± 0.04	1.36 ± 0.01	0.12 ± 0.01	0.74 ± 0.01	0.50 ± 0.01	1.94 ± 0.07	0.21 ± 0.01

Figures presented are the mean values of 50 samples with the standard error of the means.

Table 3. Fruit and seed characters of four guava varieties.

Variety	Fruit						Seed					
	Weight (g)	Length (cm)	Dia. (cm)	Meso-carp thickness (cm)	Endo-carp thickness (cm) (%)	TSS (%)	Number/fruit	Number/100g fruit	100 wt. (g)	Length (cm)	Dia. (cm)	Thickness (cm)
Kanchan-nagar	105.39	5.64	5.71	1.18	3.18	8.62	270.64	243.33	0.78	0.31	0.23	0.18
	±3.85	±0.08	±0.07	±0.04	±0.06	±0.24	±10.09	±8.65	±0.01	±0.006	±0.006	±0.004
Kazi-piara	268.56	8.63	7.58	1.50	4.19	9.64	312.42	116.88	1.14	0.37	0.27	0.18
	±16.40	±0.14	±0.09	±0.07	±0.07	±0.17	±15.25	±4.71	±0.01	±0.006	±0.005	±0.003
Mukunda-puri	111.15	5.98	5.69	1.17	3.23	10.55	318.04	287.22	0.62	0.30	0.24	0.17
	±6.37	±0.16	±0.14	±0.04	±0.07	±0.09	±15.82	±15.48	±0.006	±0.004	±0.004	±0.004
Swarup-kathi	95.71	5.47	5.29	1.16	2.67	8.95	232.62	256.06	0.84	0.32	0.27	0.17
	±3.71	±0.10	±0.11	±0.03	±0.05	±0.22	±9.44	±10.18	±0.01	±0.006	±0.007	±0.003

Figures presented are the mean values of 50 samples with the standard error of the means.

**Figure 1.** Production of four Guava varieties during season and off-season.

the minimum number of seeds (116.88 ± 4.71) per 100 g fruit, Mukundapuri again observed highest in this respect. Seeds of Kazipiara were distinctly heavier (1.14 ± 0.01 g/100 seeds) than other varieties. The lightest seeds were observed in Mukundapuri. Azad *et al.* (1987) reported almost similar results. Seeds of Kazipiara were observed bigger than rest of the varieties and Mukundapuri produced the smallest seeds in size (Table 3).

Number of fruits and yield of guava varieties varied widely between season and off-season harvest. During the study period Kanchannagar produced the highest number in both main season (376.59) and off-season (68.45) fruits as well as yield per plant (Figure-1). Though Kazipiara produced the lowest number of fruits in main season (147.63) harvest, it yielded the second highest (38.41 kg/plant). Big size fruits of the said variety were mainly responsible for that. Kazipiara produced 26.5 number of off-season fruits per plant and identical of Mukundapuri (18.80). But the yield of Kazipiara (7.31 kg/plant) was significantly higher over Swarupkathi (5.17) and Mukundapuri (2.46). Swarupkathi and Mukundapuri produced the lowest yield in main season and off-season harvest respectively. Number of fruits per plant mainly contributed to the yield of those varieties.

The results revealed that the plants of Kanchannagar exhibited better growth (plant height & spreading) and ultimately produced maximum number of fruits and yield. Kazipiara produced less number of big sized fruits and yielded similar to Kanchannagar.

References

- Anonymous. 1980. Pusti Barta Sankalan. Institute of Nutrition and Food Science, Dhaka University. p.108.
- Anonymous. 1985. The Year Book of Agricultural Statistics of Bangladesh. Bangladesh Bur. of Stat. Mins. of Plan, Dhaka.
- Azad, A.K.; A. Hoque; A.K.M. Amzad Hossain and A.M. Abdullah. 1987. Physico-Chemical characteristics of fruits of some guava varieties. Bangladesh J. Agril. Res. 12 (2): 43-49.
- Biswas, Monomohan; A.K. Azad; Aziz Ahmed and A. K. M. Amzad Hossain. 1989. Effect of fruit thinning on fruit size, yield and quality of guava cv. Kazipiara. Bangladesh Hort. 17 (2) : 1-4.
- Kahlon, P.S.; P.K. Sharma and J.L. Rambadi. 1987. Studies on the floral biology of guava cultivar Allahabad Safeda and Lucknow-49. Haryana J. of Hort. Sci. 16(1-2) : 65-73.
- Sandhu, A.S.; S.S. Baim and S.N. Songh. 1987. Studies on the floral biology of guava under Ludhiana conditions. 1. Flower bud development, time and duration of flowering and floral morphology. The Punjab Hort. J. 27(3-4) : 203-207.
- Teaotia, S.S.; I.C. Pandey and R.K. Awasthi, 1968. Description of red fleshed varieties of guava. The Punjab Hort. J. 8(2) : 126-133.