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Evaluation of Half Sib Progenies of Guava var. Arka Kiran for Fruit Yield and Quality

Sanjana U.[1], M. Kavino[2*], J. Auxcilia[3] and M. Raveendran[4]

[1]M.Sc. (Hort.), Fruit Science, Department of Fruit Science, HC&RI, TNAU, Coimbatore (Tamil Nadu), India.

[2]Assistant Professor (Hort.), Department of Fruit Science, HC&RI, TNAU, Coimbatore (Tamil Nadu), India.

[3]Professor (Hort.), HC&RI, TNAU, Coimbatore (Tamil Nadu) India.

[4]Director of Research, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India.

(Corresponding author: M. Kavino)*

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ABSTRACT: Guava (*Psidium guajava* L) is one of the commercially important fruit crops being cultivated in India. Of late, red pulp varieties are getting commercial importance due to its consumer preference. However, red pulp varieties are having higher number of seeds with bold seed size, which limits its wide acceptance. Hence, in the present study it is focussed to identify genotypes with deep pink or red colour pulp with few soft seeds. From 337 half sib progenies of guava var. Arka Kiran established during 2013-2014, twelve half sib progenies were chosen for their appealing fruit colour and individual fruit weight and tree yield. Among the half sib progenies, PG 5-8 recorded maximum plant girth and height while it was least in PG 1-7 which is preferred trait for high density planting. Fruit yield was highest in PG 32-1 (22.48 kg/plant) closely followed by PG 24-6 (22.45 kg/tree) while yield was lowest in PG 32-3 (8.81 kg/tree). Fruit weight was maximum in PG 32-1 (234.00 g) followed by PG 24-6 (228.60 g) and PG 1-7 (210.00 g) while it was least in PG 32-3(90.00 g). Highest total soluble solids (12.6°Brix), ascorbic acid (203.78 mg/100 g) and total sugars (6.72%) were noticed in PG 1-7 and the fruits of this half sib progeny had less number of seeds (325 seeds) when compared to Arka Kiran (384) and moderate titratable acidity (0.28% citric acid). The trunk girth was positively and significantly associated with fruit yield in a study of correlation among different yield contributing factors in half sib progenies. Based on yield and fruit quality attributes, PG 1-7 was found to be the best for commercial exploitation.

Keywords: Guava, half sib progenies, selection, physico-chemical characters, correlation.

INTRODUCTION

Guava is a tropical fruit crop and is being cultivated throughout India, in both tropical and sub-tropical climates because of its wide adaptability. This is one of India's most popular and well - known table fruit and it is known as the 'Poor Man's Apple' because of its inexpensive cost and high nutritional value (Rajan *et al*., 2005). It is a highly lucrative and commercially prominent fruit crop that requires less care from planting till harvest (Maheswari *et al*., 2022).

Guava is an open pollinated crop and seedlings were extensively used to raise new plantations (Hayes, 1957). Hence, guava exhibits high levels of genetic diversity due to continuous cultivation of heterogeneous seedling trees, selection from these seedlings (half sib progenies) can be used as one of the strategies to obtain superior strains with respect to fruit yield and quality besides consumer preference.

Hence need of hour is to find cultivar/s with commercially important characteristics, such as deep pink or red pulp and excellent fruit quality. In India, efforts on guava development by selection began in 1907 at the Ganeshkhind Fruit Experiment Station in Pune, one strain from open-pollinated seedlings of Allahabad Safeda collected from Lucknow was selected and released as Lucknow-49 (Phadnis, 1970). Cheema *et al*. (1927) chose cv. Sardar from the Allahabad Safeda open pollinated seedling group (Dhaliwal and Rattanpal, 2004). Iyer and Subramanyam (1988) identified a new cultivar called 'Arka Mridula' from open pollinated progenies at IIHR, Bangalore (Dinesh and Vasugi, 2015). 631 open-pollinated seedlings of red-colored guava were assessed for several features at the Central Institute for Subtropical Horticulture (CISH), Lucknow, and the guava variety Lalit was released for commercial production (Pandey *et al*., 2016). In general, both white and red flesh guava fruits have good market value for fresh consumption. However, red flesh varieties are better suited for processing apart from dessert purpose owing to their high pectin content, attractive colour, high acidity and good flavour (Tiwari and Dinesh 2001).

Some of the popular varieties of guava in India are, Lucknow-49 (Sardar), Allahabad Safeda, Chittidar, Red Fleshed, Saharanpur Seedless, Apple Colour, Banarasi Surkha, Bangalore local and Behat Coconut. Arka Kiran (IIHR, Bangalore) and Lalit (CISH, Lucknow) have gained commercial relevance in recent years,

particularly in the establishment of new guava orchards (Mitra and Irenaeus 2018).

The 'Arka Kiran' guava F_1 hybrid was developed by the Indian Institute of Horticultural Research, Bengaluru and has a potential to yield medium sized round fruits with deep red, firm pulp with high lycopene content (7.14 mg / 100 g). A linkage was found between flesh colour and seed size (Rajan *et al.,* 2005), red flesh colour of fruit is always associated with a greater number of seeds with bold seed size which impedes its export potential and wide acceptability.

In pursuance of the above facts, the present study was undertaken at Department of Fruit Science, Horticultural College and Research Institute, Coimbatore, to evaluate the half sib progenies of guava var. Arka Kiran for deep pink or red colour pulp with few soft seeds.

MATERIALS AND METHODS

A total of 337 half sib progenies of guava var. Arka Kiran were planted with a spacing of 1 × 1 m at College orchard, Department of Fruit Science, Horticultural College and Research Institute, TNAU Coimbatore during 2013-2014, with the aim to evaluate half sib progenies for their level of variability in the seedling population, as well as to select promising genotypes with deep pink or red colour pulp with few soft seeds. An analysis was also done to see whether there were any correlations between various features that could be useful in a crop improvement programme.

Twelve half sib progenies were chosen from this group based on their growth, yield and fruit quality characteristics for the past two years with a focus to identify red pulp and less seeded fruits with soft seeds. The half sib progenies in this study are referred to as PG selections. The height of plant was measured from the collar region to the tip of the plant using meter scale and spread of plant was measured in both North- South and East-West direction using measuring tape while plant girth was recorded at the collar region with the measuring tape. All the physico-chemical parameters were recorded for two seasons (August, 2021 and February, 2022) and their average values are given in Table 1 and Table 2. Fruit growth parameter in term of weight (g) was taken using an electronic balance. Length of the fruit was measured using vernier calipers and expressed in centimeters. The diameter of the fruit was measured at the center of fruit using a thread. For calculating number of seeds/fruits, the fruits were cut into four halves and the seeds were extracted from pulp and counted manually. From each of the selected progenies of guava var. Arka Kiran, one hundred seeds were taken and seed weight was recorded using electronic balance.

Chemical analysis of fruits. For chemical analysis, three fruits were randomly selected from each genotype. Fruit quality-related parameters were determined in terms of total soluble solids (°Brix), titrable acidity (%), Vitamin C content (mg/100 g), reducing sugar (%), Lycopene pigment (mg/100 g), total sugar content (%) and sugar to acid ratio. The total soluble solid (°Brix) of pulp was determined using a digital refractometer. Acidity was estimated by simple acid-alkali titration method in terms of citric acid. Ascorbic acid content of the fruit was expressed in mg/100g pulp and estimated by 2, 6- dichlorophenol indophenol visual titration method (Anon, 1975). Reducing sugars was estimated by Shaffer Somogi method and expressed as percent (Ranganna 1977). For analysis of lycopene pigment, the fruit skin was removed and the juice strained using muslin cloth. The filtered juice was mixed with 20ml acetone and shaken for 30 minutes, then 40ml petroleum ether was added, and absorbance was measured at 503nm to estimate the lycopene content using the method provided by Ranganna (1977). The total sugars are estimated as per the method suggested by Somogyi (1952) and expressed as percentage (%). The sugar/acid ratio was calculated by dividing the total sugar content of fruits by their acidity.

Statistical analysis. The data collected from all the trees were subjected to statistical analysis as follows: The statistical mean was calculated using the method suggested by Burton and Devane (1953), range was calculated based on the difference between the lowest and the highest values present in observation, standard deviation is computed by taking square of variance and standard error was calculated by dividing standard deviation by total number of select progenies.

Standard deviation (SD) = (Variance)²

Standard error (SE) = $\frac{SD}{\sqrt{n}}$

Parametric Pearson correlation analysis among various traits was performed using R Studio software (Makowski *et al.* 2020).

RESULTS AND DISCUSSION

In the present study some of the vegetative characters evaluated in the half sib progenies of guava var. Arka Kiran, such as plant height, plant spread, plant girth and number of primary and secondary branches per plant, revealed that there exists a substantial difference among themselves (Table 1). In terms of plant height, PG 1-7 was determined to be the shortest (2.16 m) with moderate North-South (1.86m) and East-West (2.29m) spread, which is preferred trait for high density planting. The tallest plant observed among the selections was the PG 5-8 with a height of 2.94m. The trunk girth showed abundant variability among progenies, the maximum in PG 5-8 (9.13cm) and minimum in PG 28-1 (5.72 cm). Azam *et al.* (2020) found a similar pattern of variation in the trunk girth of guava genotypes. It is apparent from the data that tree characters like tree height, trunk girth and plant spread showed remarkable variations in the genotypes studied (Table 1) which may be due to seedlings of heterozygous nature besides environmental influence. There is very little information about the production of primary and secondary branches in different guava genotypes. The present study found that among the 'Arka Kiran' half sib selections, the largest number of primary branches was six in PG 24-6 and the lowest number was two in PG 32-3, with the values for other selections varying between these two extremes. The largest number of secondary branches was found in PG 1-7(24 secondary branches), while the lowest number was in PG 24-6 (14 secondary branches).

Table 1: Comparative evaluation of vegetative and reproductive traits of half sib progenies of guava var. Arka Kiran.

Half sib progenies of guava var. Arka Kiran	Plant Height (m)	Plant spread(m)		Plant Girth (cm)	Number of branches / Plant		Fruit no.	Fruit yield (Kg/plant)	Fruit dimension			Seed/ fruit	
		N-S	E-W		Primary	Secondary			Fruit weight (g)	Length (g)	Diameter (cm)	No. of seeds/ Fruit	Wt of 100 seed(g)
PG 1-7	2.16	1.86	2.29	6.84	5	24	105	19.04	210	8.2	11.80	325	0.91
PG 5-8	2.94	2.15	2.19	9.13	6	21	99	12.50	128.63	6.5	10.25	378	1.05
PG 11-5	2.43	2.21	2.19	6.93	5	19	100	20.90	200.24	7.0	11.65	224	0.94
PG 13-3	2.25	2.11	2.15	6.33	3	21	98	11.36	117.34	7.0	9.55	264	0.48
PG 24-6	2.32	3.21	3.31	6.78	6	16	98	22.45	228.60	8.3	12.75	308	1.38
PG 25-1	2.38	2.11	1.91	7.99	4	17	102	13.48	132.50	6.5	10.65	259	0.61
PG 28-1	2.35	2.16	1.95	5.72	3	23	61	10.68	175.50	8.2	11.05	364	0.67
PG 32-1	2.39	3.20	3.31	6.22	5	16	97	22.48	234.00	6.3	10.80	478	0.82
PG 32-3	2.32	2.11	3.31	6.5	2	18	98	8.81	90.00	6.2	12.25	184	1.13
PG 34-1	2.38	2.11	1.91	7.99	4	17	103	19.98	195.80	8.0	12.15	391	0.98
PG 35-1	2.16	2.21	1.90	6.01	3	17	89	17.84	200.00	8.1	12.25	486	1.05
PG 36-1	2.93	1.98	2.10	8.76	3	22	104	9.34	91.00	6.2	9.50	198	0.94
Arka Kiran	2.17	1.88	2.62	6.00	4	23	86	18.89	200.00	9.5	7.75	384	0.98
Mean	2.40	2.25	2.40	7.02	4.08	19.54	96	15.98	169.51	7.26	11.22	326.38	0.92
Maximum	2.94	3.21	3.31	9.13	6	24	95.38	22.48	234	8.3	12.75	486	1.38
Minimum	2.16	1.86	1.90	5.72	2	16	105	8.81	90	6.2	9.50	184	0.48
SE of mean	0.07	0.12	0.15	0.31	0.35	0.81	61	1.41	14.11	0.24	0.29	27.27	0.07
SD	0.26	0.44	0.53	1.10	1.26	2.90	3.24	5.07	50.88	0.86	1.04	98.34	0.23
CV (%)	10.67	19.36	22.33	15.72	30.80	14.87	11.68	31.75	30.02	11.88	9.30	30.13	25.49

The extent of fruit set depends upon the variety or species, the time of pollination and type of pollen. Among selected progenies PG 1-7 had the highest number of fruits /plant (105 fruits/plant) with fruit yield of 19.04 kg/plant while PG 28-1 had only 61 fruits/plant. The maximum fruit yield was noticed in PG 32-1 (22.48 kg/plant) and a minimum of 8.81 kg/plant in PG 32-3.A similar pattern of variation in the fruit yield of guava genotypes was identified by Chopra *et al.* (2021). Depending upon the availability of food reserve, the extent of fruit set is also altered (Elsheery *et al*., 2020).

The physical properties of the fruits in the half sib progenies varied in great extant. The maximum fruit length and diameter was observed in PG 24-6 (8.30 cm and 12.75 cm) and the lowest in PG 36-1(6.2 cm and 9.5 cm). Such variation in the physical parameters of fruit was also observed in the seedling progenies of guava variety Allahabad Safeda (Marak and Mukunda, 2007). The maximum fruit weight was in PG 32-1 (234.00g) and minimum fruit weight was in PG 32-3(90.00g) implying a large range of fruit weight in the progeny. The presence of hard seeds and a greater number of seeds per fruit are the two most significant disadvantages of any red pulped guava variety (Boora, 2012). PG 32-3 (184 seeds/fruit) had the fewest seeds per fruit, while PG 35-1(486 seeds/fruit) had the most, on comparing Arka Kiran with PG 1-7 whose fruits were of almost same weight, PG 1-7 was found to have less number of seeds (325 seeds/fruit) than that of Arka Kiran (384 seeds/fruit); the weight of 100 seeds was lowest in PG 13-3 (0.48g) and highest in PG 24-6 (1.38g). There was a lot of variances in these fruit seed traits among the half sib progenies of guava var. 'Arka Kiran' and these differences were statistically significant (Table 1). Variation in such seed characters of guava fruits was also noticed in Lucknow-49 a selection from Allahabad Safeda (Phadnis, 1970) and Allahabad Surkha (Nand *et al*., 1991). Such variation in physical parameters of the fruit is mainly attributed due to genetic makeup of plant.

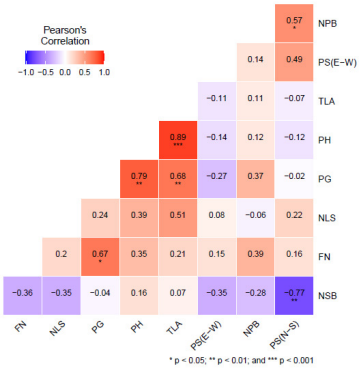
The chemical composition of fruits reflects the guava fruit's quality and consumer preference. In the present study it is inferred that the maximum TSS (12.6°Brix) and ascorbic acid (203.73 mg/100g) content were recorded in PG 1-7 whereas minimum TSS (9.2°Brix) and ascorbic acid content was found in PG 25-1 (156.89 mg/100g). Highest acidity was recorded in PG 35-1(0.29%) whereas lowest was recorded in PG 5-8(0.22%). However, the parent Arka Kiran recorded moderate TSS (12°Brix), acidity (0.28%) and ascorbic acid content (185.32 mg/100g). Under the Tarai condition of Uttarakhand, Arka Kiran showed TSS of 7.54°Brix (Dubey *et al*., 2016). Patel *et al*. (2011) discovered that Lalit had a higher acidity of 0.61 percent in the Meghalaya mid hills. The maximum sugar content (6.72 %) and moderate sugar/acid ratio (24) was noticed in PG 1-7 while minimum total sugar was recorded in PG 25-1 (4.69%) and minimum sugar/acid ratio was recorded in PG 35-1 (19.62). The guava fruit's red/pink colour comes from the lycopene component. In the 'Arka Kiran' half sib progenies, there was a lot of diversity in lycopene pigment. Among the half-sib progenies maximum lycopene pigment was found in PG 34-1, whereas it was least in PG 35-1. Such variation in the lycopene pigment of fruit was also observed in the seedling progenies of guava variety Allahabad Safeda by Biradar *et al*. (2007). Since the half sib progenies of 'Arka Kiran' showed a range of red colour, the character is likely to be governed by polygenes, with the intensity of colour depending on the number of genes present in a particular genotype contributing to the colour (Table 2).

Table 2: Comparative evaluation of quality traits of half sib progenies of guava var. Arka Kiran.

Half sib progenies of guava var. Arka Kiran	TSS(°B)	Titratable Acidity (%)	Ascorbic Acid (mg/100g)	Reducing Sugars (%)	Lycopene pigment (mg/100g)	Total sugar (%)	Sugar: acid Ratio
PG 1-7	12.60	0.28	203.73	3.66	6.00	6.72	24.00
PG 5-8	11.60	0.22	198.10	3.95	5.95	6.50	29.54
PG 11-5	11.20	0.26	197.20	3.69	5.82	5.71	21.96
PG 13-3	11.50	0.24	172.30	3.60	5.93	6.44	26.83
PG 24-6	11.40	0.23	195.20	3.55	5.56	5.73	24.91
PG 25-1	9.20	0.23	156.89	3.03	5.25	4.69	20.39
PG 28-1	10.80	0.27	202.42	3.15	5.16	5.63	20.85
PG 32-1	10.20	0.23	188.62	3.05	4.44	5.40	23.48
PG 32-3	9.21	0.24	194.60	3.00	4.36	4.87	20.29
PG 34-1	11.60	0.27	201.00	3.43	6.14	5.88	21.77
PG 35-1	11.10	0.29	196.70	3.41	3.45	5.69	19.62
PG 36-1	9.20	0.23	163.97	3.12	5.75	4.78	20.78
Arka Kiran	12.00	0.28	185.32	3.66	5.98	5.63	20.10
Mean	10.89	0.25	188.93	3.41	5.37	5.67	22.70
Maximum	12.60	0.29	203.73	3.95	6.14	6.72	29.54
Minimum	9.20	0.22	156.89	3.00	3.45	4.69	19.62
SE of mean	0.31	0.01	4.21	0.09	0.23	0.18	0.82
SD	1.12	0.02	15.19	0.31	0.82	0.64	2.95
CV (%)	10.25	10.95	8.04	9.18	15.23	11.28	13.00

Correlation among different yield attributing traits. Correlation studies provide accurate information on the type and extent of relationships between different characteristics and understanding these relationships will aid in improving yield and other traits. In the present study, highly significant and positive association between fruit number and trunk girth was observed (0.67) (Fig 1). Ouedraogo *et al.* (2020) concluded that trunk girth had a substantial positive relationship with yield. Plant height showed high positive association with plant girth (0.79) (Atay *et al.,* 2021), number of leaves per shoot (0.39) and total leaf area (0.89). Kumari *et al.* (2018) found that the leaf size had most significant positive correlation with the vigour of guava plants. The number of primary branches had no relationship with the crop's yielding characteristics and it was found to be non-significant. Secondary branches had a significant and negative association with North-South spread of the plant (-0.77). This demonstrates that plants with lesser number of secondary branches favours spreading in a north-south direction, which in turn contributes to the yield. Shikhamany *et al.* (1978) also reported that North South spread was found to have a higher contribution than East-West spread in predicting the yield. The spread of the plant in North-South and East-West directions had a significant and positive association with each other and had the direct positive effect on the fruit yield. This is to be expected, as increased plant spread leads to increased fruiting surface. The plant spread was also found to be correlated with the number of leaves per shoot (0.22) thereby indirectly contributing towards higher yields. Patel *et al.* (2015) found that plant height, stem diameter, canopy spread, shoot diameter and number of leaves were all significantly and positively correlated with fruit yield.

In this study, a positive correlation was found between trunk girth and yield, and this information could be useful in a selection programme. One can indirectly select for higher yields by selecting hybrid seedlings with a larger trunk girth. The findings are especially important in terms of seedling selection for plants with dwarf frameworks. Since there was a positive correlation between the number of leaves in a shoot and plant height, it can be useful in guava breeding programme for pre-selection of progenies.



FN -Number of fruits per plant, **NLS**- Number of leaves per shoot, **PG**- Plant girth, **PH**- Plant height, **TLA**-Total leaf area, **PS(E-W)**- Plant spread in the E-W direction, **PS(N-S)**-Plant spread in the N-S direction, **NPB-**Number of primary branches, **NSB**- Number of secondary branches.

Fig. 1. Correlation studies for different yield attributing traits in half sib progenies of guava var Arka Kiran.

CONCLUSION

Based on the findings of present study, it could be inferred that guava genotypes differ greatly in terms of morphological and physico-chemical traits. In the investigation of several physico-chemical parameters of half sib progenies of the guava variety Arka Kiran, the half sib progeny PG 1-7 was found to be the best in terms of highest intensity of fruit pulp colour, yield, and fruit quality besides seed attributes. According to the results of the correlation studies, higher stem girth, among other features, contributed to higher yields and hence, it could be utilised as a preselection strategy in guava breeding programmes.

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REFERENCES

Anonymous (1975). Official method of analysis, Association of official analytical chemist (A.O.A.C), Washington D. C., *12*: 554- 829.

Atay, E., Crete, X., Loubet, D. & Lauri, P. E. (2021). Effects of different crop loads on physiological, yield and fruit quality of 'joyatm' apple trees: high crop load decreases maximum daily trunk diameter and does not affect stem water potential. *International Journal of Fruit Science*, *21*(1): 955-969.

Azam, M. G., Uddin, M. S., Chowdhury, S. K. H., Rashid, A. H., Barua, H., Chhanda, R. A. & Islam, M. N. (2020). Variability studies of guava (Psidium guajava L.) genotypes for growth, yield and quality attributes in Chattogram region of Bangladesh. *Journal of Agricultural Science & Engineering Innovation (JASEI)*, *1*(2): 3-9.

Biradar Suryakanth, L. & Mukunda, G.K. (2007). TG Selection 5/12-A promising genotype of taiwan guava from Bangalore. *Acta horticulturae, 735*: 85-89.

Boora, R.S. (2012). Improvement in guava (*Psidium guajava* L.)- a review. *Agricultural Reviews*, *33*(4).

Burton, G. W. & Devane E. M. (1953). Estimating heritability in tall Fescue (*Festuca arudanacea*) from replicated clonal material. *Agronomy Journal*, *45*:478-481.

Cheema, G. S. & Deshmukh, G. B. (1927). Culture of guava and its improvement by selection in western India. Bull. Department of Agriculture, Bombay No. 148.

Chopra, M. L., Kumar, K., Vikas, M. A. & Jat, P. K. (2021). Studies on Variability in Growth, Foliage and Flowering characteristics of Seedling Origin Guava (*Psidium guajava* L.). *Biological Forum – An International Journal, 14*(1): 379-385

Dhaliwal, G .S. & Rattanpal, H. S. (2004). Evaluation of open-pollinated and hybrid progenies in guava for fruit size. *Indian Journal of Horticulture*, *61*(4): 296-298.

Dinesh, M. R. & Vasugi, C. (2015). Guava breeding. Fruit Breeding, 277–288.

Dubey, M. C., Kumar, R., Kumar, A. & Kohli, K. (2016) Evaluation of different guava (*Psidium guajava* L.) genotypes under tarai condition of Uttarakhand. *The Bio scan*, *11*(3): 1765-1770.

Elsheery, N. I., Helaly, M. N., El-Hoseiny, H. M. & Alam-Eldein, S. M. (2020). Zinc oxide and silicone nanoparticles to improve the resistance mechanism and annual productivity of salt-stressed mango trees. *Agronomy*, *10*(4): 558.

Hayes, W. B. (1957). Fruit growing in India, Kitabistan, India.

Iyer, C. P. A. & Subramanyam, M. D. (1988). IIHR. Selection-8 and improved guava cultivar. *South Indian Horticulture*, *36*(5): 258-259.

Kumari Shaili, Arumugam, N., Singh, R., Srivastav, M., Banoth, S., Mithra, A. C. & Khan, A. (2018). Diversity analysis of guava (*Psidium guajava*) germplasm collection. *Indian Journal of Agricultural Sciences, 88*: 489-497.

Maheswari, P., Reddy, M. J., Reddy, V. S. P., Bhargav, T. S., Raja, P. & Hoang, V.T. (2022). Yield estimation of guava fruit using U-Net Architecture. *6th International Conference on Trends in Electronics and Informatics (ICOEI)*. 1656-1659.

Makowski, D., Ben-Shachar, M. S., Patil, I. & Lüdecke, D. (2020). Methods and algorithms for correlation analysis in R. *Journal of Open Source Software*, *5*(51): 2306.

Marak, J.K. &Mukunda, G.K. (2007). Studies on the performance of open pollinated seedling progenies of guava cv. 'Apple Colour'. *Acta horticulturae*, 79-84.

Mitra, S. K., & Irenaeus, K. S. (2018). Guava cultivars of the world. *Acta Horticulturae*, *1205*: 905-910

Nand, D., Shanker, G. & Srivastava, A.K. (1991). Guava "Allahabad Surkh" in deep pink inside. *Indian Horticulture*, *36*(2): 4-5.

Ouedraogo, Sambo, Loyapin Bonde, Oumarou Ouedraogo, AmadeOuedraogo, AdjimaThiombiano, & Issaka Joseph Boussim (2020). To what extent do tree size, climate and land use influence the fruit production of *Balanites aegyptiaca* (L) Delile in tropical areas (Burkina Faso)?. *International Journal of Fruit Science 20, 3*: 282-299.

Pandey, D., Pandey, A. K., & Yadav, S. K. (2016). Evaluation of newly developed guava cultivars & selections under Lucknow conditions. *Indian Journal of Horticulture, 73*(3):334-336.

Patel, R. K., Maiti, C. S., Deka, B. C., Deshmukh, N. A., & Roy, D. (2011). Variability studies in guava (*Psidium guajava* L.) genotypes for growth, yield and quality attributes at mid-hills of Meghalaya. *Indian Journal Hill Farming*, *24*(1): 24-28.

Patel, R. K., Maiti, C. S., Deka, B. C., Vermav, V. K., Deshmukh, N. A., & Verma, M. R. (2015). Genetic variability, character association and path coefficient study in guava (*Psidium guajava* L.) for plant growth, floral and yield attributes. *International Journal of Bio-resource and Stress Management*, *6*(4): 457-466.

Phadnis, N. A. (1970). Improvement of guava by selection in Maharashtra. *Indian Journal of Horticulture*, *27*: 99-105.

Rajan, S. & Negi S. S. (2007). Improvement of guava through breeding. *Acta horticulturae*, *735*: 31-37

Rajan, S., Yadava, L. P., Kumar, R., & Saxena, S. K. (2005). Selection possibilities for seed content-a determinant of fresh fruit quality in guava (*Psidium guajava* L.).*Journal of Applied Horticulture, 7*: 52–54.

Ranganna, S. (1977). Manual of analysis of fruit and vegetable products. Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.

Shikhamany, S. D., Iyer, C.P. A., Ramachander, P. R. & Srinivasan, V. R. (1978). Studies on the relationship of certain growth attributes with fruit yield in guava (*Psidium guajava* L.). II. Path coefficient analysis. *Vatika*, *1*: 26-30.

Somogyi, N. (1952). Notes on sugar determination. *Journal of Biological and Chemicals,* 145-154.

Tiwari, R. B. & Dinesh, M. R. (2001). Evaluation of seven exotic red fleshed guava varieties for processing into RTS beverage. *Indian Food Packer, 55***:** 58-62.

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