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Biochemical Screening in Fruits of Guava (*Psidium guajava* L.) Genotypes

[1]Husameldin. H. Mahmoud and [2]Thuria. S. Peter
Department of Horticulture,
Alzaeim Alazhari University, Sudan, Libya.
Corresponding Author: Husameldin. H. Mahmoud

Abstract
Screening was carried out on hundred guava genotype in respect of biochemical attributes during 2010-2011.Bio-chemical fruit characters of guava fruits varies significantly among different guava genotypes. Out of hundred guava genotypes, thirteen elite guava genotypes (genotype no 100,99,30,50,4,94,57,88,5,33,3,8 and 67) toped the rest of genotypes in term of bio-chemical characters. Tree no. 99 was found superior one over all genotypes , in term of fruit ascorbic acid content (507.2mg/100g)TSS (11.00°B), total sugar (8.60%), reducing sugar (5.93%) and non reducing sugar (3.36%).

Keywords: guava, genotypes, screening, fruit, biological, characters.

INTRODUCTION

Gen*us Psidium* contains about 150 species (Hayes, 1974). All cultivated varieties of guava are either diploid 2n=2x =22 or triploid 2n=3x =33 (Atchinson, 1947).In guava, most of the commercial varieties are reported to be diploids, the chromosome number being 2n = 22, except the seedless types which are triploids. A natural triploid with somatic chromosome number of 2n = 33 was reported by Kumar and Ranade (1952).

Guava is very common tropical fruit in the Sudan, the tree is grown commercially in every regions, and its production continues all the year round (Salih and Elbashir 2000). The most important guava producing states are Khartoum, blue Nile (Sennar, Singa) and (shandi, Kassala), northern kordofan (Al-Rahad Um-Ruwaba El-obeid) and Darfur. (Babiker, 2010).

The major problems facing the guava industry are severity of wilt disease, high seed content of diploid commercial varieties and poor yield with small and miss shaped fruit of triploid seedless varieties. (Ray, 2002).

Improvement in guava fruit can be achieved through development of cultivars with least number and soft seeds, resistant to guava wilt disease and to fruit fly, whitefly and mealy bug, spreading growth habit, suitable for processing, better fruit quality in terms of shape, size, colour, firmness, thick pulp pleasing aroma and better keeping quality, having pink\ red flesh and skin for export market. (Shukla *et al*., 2004).

However, seed propagation should be avoided as owing to heterozygous nature of tree and cross-pollination, the seedling raised plants are never true – to type. Apart from a longer juvenile phase the seedlings differ widely in yield and bio-chemical characteristics of fruits. Seedlings, however, are used as rootstocks. Several methods of vegetative propagation techniques have been standardized in guava. (Mukhopadhay and Sen, 1986). Guava strains in Sudan varies in term of fruit size, color and white to red pulp also softy to rough, waxy and hardness of seeds and flavor, all this variation due to sexual propagation of guava. The framers named some strains that shown distinct character such like Shandi and Pakistani (white varieties). Sudany, shambat, Singa and ganip (red varieties). (Babiker, 2010). The natural self-pollination in guava with 35% outcrossing results in a heterozygous. Open-pollinated seedling population, with adequate genetic variation very useful for selection of desirable commercial types (Nakasone and Paul, 1998). Selection can also be made from wild population. Seeds were collected from various guava – growing belts and seedling were evaluated to identify superior types for better yield characters. (Cheema and Deshmuk, 1927).

The main objective of this study was to develop promise Guava genotypes with better fruits bio-chemical characters through screening among genotypes (guava trees) in term of bio- chemical characters of the fruits.

LITERATURE REVIEW

Guava (*Psidium guajava L*), is one of the important fruit cultivated in several tropical and subtropical countries of the world. (Pathak, *et al.* 2007). The centre of origin of guava tree was southern Mexico and Central America, and was long ago spread throughout the American tropics, Asia, Africa and Pacific Islands. Genus Psidium belong to family Myrtaceae and 15 contains about 150 species, of

which most widely cultivated is common guava, *P. guajava*. (Purseglove, 1974).

Guava bears flower solitary or in cyme of two to three flowers, on the current season growth in the axil of the leaves (Prakash, 1976). Peak time of anthesis is between 5.00-6. 30 AM in most of the varieties of guava. The dehiscence of anthers occur 15-30 minutes after anthesis and continues for two hours .The pollen fertility is high in almost all the cultivars (Balasubramanyam, 1959). Although, the guava is self pollinated crop but some extent cross pollination takes place by insect. (Arvindakshan, 1960). Guava is mainly a self pollinated crop but occurrence of cross pollination results in great variation in the seedling population. (lyer and Subramanian,1987).

Inheritance Pattern in guava reported by Shukla *et al*. (2004). Guava cultivars are heterozygous in nature. There is a linkage between red flesh colour and bold seed size. Triploidy and some other genetic factors are responsible for female sterility. (Subramanyam and lyer, 1982).

The propagation of guava through seeds should not be encouraged because the seedlings have long juvenile phase, give lower yields and bear poor fruits quality. But the seedlings can be served as rootstock material for grafting or budding. For planting seedlings, seed should be collected from the plants producing high quality fruits and high yield (http://www.fruitipedia.com/guava.htm.). Thirty-two guava germplasm were evaluated on the basis of fruit morphology, bio-chemical properties and yield (Jana *et al.,* 2010).

The varietals characteristics in guava are not as distinct as found in majority of other fruit crops. Its propagation through seeds reduces the distinctive characteristics of a variety in commercial cultivation. L-49 variety, one of the important guava varieties developed through selection from cultivar Allahabad Safeda, and distinct with semi-dwarf tree, high yielder and white flesh. Banarasi Surkha variety, its local selection from red fleshed type and distinct with heavy bearing, large fruits, soft and pink flesh, CISHG-1 variety, distinct with fruits skin colour are deep red, good TSS percent and soft seeds, Ark Mridula (Selection-8) variety, developed through selection from Allahabad Safeda seedling and distinct with soft seeds and white flesh, Lalit (CISHG- 3) variety, developed through seedling selection from cultivar Apple Colour., RHR-G-14 variety, developed through seedling selection from Thailand genotypes and distinct with pink colour of fruits skin and flesh and good sugar. Pant Prabhat variety, distinct with prolific bearing, soft seed and good fruit quality. (Ray, 2002).

Efforts have been made over the past few decades to widen guava genetic base by creating Attempts are still going on to improve the existing commercial cultivars through selection of germplasm and combining the desirable traits of various genotypes through hybridization. A variety with in-built resistance to the biotic and a biotic resistance besides high yielding capacity of good quality fruit is lacking in guava. The DNA marker assisted selection has the potential to introduce and deploy favorable gene combinations for disease control along with the other agronomical important traits. (George and Sonu, 2010).

Guava is an open pollinated crop, and seedlings are extensively used to raise new plantations. Selection from these seedlings can be used to obtain superior strains with respect to fruit yield and quality. (Singh, 1995).

Guava fruit contained 5.4% seed, 8.3% Pomace/peel, Pulp 82% and Juice 65%. prominent 86 sugars are Fructose 59%, Glucose 36% and Sucrose 5% . Fructose is the principal sugar in green fruits while fully ripe fruits contain high content of sucrose. (Akash *et al*., 2009). The ascorbic acid is mainly found in the skin and slightly lower concentration is found in the flesh (Nakasone and Paull, 1998). Pink fleshed cultivars usually low in ascorbic acid content than White fleshed ones (Mitra *et al.,* 1984). One guava has more than 300 mg /100g of vitamin C, while one orange has mere 69 mg /100g. Reducing sugars in guava fruits ranged between 2.4-6.2, Non-reducing sugars 2.5-3.8, Total sugars 4.9-10.1, Acidity 0.22-0.39, Calories 36-50, Crude Fiber 2.8-5.5 g, Calcium 9.1-17 mg, Phosphorus 7.8-30 mg. Flavor characteristic of guava is due to hydrocarbons, alcohol and carbonyl compounds. (Mitra and Sanyal, 2004).

In cultivar Allahabad Safeda average fruit weight ranged between 90-160 (g), TSS ranged between 8.4-10.6(^{0}Brix), total sugars 6.8-8.5(%) and ascorbic Acid 110-192(mg/100g pulp), cultivar Apple Colour average fruit weight 80-120(g) TSS 7.8-11.6 (^{0}Brix), total sugars 6.2- 7.3(%) and ascorbic acid 115-30(mg/100g pulp), cultivar Banarasi average fruit weight 90- 130(g), TSS 9.2- 10.3 (^{0}Brix), total sugars 6.8-8.0 (%) and ascorbic acid 78- 190 (mg/100g pulp), cultivar Baruipur average fruit weight 88-125 (g),TSS 8.8-9.3 (^{0}Brix), total sugars 6.8-7.6 (%) and ascorbic acid 105-180 (mg/100g pulp), cultivar Behat Coconut average fruit weight 82-156 (g),TSS 9.0-9.4 (^{0}Brix), total sugars 6.8-7.7(%) and ascorbic acid 88-168(mg/100g pulp), cultivar Chittidar average fruit weight 95-152 (g) TSS 8.2-10.6 (^{0}Brix), total sugars 6.4-8.8 (%) and ascorbic acid 97- 234(mg/100g pulp), cultivar Harijha average fruit weight 82-135 (g),TSS 8.6-9.2 (^{0}Brix), total sugars 6.3-7.9 %) and ascorbic acid 92-165(mg/100g pulp), cultivar Kerala average

fruit weight 76- 117 (g), TSS 9.1-9.8 (^{0}Brix), total sugars 6.6-8.4(%) and ascorbic acid 84-185 (mg/100g pulp), cultivar Pear Shaped average fruit weight 79-131(g), TSS 8.8-9.6 (^{0}Brix), total sugars 6.7-7.5(%)and ascorbic acid 75- 157 (mg/100g pulp), cultivar Red Fleshed average fruit weight 92-135 (g), TSS 8.2-11.0 (^{0}Brix), total sugars 7.0-10.4 (%) and ascorbic acid 75-226 (mg/100g pulp), cultivar Sardar average fruit weight 96-188 (g), TSS 9.2- 1.6 (^{0}Brix), total sugars 7.3-10.6 (%) and ascorbic acid 133-216 (mg/100g pulp), cultivar Seedless average fruit weight 71-87 (g),TSS 8.4- 9.2 (^{0}Brix), total sugars 6.7-7.4(%) and ascorbic acid 83-168 (mg/100g pulp). (Reddy *et al.,*1999).

MATERIALS AND METHODS

The experiment was conducted in 2010 – 2011 at Alkhelala area- north of Khartoum north in orchard of Mohammed Alhadi Alshakh to screen Guava genotypes (100 trees) in respect of fruit biochemical characters. Three mature guava fruits (three replications) were collected from each tree, out of hundred Guava trees (genotypes).

OBSERVATIONS

Three ripe fruits were collected randomly from each guava tree for recording fruits biochemical charactersas followed:

BIOCHEMICAL ANALYSIS

The representative fruits, allowed for natural and uniform ripening were utilize to determine the various biochemical parameters of fruit.

Ascorbic Acid (mg /100g)

Ascorbic acid was determined by using the 2,6 dichlorophenol-indophinol titration method of (Ruck, 1963).

Total Soluble Solid (TSS) (^{0}Brix %)

The total soluble solid was determined by using Erma hand refractometer (Anonymous, 1960) and expressed in percentage.

PH Value

149 Were determent directly for guava juice using glass electrode PH meter.

Titerable Acidity (%)

Titerable acidity was determined by titrating a known quantity of blended sample diluted with water against standard sodium hydroxide solution, using phenolphthalein as an indicator and was expressed as citric acid in percentage (Anonymous, 1960).

Sugars (%)

The total and reducing sugars were determined by method advocated by (Ranganna, 1978). Non-reducing sugars were calculated as the difference between total and reducing sugars. The values were expressed in percentage.

DATA ANALYSIS

The data were analyzed statistically by using randomized completed block design as per the method suggested by (Pansey and Sukhatme, 1985).

RESULT AND DISCUSSION

The results obtained in the present study on screening of hundred Guava genotypes in respect of fruits biochemical characters, are discussed hereunder in the light of established facts and figures available in the literature.

Significant variation was recorded among all genotypes in term of fruits quality characters. The fruit quality in guava is mainly judged by ascorbic acid, sugar content, total soluble solids and acidity in all fruit except seed. From these experimental results, it appears that the ascorbic acid ranged between 41.40-507.2 mg /100g (table, 1 fig 1). In this present experiment, the highest ascorbic acid was found to be superior over all other results recorded. The overall assessment of various ascorbic acid content of guava varies from 75 to 260 mg/100g depending on varietals' different (Mitra and Sanyal, 2004) and ((Das *et al*, 1995). Ascorbic acid in near ripened fruits may be between 350 mg and 450 mg/100g (Rodriguez *et al.* 1971). Similar results in respect of maximum level of Vitamin C 340 (mg /100g) were also reported by (Anonymous, 2009).

Kahlon *et al*. (1997) found that ascorbic acid of guava fruits ranged from (82-196 mg/100g), (114-299 mg/100g) during rainy and winter seasons, respectively. Chauhan *et al*. (1986) observed that showed considerable fluctuation during season and it was the Maximum ascorbic acid content registered in Allahabad Safeda (329.28 mg/100g) in winter season crop, and minimum ascorbic acid content recorded (92.70 mg/100g) during rainy season.

The experimental results indicated that , the genotype no 99 was superior in ascorbic acid content (507.2mg/100g) compared with rest of genotypes followed by genotype no 30 (287.6 mg/100g), 100 (207.5mg/100g), 88 (204.7mg/100g), 57 (186.8 mg/100g), 33 (183.1 mg/100 g),4 (160.4 mg/100 g), 67 (150.1 mg/100g), 8 (128.6 mg/100 g), 94 (124.6 mg/100g), 50 (120.0 mg/100g) 3 (110.1 mg/100 g) and 5 (90.7 mg/100 g) respectively(table,1 fig,1).

Total soluble solids (TSS) was significantly higher in the fruits of genotype no 94 (11.00°B), followed by 4 (9.76°B), 50 (9.66°B), 100 (9.50°B), 57 (8.83°B), 8 (8.56°B), 5 (8.50°B), 88 (7.66°B), 99 (7.66), 67 (7.30°B), 3 (6.73°B), 30 (6.56°B), and 33 (3.50°B) respectively (table, 1 fig ,2). However the highest TSS content was recorded in genotype no 94

(11.00°B) (Table, 1 fig, 2). This finding falls in line with the results reported by Bashir *et al.* (2009) who opined that TSS content of fruits was (11.35°B). The increase in TSS might be due to accumulation of sugar and other soluble component from hydrolysis of protein and oxidation of ascorbic acid (Mahalakshmi, 2000). Kahlon *et al*. (1997) found that, TSS content of guava fruit ranged from (7.80-14.40%), (8.6-14.80%)

The highest total sugars of the fruits was achieved in genotype no 94 (9.06%) followed by 5 (8.87%), 3 (8.70%), 4 (8.60%), 99 (8.60%), 50 (8.40%), 100 (8.20%), 88 (7.93%) 57 (7.93%), 8 (7.26%), 67 (6.93%), 33 (6.60%) and 30 (6.20%), respectively (table ,2 fig, 3). And this result agree with the finding of (Patel *et al.,* 2007).

Maximum reducing-sugars was obtained in genotype no 94 (6.00%) followed by 99 (5.93%), 50 (5.83%), 8 (5.00%), 67 (5.00%), 88 (5.00), 4 (4.96), 3(4.93%), 100 (4.93%), 57 (4.80%), 33 (4.23%), 30 (3.73%) and 99 (2.66%) respectively (table ,1 fig 3).Values registered in this experimental results overcome the range of Reducing sugars in guava fruits(2.4-6.2%) reported by (Mitra and Sanyal, 2004).In sedition to that the same values fall with in the range of reducing sugar in guava fruits(4.80 to 8.00%) reported by (Anonymous, 2010).

Higher non-reducing sugar was observed in genotype no 5(3.90) followed by 3 (3.80%), 4 (3.63%), 100 (3.36%), 57 (3.13%), 94 (3.03%), 67 (2.93%), 88 (2.93%), 99 (2.66%), 50 (2.56%), 30 (2.46%), 33 (2.36%) and genotype no 8 (2.23%) subsequently (table ,1 fig ,3). Patel *et al*. (2007) found that the per cent of non-reducing sugar in guava fruits was (2.67%), which was inferior when compared with the values recorded in genotypes no 5, 4, 100, 57, 94, 67 and 88(table,1 fig , 3). However the percent of non reducing sugar in genotypes no 99 in par with the result opined by (Patel 280*et al.,* 2007).

Titratable acidity was significantly lower in genotype no 67 (0.01%) while Similar trend in acidity content was recorded in genotypes no100 (0.20%), 94 (0.20%), 88 (0.20%) and 5 (0.20%) followed by 8 (0.23%), 30 (0.27%), 33 (0.27%), 4 (0.30%), 50 (0.30%), 57 (0.30%), 99 (0.40%) and then genotype no 3 (0.40%) (table, 1 fig , 4). And this results agree with the finding of (Mitra and Sanyal, 2004 and Anonymous, 2010) whose reported that, the acidity of guava fruit ranged between (0.22-0.39 %) and (0.26 to 0.75%) respectively. According to Tandon *et al*. (1983) the titratable acidity in the winter season ripe guava fruits was (0.36%) in var. Apple Colour and (0.37%) in both Chittidar and Sardar guava varieties.

The greatest PH value was registered in genotype no 94 (4.60), 100 (4.60), 67 (4.60), 3 (4.57), 30 (4.57), 33 (4.57), 50 (4.57) 57 (4.53), 99 (4.50), 4 (4.43), 5 (4.43), 8 (4.43) and 88 (4.43) subsequently (table, 1 fig 4). And this values registered in this experiment, were in line with the range of PH (3.50 and 4.56) reported by (Anonymous, 2010).

The detailed above results clearly showed that the levels of total sugar, reducing sugar, non reducing sugar, PH and acidity per cent were found to be in bar with the finding of (Mitra and Sanyal, 2004), (Mitra *et al*., 1984) and (Reddy *et al.,*1999).

Dhawan *et al*. (1983) found that, total sugar content in guava var. Lucknow-49 was (9.52%) Prabhu, (2010) recorded that, the Selection-3 was superior in total sugar (9.37%), reducing sugar (4.76%) and non-reducing sugars content (4.61%) in relation to the rest of genotypes.

From these experimental results, it appears that fruit quality in guava composition varies due to sexual propagation; this result is almost in par with the data previously reported by (Ray, 2002).

Hence, based on fruit quality, the genotypes no 99 followed by 30, 5, 100, 88, 50, 57, 67, 4, 94, 8, 33 and 3 (table 1 & fig from 1 to 4) were found promising for cultivation.

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APPENDIX

Table (1): Chemical characteristics of guava Genotypes

Genotypes	Ascorbic acid (gm/100g)	Total soluble solids (%)	pH-value	Titratable acidity (%)	Sugars (%)		
					Total	Reducing	Non-reducing
G .No 1	57.47zab	7.433k-q	4.50cdef	0.3000efgh	8.600efg	5.133i-p	3.467c-k
G .No 2	95.03nop	6.200tuvwxyz	4.33hijk	0.3000efgh	8.267ghij	5.200h-n	3.067h-o
G .No 3	110.1lmn	6.733p-z	4.57bcd	0.4333abcd	8.733def	4.933o-v	3.800cd
G .No 4	160.7def	9.767cde	4.43efgh	0.3000efgh	8.600efg	4.967n-u	3.633cdef
G .No 5	90.70opq	8.500ghij	4.43efgh	0.2000hijk	8.867cde	4.967n-u	3.900c
G .No 6	43.83zbs	9.867bcd	4.50cdef	0.2667fghi	9.467a	5.900cde	3.567c-h
G .No 7	41.73zbu	7.067m-w	4.47defg	0.3000efgh	7.933jklm	4.967n-u	2.967k-r
G .No 8	128.6hij	8.567fghij	4.43efgh	0.2333ghij	7.267pqrs	5.033l-rs	2.233t-z
G .No 9	60.60y	7.500k-q	4.47defg	0.2667fghi	9.333ab	5.800cdef	3.533c-i
G .No 10	58.80yz	7.267l-s	4.40fghi	0.3667cdef	9.200abc	5.267hijkl	3.933c
G .No 11	58.63z	7.433k-q	4.40fghi	0.3000efgh	6.200x	5.400gh	0.800zf
G .No 12	136.6ghi	7.967h-o	4.50cdef	0.2333ghij	8.733def	5.667ef	3.067h-o
G .No 13	57.83za	7.400k-r	4.47defg	0.2000hijk	9.333ab	3.500cd	5.833a
G .No 14	55.37zbd	7.000n-y	4.47defg	0.3667cdef	7.600mnop	5.733def	1.867z
G .No 15	115.0kl	5.900z	4.37ghij	0.3000efgh	5.800yz	3.700zl	2.100wxyz
G .No 16	226.1bc	5.667zb	4.33hijk	0.4000bcde	6.200x	4.433zb	1.767zb
G .No 17	141.6g	5.733za	4.27jkl	0.4000bcde	7.000stuv	4.400zc	2.600n-w
G .No 18	49.97zbm	6.167u-z	4.37ghij	0.3000efgh	7.333opqrs	5.000m-t	2.333t-z
G .No 19	146.9fg	6.033wxyz	4.47defg	0.3000efgh	6.000xy	3.833ab	2.500q-y
G .No 20	47.10zbp	7.133m-v	4.47defg	0.3000efgh	7.200qrs	5.333hij	1.867z
G .No 21	86.67pqr	7.000n-y	4.23klm	0.3000efgh	5.800yz	3.733zi	2.067xyz
G .No 22	177.5de	8.033h-n	4.43efgh	0.2333ghij	5.400zyb	3.600zj	1.800za
G .No 23	317.0abc	5.567zc	4.40fghi	0.2000hijk	5.800yz	3.567zk	2.233t-z
G .No 24	41.00zbx	4.900zg	4.23klm	0.5000ab	6.000xy	5.667ef	0.333zh
G .No 25	81.43rs	7.700i-p	4.43efgh	0.2667fghi	8.333ghi	4.900p-v	3.433c-l
G .No 26	33.43zby	8.100g-m	4.47defg	0.3000efgh	8.000ijkl	5.300hijk	2.700m-u
G .No 27	103.2m	4.233zi	4.10o	0.3667cdef	5.467zya	4.467za	2.067xyz
G .No 28	51.57zbi	7.333k-s	4.20lmn	0.5000ab	5.800yz	3.600zj	2.200u-z
G .No 29	70.00uvw	7.200l-u	4.50cdef	0.2000hijk	8.333ghi	4.733u-z	3.600cdefg
G .No 30	287.6b	6.567q-z	4.57bcd	0.2667fghi	6.200x	3.733zi	2.467r-y
G .No 31	95.00o	6.200t-z	4.30ijkl	0.4333abcd	8.067hijk	4.767t-y	3.300d-l
G .No 32	81.47r	7.233l-t	4.47defg	0.2333ghij	8.000ijkl	5.300hijk	2.700m-u
G .No 33	183.1d	3.500zj	4.57bcd	0.2667fghi	6.600w	4.233zf	2.367t-z
G .No 34	67.37vw	6.667p-z	4.53cde	0.3000efgh	6.600w	4.367zd	2.233t-z
G .No 35	126.4i	7.167l-v	4.37ghij	0.4333abcd	6.667vw	4.333ze	2.333t-z
G .No 36	51.67zbh	9.500cdef	4.70a	0.3333defg	8.600efg	5.333hij	3.267e-l
G .No 37	71.83tu	7.700i-p	4.30ijkl	0.5000ab	9.100abc	5.233h-m	3.700cde
G .No 38	73.37stu	6.733p-z	4.13no	0.4333abcd	6.933stuvw	6.600b	0.333zh
G .No 39	76.50s	7.000n-y	4.43efgh	0.2000hijk	8.000ijkl	5.000m-t	3.000j-q
G .No 40	41.40zbv	6.933o-z	4.47defg	0.2667fghi	6.600w	5.267hijkl	1.333zd
G .No 41	63.33wxy	8.167g-l	4.57bcd	0.1000k	6.800tuvw	4.567xyz	2.233t-z
G .No 42	67.17vwx	8.167g-l	4.47defg	0.3000efgh	8.400fgh	3.900zh	4.500b
G .No 43	63.00xy	7.200l-u	4.17mno	0.5000ab	7.667lmno	5.400gh	2.267t-z
G .No 44	43.43zbt	6.867p-z	4.40fghi	0.3000efgh	7.267pqrs	4.333ze	2.933l-s
G .No 45	63.90wx	8.667f-i	4.50cdef	0.3000efgh	8.400fgh	5.300hijk	3.100g-n
G .No 46	125.2ij	9.033defg	4.60bc	0.1333jk	7.200qrs	4.467za	2.733m-t
G .No 47	99.77mno	7.067m-w	4.57bcd	0.3000efgh	8.333ghi	5.300hijk	3.033i-p
G .No 48	52.30zbg	6.133v-z	4.37ghij	0.3333defg	6.133xy	5.067k-r	1.067ze
G .No 49	55.73zbc	6.933o-z	4.33hijk	0.4667abc	5.333zyb	4.700vwxyz	0.6333zi
G .No 50	120.0jkl	9.667cde	4.57bcd	0.3000efgh	8.400fgh	5.833cdef	2.567o-x
G .No 51	50.13zbj	7.033n-x	4.30ijkl	0.5000ab	5.200zyc	4.533yz	0.333zh
G .No 52	97.90no	4.667zh	4.50cdef	0.3000efgh	5.600zya	3.433zb	2.167v-z
G .No 53	44.70zbr	10.73ab	4.57bcd	0.2333ghij	9.067bcd	5.600fg	3.467c-k
G .No 54	57.30zbb	7.300l-s	4.50cdef	0.2333ghij	8.067hijk	5.400gh	2.667m-v

Table (1): Cont.

Genotypes	Ascorbic acid (gm/100g)	Total soluble solids (%)	pH-value	Titratable acidity (%)	Sugars (%)		
					Total	Reducing	Non-reducing
G .No 55	123.1j	9.500cdef	4.53cde	0.3000efgh	8.400fgh	5.300hijk	3.100g-n
G .No 56	47.53zbo	6.667p-z	4.40fghi	0.2333ghij	7.600mnop	5.000m-t	2.600n-w
G .No 57	186.8cde	8.833efgh	4.53cde	0.3000efgh	7.933jklm	4.800s-x	3.133f-m
G .No 58	120.6jk	7.667j-p	4.47defg	0.2333ghij	7.000stuv	4.600w-z	2.400t-y
G .No 59	84.50qr	5.967yz	4.50cdef	0.2333ghij	6.600w	4.867q-v	1.733zb
G .No 60	110.7lm	6.867p-z	4.47defg	0.3000efgh	7.800klmn	5.800cdef	2.000yz
G .No 61	70.67u	7.100m-v	4.47defg	0.3000efgh	7.667lmno	5.300hijk	2.367t-z
G .No 62	77.00rst	7.133m-v	4.43efgh	0.2000hijk	8.067hijk	5.767cdef	2.300t-z
G .No 63	73.00t	5.000ze	4.30ijkl	0.5000ab	8.033hijkl	5.967cd	2.067xyz
G .No 64	69.33v	6.833p-z	4.30ijkl	0.4333abcd	6.600w	4.433zb	2.167vwxyz
G .No 65	64.87w	6.500q-z	4.47defg	0.3667cdef	6.600w	4.933o-v	1.667zc
G .No 66	50.13zbk	5.733za	4.43efgh	0.3667cdef	8.333ghi	5.300hijk	3.033i-p
G .No 67	150.1f	7.300l-s	4.60bc	0.1000k	7.933jklm	5.000m-t	2.933l-s
G .No 68	157.1ef	7.033n-x	4.47defg	0.3000efgh	7.133rst	4.500z	2.633m-v
G .No 69	143.9fgh	6.367r-z	4.30ijkl	0.3667cdef	6.667vw	4.800s-x	1.867z
G .No 70	136.1h	7.000n-y	4.33hijk	0.5333a	7.467nopqr	5.367ghi	2.100wxyz
G .No 71	111.4lklmn	7.667j-p	4.53cde	0.3000efgh	7.733klmn	4.700vwxyz	3.033i-p
G .No 72	101.1mn	6.667p-z	4.37ghij	0.3333defg	7.600mnop	5.400gh	2.200u-z
G .No 73	53.07zbf	6.667p-z	4.33hijk	0.5000ab	7.667lmno	5.167h-o	2.500q-y
G .No 74	94.90op	8.333ghijk	4.50cdef	0.3667cdef	7.467nopqr	4.800s-x	2.667m-v
G .No 75	87.47p	5.667zb	4.33hijk	0.4667abc	7.533nopq	5.067k-r	2.467r-y
G .No 76	48.43zbn	5.333zd	4.40fghi	0.2000hijk	7.267pqrs	4.800s-x	2.467r-y
G .No 77	62.00xyz	6.333s-z	4.60bc	0.1000k	7.267pqrs	6.867a	0.400zg
G .No 78	70.73tuv	9.667cde	4.57bcd	0.3333defg	7.067stu	5.400gh	1.667zc
G .No 79	54.73zbe	6.667p-z	4.43efgh	0.3000efgh	7.333opqrs	5.100j-q	2.233t-z
G .No 80	50.10zbl	4.833zf	4.43efgh	0.2333ghij	6.733uvw	4.467za	2.267t-z
G .No 81	74.17st	7.500k-q	4.47defg	0.1333jk	9.467a	5.933cd	3.533c-i
G .No 82	152.5efg	7.000n-y	4.47defg	0.1667ijk	8.467fg	4.900p-v	3.567c-h
G .No 83	70.17uv	6.000xyz	4.40fghi	0.3000efgh	7.067stu	4.700v-z	2.367t-z
G .No 84	83.50qrs	7.000n-y	4.47defg	0.2000hijk	7.667lmno	5.000m-t	2.667m-v
G .No 85	115.2k	7.000n-y	4.57bcd	0.3000efgh	7.200qrs	5.367ghi	1.833z
G .No 86	46.03zbq	10.33abc	4.67ab	0.3333defg	8.600efg	5.100j-q	3.500c-j
G .No 87	41.37zbw	5.167ze	4.00p	0.3333defg	6.567w	4.100zg	2.367t-z
G .No 88	204.7cd	7.667j-p	4.43efgh	0.2000hijk	7.933jklm	5.000m-t	2.933l-s
G .No 89	86.13q	7.067m-w	4.47defg	0.2000hijk	7.333opqrs	4.900p-v	2.433s-y
G .No 90	99.67n	10.67ab	4.53cde	0.4333abcd	7.667lmno	5.200h-n	2.467r-y
G .No 91	133.7hi	5.667zb	4.50cdef	0.3000efgh	6.600w	4.733u-z	1.867z
G .No 92	113.5klm	7.000n-y	4.50cdef	0.2333ghij	7.600mnop	4.867q-v	2.733m-t
G .No 93	139.2gh	6.867p-z	4.50cdef	0.2333ghij	7.267pqrs	5.100j-q	2.533p-x
G .No 94	124.6ijk	11.00a	4.60bc	0.2000hijk	9.067bcd	6.000c	3.067h-o
G .No 95	87.00pq	6.733-z	4.60bc	0.3000efgh	7.067stu	4.767t-y	2.300t-z
G .No 96	159.7e	6.333s-z	4.43efgh	0.2333ghij	7.067stu	4.833r-w	2.233t-z
G .No 97	215.8bcd	6.667p-z	4.50cdef	0.4000bcde	6.933stuvw	6.600b	0.333zh
G .No 98	363.1ab	7.333k-s	4.47defg	0.2667fghi	8.267ghij	5.000m-t	3.267e-l
G .No 99	507.2a	7.667j-p	4.50cdef	0.4000bcde	8.600efg	5.933cd	2.667m-v
G .No 100	207.5c	9.500cdef	4.60bc	0.2000hijk	8.200ghij	4.933o-v	3.267e-l
C.V%	5.85%	7.08%	1.29%	1.22%	2.71%	2.62%	2.23%
$Lsd_{0.05}$	43.40**	0.8194*	0.08819*	0.08819*	0.3260*	0.2099*	0.4137*
SE±	15.56	0.2938	0.03162	0.03162	0.1169	0.07528	0.1483

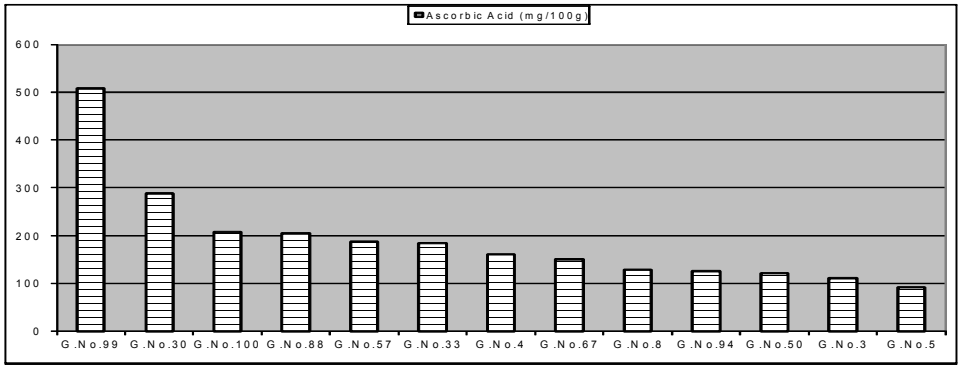

Fig. 1: Ascorbic acid in fruit of thirteen selected guava genotypes

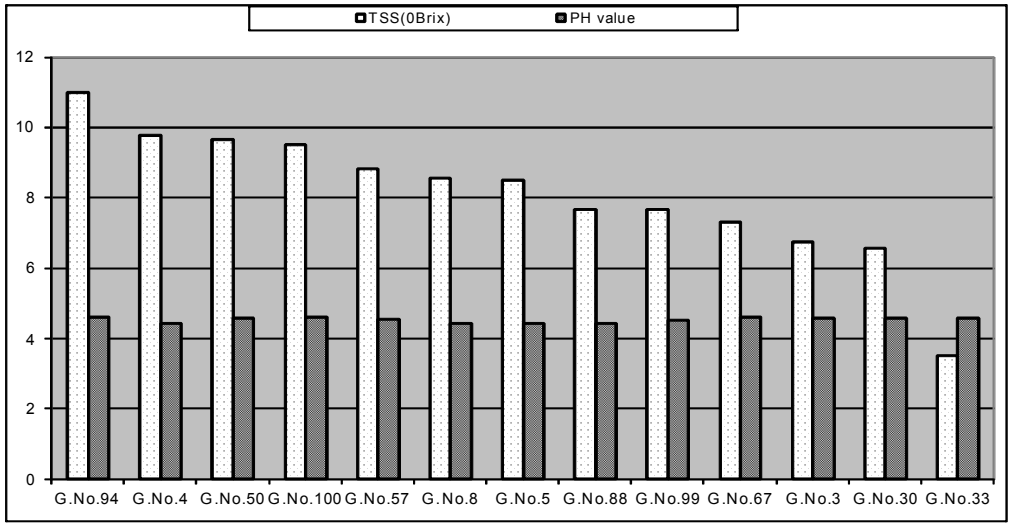

Fig. 2: Total soluble solid (TSS) and PH value in fruit of thirteen selected guava genotypes

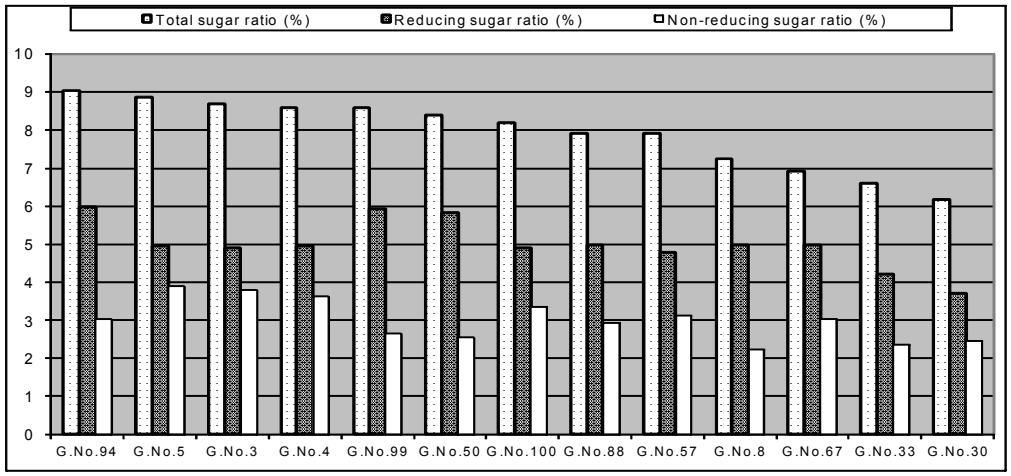

Fig. 3: Total, Reducing and non-reducing Sugars in fruit of thirteen selected guava genotypes

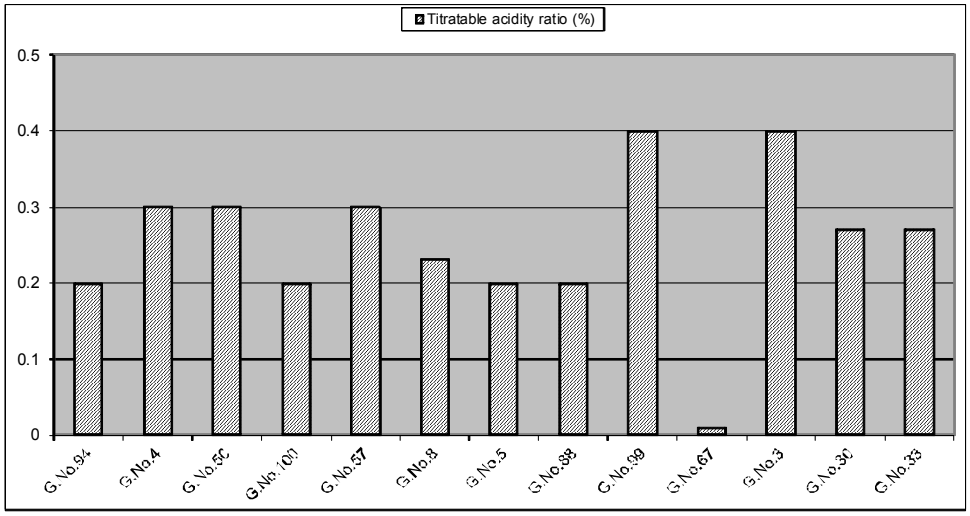

Fig. 4: Titerable acidity in fruit of thirteen selected guava genotypes