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## A survey on productivity status of guava (*Psidium guajava* L.) orchards in Hisar district of Haryana

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### Abstract

A field survey was conducted to study the productivity status of guava orchards in Hisar district of Haryana during June 2021 to February 2022. In total 24 orchards of guava were selected for the study. The bench mark survey of guava fruit crops was carried out to know the general information of orchards. The results reported that tree girth 52.79 cm, tree height 4.97 m, tree spread (5.40 m E-W & 4.77 m N-S), tree canopy (67.82 m), fruit yield (48.02 kg tree<sup>-1</sup>), fruit size (length 6.17 cm and diameter 7.02 cm), fruit weight (88.38 g), TSS (13.50° Brix) and acidity (0.28%) were observed in rainy season. However in winter season tree girth was 52.65 cm, tree height 4.74 m, tree spread (5.14 m E-W & 4.58 m N-S), tree canopy (59.13 m), fruit yield (43.09 kg tree<sup>-1</sup>) fruit size (length 5.53 cm and diameter 6.32 cm), fruit weight (79.46 g), TSS (13.850° Brix) and acidity (0.30%) were noted guava orchards in Hisar district of Haryana.

**Keywords:** Guava orchards, nutrient status, bench mark survey and foliar application

### Introduction

Fruits and their culture have very close association with life of man. Human civilization linked with development of fruit industry. Role of fruit which are widely called as “protective food” in human diet is well known from the prehistoric era. In the galaxy of fruit crops, guava is dominating fruit crop.

Guava (*Psidium guajava* L.) belongs to family Myrtaceae is grown in tropical and sub-tropical regions of the world. It is one of the most important fruit crops in India which is also known as “Apple of tropics.” The guava classified under genus *Psidium* that contains 150 species but only *Psidium guajava* L. is exploited commercially. The common guava is diploid (2n=22), but natural and artificial triploid (2n=33) and Aneuploid exists. It was introduced in India in the 17<sup>th</sup> century by Portuguese and the area under this crop is extending from Mexico to Peru and is now being cultivated in more than 60 countries of the world including India, Algeria, Australia, Brazil, California, China, Columbia, Costa Rica, Cuba, Egypt, Florida, Hawaii, Indonesia, Israel, Kenya, Malaysia, New Zealand, Panama, Pakistan, Philippines, Spain, South Africa and U.S.A. It is now widely grown all over the tropics and subtropics and gradually becoming crop of commercial significance.

The fruit of guava is highly valued and used in a number of different ways. It contains a high amount of vitamin C which is about three to four times more than that of fresh orange juice. The fruit also contains large amounts of vitamin A and B along with the minerals namely iron, calcium and phosphorus. The fruit can be eaten raw and is usually sliced and used in salads or desserts. Guava juice and guava nectar are popular beverages, while guava syrup can be used to flavour desserts. Green guavas can also be used as a source of pectin, while small and over ripe fruits are utilized as a source of ascorbic acid for various foods and drinks. The leaves and bark have high tannin content. Guava is one of the fourth most important fruit crop in India after Mango, Banana and Citrus. It is grown commercially on an area of about 290 thousand hectares with an annual production 4539 thousand tonnes in India (Horticultural Statistics at a Glance, 2019-20). In Haryana, it occupies an area of 8.69 thousand ha and production of 195.60 thousand tonnes (National Horticultural Board, 2018) [7]. Guava is second important fruit crop of Haryana-after/Kinnow it obtained second rank among all fruit crops. Guava can be grown in wide range of soils but does best in deep fertile and well-drained loams. It can tolerate a wide range of pH from 4.5-8.2 water logging adversely affects the growth, although guava can tolerate drought conditions much better than other tropical fruits (Arshad, 2015) [1]. The tropical climate is considered excellent for cultivation.

However, information regarding productivity status of guava orchards in Hisar district of Haryana is lacking. Keeping in view the above discussed facts of sufficient information and sparse related research, the present survey was undertaken to find out the productivity status of guava orchards in Hisar district of Haryana conditions.

### Material and Methods

The survey were carried out with a view of delineate the nutrient deficiency/sufficiency areas in the Hisar district of Haryana during June 2021 to February 2022. The area extent of Hisar district of Haryana is confined within northern latitudes of 29°15' 5'5" N and eastern longitudes of 75°72' 45'55" E and 215 meters (705 feet) above sea level is located in Northern India. Twenty four orchards were selected in the district for detailed investigations. In this regard bench mark survey was done at different locations of Hisar district. The bench mark survey of guava fruit crops was carried out to know the general information of orchards.

The trunk circumference was measured 15 cm above the ground with the help of measuring tape for tree girth. Height of the trees was measured with the help of measuring hole up to the maximum point of height ignoring only the off type shoots. The height was expressed in meters. In case of plant spread, the distance between points to which most of branches of a tree had grown in the North-South and East-West directions were measured. The off shoots were not considered in the measurement.

The canopy volume was calculated by formula given by Roose *et al.* (1986)<sup>[10]</sup> in (m).

$$V = 4/6 \pi hr^2$$

### Where

H= Tree height

R= sum of E-W and N-S direction/4

E-W = East-West

N-S= North-West

The fruiting characters of crop were recorded from July to August in rainy season and from December to January in winter season. The data were recorded in terms of yield tree<sup>-1</sup> and quality characters. The harvested fruits were weighed, using a weighing balance in rainy and winter season and the fruit yield was expressed in kilograms plant<sup>-1</sup>. A sample of ten fruit was taken from working height of selected. The data on physical characters of fruits were noted in terms of fruit size and fruit weight. The length and diameter of ten randomly selected fruits from each treatment were recorded with the help of ordinary scale and were expressed in centimeters. The fruit size was calculated by multiply the fruit length into diameter and expressed in centimeter square. The weight of

ten randomly selected fruits was recorded on Pan Balance and expressed in grams fruit<sup>-1</sup>.

### Quality characters of fruit

The quality characters of fruits were recorded in the month of August and January. The data on quality characters of fruits were determined in terms of total soluble solids and acidity. Vitamin C, also known as ascorbic acid, is necessary for the growth, development and repair of all body tissues. It's involved in many body functions, including formation of collagen, absorption of iron, the proper functioning of the immune system, wound healing and the maintenance of cartilage, bones and teeth.

### Preparation of sample

The fruits were chopped with a stainless steel knife and blended into a homogenous pulp in a mixture and juice was extracted with the help of muslin cloth.

### Total soluble solids

Juice of each sample was thoroughly stirred before taking the reading. Refractometer was cleaned with distilled water before taking each reading. Total soluble solids content of juice was determined with the help of Bausch and Lomb hand refractometer in terms of degree °Brix.

### Acidity

Five ml fruit juice was taken and titrated with 0.1 N NaOH using phenolphthalein as an indicator. The end point was denoted by appearance of light pink colour.

$$\text{Acidity \%} = \frac{0.0064 \times \text{Volume of 0.1 N NaOH used}}{\text{Volume of juice taken}} \times 100$$

### Results and Discussions

#### Tree growth characteristics

**Tree girth:** The data regarding the tree girth are presented in the Table 1. The tree girth varied from 37.60 to 65.83 cm with mean of 52.79 cm in rainy season and 37.50 to 65.65 cm with mean of 52.65 cm in winter season of different guava orchards of Hisar district. The maximum tree girth 65.83 cm was observed in the orchard no. 12 and minimum tree girth 37.60 cm was observed in the orchard no. 13 in rainy season and the maximum tree girth 65.65 cm was observed in the orchard no.12 and minimum tree girth 37.50 was observed in the orchard no.13 in winter season. Baksh *et al.* (2008)<sup>[2]</sup> reported that increment of plant girth ranged between 0.82 to 1.48 cm under integrated nutrient management. Kumar *et al.* (2009)<sup>[4]</sup> studied impact of different sources of nutrients on vegetative growth parameters of guava (*Psidium guajava* L.) and reported that stem girth ranged between 13.60 to 14.95 cm.

**Table 1:** Tree girth (cm) of guava orchards in Hisar district

Orchard number	Tree girth in rainy season	Tree girth in winter season
Orchard 1	65.00	64.82
Orchard 2	62.50	62.33
Orchard 3	55.80	55.65
Orchard 4	48.00	47.87
Orchard 5	46.50	46.37
Orchard 6	49.00	48.87
Orchard 7	48.50	48.37
Orchard 8	48.00	47.87

Orchard 9	38.00	37.90
Orchard 10	59.30	59.14
Orchard 11	56.40	56.24
Orchard 12	65.83	65.65
Orchard 13	37.60	37.50
Orchard 14	58.41	58.25
Orchard 15	39.10	38.99
Orchard 16	41.31	41.20
Orchard 17	43.60	43.48
Orchard 18	58.60	58.44
Orchard 19	63.30	63.13
Orchard 20	54.86	54.71
Orchard 21	55.80	55.65
Orchard 22	49.60	49.46
Orchard 23	59.50	59.34
Orchard 24	62.50	62.33
Mean	52.79	52.65

### Tree height

Tree height is a reliable index of growth and development representing the infrastructure build-up over a period of time and it is presented in Table 2. The tree height varied from 4.18 to 5.92 m with mean of 4.97 m in rainy season and 3.98 to 5.74 m with mean of 4.74 m in winter season different guava orchards of Hisar district. The maximum tree height 5.92 m was observed in the orchard no. 10 and minimum tree height 4.18 m was observed in the orchard no. 17 in rainy season and the maximum tree height 5.74 m was observed in

the orchard no. 10 and minimum tree height 3.98 m was observed in the orchard no. 17 in winter season. Baksh *et al.* (2008) <sup>[2]</sup> reported that increase in plant height ranged between 0.21 to 0.47 m under integrated nutrient management. Kumar *et al.* (2009) <sup>[4]</sup> studied optimization of major nutrients for guava yield and quality under east coastal conditions and found that maximum plant height (2.8 m) was recorded under 900 g nitrogen tree<sup>-1</sup>, while minimum was recorded (2.3 m) in control.

**Table 2:** Tree height (m) of guava orchards in Hisar district

Orchard number	Tree height in rainy season	Tree height in winter season
Orchard 1	5.18	4.94
Orchard 2	5.10	4.76
Orchard 3	5.12	4.81
Orchard 4	5.12	4.99
Orchard 5	4.72	4.50
Orchard 6	5.10	4.66
Orchard 7	5.18	4.84
Orchard 8	5.60	5.34
Orchard 9	5.57	5.31
Orchard 10	5.92	5.74
Orchard 11	4.25	4.05
Orchard 12	4.81	4.68
Orchard 13	4.60	4.28
Orchard 14	5.25	5.00
Orchard 15	4.93	4.70
Orchard 16	4.24	4.14
Orchard 17	4.18	3.98
Orchard 18	4.69	4.47
Orchard 19	4.92	4.69
Orchard 20	5.07	4.73
Orchard 21	5.16	4.92
Orchard 22	5.20	5.16
Orchard 23	4.55	4.34
Orchard 24	4.92	4.69
Mean	4.97	4.74

### Tree spread

The data regarding the tree spread are presented in the Table 3. The tree spread varied from 4.54 to 6.36 m E-W, 4.03 to 5.59 m N-S with mean of 5.40 m E-W & 4.77 m N-S in rainy season and 4.33 to 6.06 m E-W, 3.94 to 5.33 m N-S with mean of 5.14 m E-W & 4.58 m N-S in winter season different guava orchards of Hisar district. The maximum tree spread 6.36 m E-W and 5.59 m N-S was observed in the orchard no.

11 and 12, respectively and minimum tree spread 4.54 m E-W and 4.03 m N-S were observed in the orchard no. 15 and 17, respectively in rainy season and the maximum tree spread 6.06 m E-W and 5.33 m N-S were observed in the orchard no. 11&12, respectively and minimum tree spread 4.33 m E-W and 3.94 m N-S were observed in the orchard no. 15 in winter season. Virendra Kumar *et al.* (2010) <sup>[13]</sup> studied impact of different sources of nutrients on vegetative growth parameters

of guava (*Psidium guajava* L.) and reported that plant spread ranged between 5.70 to 6.94 m. Trivedi *et al.* (2012) conducted an experiment on impact of organic manures and inorganic fertilizers on growth, yield, nutrient uptake and soil nutrient status in guava and found that plant spread ranged between 5.04 to 5.72 m (E-W) and 5.37 to 5.93m (N-S).

**Table 3:** Tree spread (m) of guava orchards in Hisar district

Orchard number	Tree spread in rainy season		Tree spread in winter season	
	E-W	N-S	E-W	N-S
Orchard 1	5.28	4.21	5.03	4.21
Orchard 2	5.40	4.86	5.15	4.63
Orchard 3	5.03	4.85	4.79	4.62
Orchard 4	5.40	4.34	5.15	4.34
Orchard 5	5.62	4.84	5.36	4.41
Orchard 6	5.55	5.11	5.39	4.87
Orchard 7	5.12	4.48	4.88	4.27
Orchard 8	5.18	4.78	4.94	4.56
Orchard 9	6.10	5.21	5.91	5.16
Orchard 10	5.62	4.93	5.36	4.60
Orchard 11	6.36	5.51	6.06	5.25
Orchard 12	5.97	5.59	5.69	5.33
Orchard 13	5.83	4.69	5.36	4.47
Orchard 14	5.21	4.82	4.96	4.69
Orchard 15	4.54	4.13	4.33	3.94
Orchard 16	5.07	4.18	4.53	3.98
Orchard 17	5.12	4.03	4.88	3.94
Orchard 18	5.48	5.33	5.12	5.08
Orchard 19	5.65	4.86	5.38	4.63
Orchard 20	5.23	5.12	5.08	4.88
Orchard 21	4.92	4.38	4.69	4.17
Orchard 22	5.76	5.10	5.69	5.16
Orchard 23	4.92	4.36	4.69	4.15
Orchard 24	5.28	4.83	5.03	4.60
Mean	5.40	4.77	5.14	4.58

### Tree Canopy

The data regarding the tree canopy are presented in the Table 4. The tree canopy varied from 45.79 to 93.22 m with mean of 67.82 m in rainy season and 39.28 to 85.22 m with mean of 59.13 m in winter season different guava orchards of Hisar district. The maximum tree spread 93.22 m was observed in the orchard no. 9 and minimum tree spread 45.79 m was observed in the orchard no. 17 in rainy season and the maximum tree spread 85.22 m was observed in the orchard no. 9 and minimum tree spread 39.28 m was observed in the orchard no. 16 in winter season.

**Table 4:** Tree canopy (m<sup>3</sup>) volume of guava orchards of Hisar district

Orchard number	Tree canopy in rainy season	Tree canopy in winter season
Orchard 1	61.04	55.18
Orchard 2	70.24	59.53
Orchard 3	65.39	55.77
Orchard 4	63.55	58.71
Orchard 5	67.57	56.15
Orchard 6	75.82	64.16
Orchard 7	62.46	52.96
Orchard 8	72.68	62.90
Orchard 9	93.22	85.22
Orchard 10	86.21	74.42
Orchard 11	78.34	67.80
Orchard 12	84.10	74.36
Orchard 13	66.61	54.10
Orchard 14	69.10	61.06
Orchard 15	48.48	41.96
Orchard 16	47.46	39.28
Orchard 17	45.79	40.54
Orchard 18	71.70	60.85
Orchard 19	71.10	61.53
Orchard 20	71.06	61.45
Orchard 21	58.39	50.53
Orchard 22	80.24	79.39
Orchard 23	51.27	44.36
Orchard 24	65.79	56.94
Mean	67.82	59.13

### Fruit yield and quality characteristics

#### Fruit yield (kg tree<sup>-1</sup>)

The data regarding the fruit yield are presented in the Table 5. The fruit yield varied from 32.52 to 63.86 kg tree<sup>-1</sup> with mean of 48.02 kg tree<sup>-1</sup> in rainy season and 31.16 to 57.21 kg tree<sup>-1</sup> with mean of 43.09 kg tree<sup>-1</sup> in winter season different guava orchards of Hisar district. The maximum fruit yield 63.86 kg tree<sup>-1</sup> was observed in the orchard no. 12 and minimum fruit yield 32.52 kg tree<sup>-1</sup> was observed in the orchard no.1 in rainy season and the maximum fruit yield 57.21 kg tree<sup>-1</sup> was observed in the orchard no. 6 and minimum fruit yield 31.16 kg tree<sup>-1</sup> was observed in the orchard no. 1 in winter season. Walling and Sanyal (1995) [14] noticed that total weight of fruits plant<sup>-1</sup> ranged from 27.70 to 102.27 kg tree<sup>-1</sup> under the foot hills of Nagaland condition. Ram *et al.* (2007) studied the integrated plant nutrient management in guava (*Psidium guajava* L.) cv. Sardar and concluded that total weight of fruits plant<sup>-1</sup> ranged from 80.50 to 150.25 kg ha<sup>-1</sup>.

**Table 5:** Fruit yield (kg tree<sup>-1</sup>) of guava orchards in Hisar district

Orchard number	Yield tree <sup>-1</sup> in rainy season	Yield tree <sup>-1</sup> in winter season
Orchard 1	32.52	31.16
Orchard 2	41.74	35.43
Orchard 3	39.87	36.75
Orchard 4	39.40	34.33
Orchard 5	43.86	39.33
Orchard 6	63.80	57.21
Orchard 7	39.41	35.34
Orchard 8	43.85	39.32
Orchard 9	46.96	42.11
Orchard 10	48.74	46.71
Orchard 11	42.78	38.36
Orchard 12	63.86	54.27
Orchard 13	48.64	43.62
Orchard 14	55.42	46.70



Orchard 15	47.84	42.90
Orchard 16	46.52	41.72
Orchard 17	44.43	39.84
Orchard 18	58.89	52.81
Orchard 19	56.83	47.96
Orchard 20	56.52	51.68
Orchard 21	46.51	41.71
Orchard 22	59.63	56.47
Orchard 23	38.64	34.65
Orchard 24	45.73	44.01
Mean	48.02	43.09

### Fruit size (cm)

The data regarding the fruit size are presented in the Table 6. The fruit size varied from 5.38 to 6.63 cm length and 6.38 to 7.82 cm diameter with mean of 6.17 and 7.02 cm length and diameter, respectively in rainy season and 5.11 to 6.05 cm length and 5.83 to 7.14 cm diameter with mean of 5.53 and 6.32 cm length and diameter, respectively in winter season different guava orchards of Hisar district. The maximum fruit size 6.63 cm length and 7.82 cm diameter were observed in the orchard no. 10 and minimum fruit size 5.38 cm length and 6.38 cm diameter was observed in the orchard no. 16 in rainy season and the maximum fruit size 6.05 cm length and 7.14 cm diameter were observed in the orchard no. 10 and minimum fruit size 5.11 cm length and 5.83 cm diameter were observed in the orchard no. 11 and 16, respectively in winter season. There are various factors on which the size of the fruit in terms of length, breadth and volume depends upon, it may be number of fruits on tree, season and genetic make-up of a variety. It was reported by Cheema and Deshmukh (1927) [3] that the size was more on the guava trees which were pruned as compared with the unpruned guava trees.

**Table 6:** Fruit size (cm) of guava orchards in Hisar district

Orchard number	Fruit size in rainy season		Fruit size in winter season	
	Length (cm)	Diameter (cm)	Length (cm)	Diameter (cm)
Orchard 1	6.35	7.32	6.00	6.68
Orchard 2	6.37	7.81	5.62	6.44
Orchard 3	5.98	6.47	5.46	5.91
Orchard 4	6.15	7.27	5.62	6.44
Orchard 5	6.35	6.82	5.90	6.23
Orchard 6	6.41	7.57	5.85	6.91
Orchard 7	6.21	7.04	5.47	6.33
Orchard 8	5.85	6.42	5.34	5.87
Orchard 9	6.31	7.05	5.36	6.14
Orchard 10	6.63	7.82	6.05	7.14
Orchard 11	6.39	7.34	5.84	6.51
Orchard 12	5.69	6.94	5.50	6.34
Orchard 13	5.93	6.82	5.42	6.22
Orchard 14	6.52	7.49	5.45	6.64
Orchard 15	5.85	6.42	5.34	5.87
Orchard 16	5.38	6.38	4.61	5.83
Orchard 17	6.36	7.01	5.51	6.30
Orchard 18	6.17	7.09	5.63	6.48
Orchard 19	5.73	6.69	5.23	6.41
Orchard 20	6.54	7.52	5.47	6.36
Orchard 21	6.34	6.91	5.79	6.01
Orchard 22	6.15	6.57	5.82	6.00
Orchard 23	6.36	6.71	5.11	6.53
Orchard 24	5.96	6.95	5.44	6.05
Mean	6.17	7.02	5.53	6.32

### Fruit weight (g)

The data regarding the fruit weight in the Guava orchards of Hisar district of Haryana are presented in the Table 7. The fruit weight of rainy season is varied from 70.53 to 104.57 g and in winter season fruit weight varied from 64.41 to 90.49 g. The maximum fruit weight of rainy (104.57 g) and winter season (90.49 g) both were received from orchard no. 9. The minimum fruit weight of rainy (70.53 g) and winter season is (64.41 g) both were getting from orchard no. 9. The mean fruit weight of rainy and winter season is 88.38 g and 79.46 g, respectively. Mitra *et al.* (2010) [6] studied the integrated nutrient management in high density guava orchards and concluded that fruit weight varied between 99.14 to 122.80 g in rainy season and 122.50 to 145.00 g in winter season. Varsha *et al.* (2011) [12] reported that weight of fruit ranged from 131.80 to 289.40 g. Ramniwas *et al.* (2012) [9] revealed that fruit weight varied between 132.33 to 182.17 g under meadow Orchard in Udaipur.

**Table 7:** Fruit weight (g) of guava orchards of Hisar district

Orchard number	Fruit weight in rainy season	Fruit weight in winter season
Orchard 1	87.00	75.45
Orchard 2	95.40	85.12
Orchard 3	84.87	77.50
Orchard 4	89.50	81.73
Orchard 5	93.69	82.56
Orchard 6	97.35	88.90
Orchard 7	90.73	82.85
Orchard 8	82.74	75.56
Orchard 9	104.57	90.49
Orchard 10	98.52	89.97
Orchard 11	70.53	64.41
Orchard 12	81.95	74.84
Orchard 13	85.66	73.22
Orchard 14	95.83	87.51
Orchard 15	98.85	87.27
Orchard 16	79.37	72.48
Orchard 17	77.94	71.17
Orchard 18	88.74	81.04
Orchard 19	80.64	73.64
Orchard 20	98.34	89.80
Orchard 21	94.85	83.62
Orchard 22	79.28	72.40
Orchard 23	80.94	73.91
Orchard 24	83.84	71.56
Mean	88.38	79.46

### Chemical composition of fruit

#### Total Soluble Solids

The data regarding the total soluble solids in the Guava orchards of Hisar district of Haryana are presented in the

Table 8. The total soluble solids (TSS) in the fruits of Guava orchards ranged from 13.01 to 13.96° Brix in rainy season and 13.37 to 14.21° Brix in winter season. The maximum TSS of rainy and winter season is 13.96° Brix from orchard no. 14 and 14.21° Brix from orchard no. 19 respectively. The minimum TSS of rainy and winter season is 13.01° Brix from orchard no. 13 and 13.37° Brix from orchard no. 8&12 respectively. The mean TSS of rainy and winter season is 13.50° Brix and 13.85° Brix, respectively. Uma Shankar *et al.* (2002) reported that TSS of fruit ranged between 9.90 to 11.66° Brix in rainy season and 13.20 to 15.60° Brix in winter season. Kumar *et al.* (2009) [4] evaluated that higher doses of nitrogen and phosphorous application have no influence on TSS however, application of potassium significantly increase TSS of guava. Mandeep *et al.* (2013) [5] revealed that TSS of guava fruit ranged between 7.33 to 11.67° Brix that under Malwa plateau conditions.

**Table 8:** Total Soluble Solids (°Brix) of Guava orchards in Hisar district

Orchard number	Total soluble solids in rainy season	Total soluble solids in winter season
Orchard 1	13.30	13.85
Orchard 2	13.52	13.87
Orchard 3	13.21	13.76
Orchard 4	13.84	14.20
Orchard 5	13.42	13.57
Orchard 6	13.75	14.11
Orchard 7	13.45	13.90
Orchard 8	13.42	13.37
Orchard 9	13.12	13.46
Orchard 10	13.74	14.20
Orchard 11	13.56	13.91
Orchard 12	13.42	13.77
Orchard 13	13.01	13.85
Orchard 14	13.96	13.63
Orchard 15	13.32	13.67
Orchard 16	13.11	13.45
Orchard 17	13.44	13.79
Orchard 18	13.53	13.88
Orchard 19	13.75	14.21
Orchard 20	13.67	14.03
Orchard 21	13.36	13.71
Orchard 22	13.66	14.02
Orchard 23	13.53	14.08
Orchard 24	13.79	14.05
Mean	13.50	13.85

#### Acidity (%)

The data presented in the Table 9 revealed that the acidity in the Guava orchards varied from 0.24 to 0.32 per cent in rainy season and 0.25 to 0.33 percent in winter season. The maximum acidity of 0.32 per cent from Orchard no. 7 was observed in rainy season and 0.33 per cent Orchard no. 19 in winter season. The minimum acidity of 0.24 percent during rainy season and 0.25 per cent during winter both were observed from Orchard no. 10. The mean acidity of 0.28 percent observed in rainy season and 0.30 per cent was observed in winter season. Kumar *et al.* (2009) [4] reported that titrable acidity of guava orchards ranged between 0.20 to 0.24% under east coastal conditions. Mandeep *et al.* (2013) [5] reported that titrable acidity ranged between 0.20 to 0.44 per cent.

**Table 9:** Acidity (%) of guava orchards of Hisar district

Orchard number	Acidity in rainy season	Acidity in winter season
Orchard 1	0.27	0.28
Orchard 2	0.31	0.31
Orchard 3	0.28	0.30
Orchard 4	0.30	0.31
Orchard 5	0.25	0.30
Orchard 6	0.27	0.28
Orchard 7	0.32	0.31
Orchard 8	0.28	0.29
Orchard 9	0.31	0.32
Orchard 10	0.24	0.25
Orchard 11	0.27	0.28
Orchard 12	0.30	0.31
Orchard 13	0.28	0.29
Orchard 14	0.31	0.31
Orchard 15	0.26	0.27
Orchard 16	0.28	0.32
Orchard 17	0.30	0.31
Orchard 18	0.28	0.27
Orchard 19	0.29	0.33
Orchard 20	0.26	0.27
Orchard 21	0.26	0.27
Orchard 22	0.31	0.32
Orchard 23	0.28	0.31
Orchard 24	0.28	0.30
Mean	0.28	0.30

#### Conclusions

From the overall study it is to be concluded that mean tree girth 52.79 cm, tree height 4.97 m, tree spread (5.40 m E-W & 4.77 m N-S), tree canopy (67.82 m), fruit yield (48.02 kg tree<sup>-1</sup>), fruit size (length 6.17 cm and diameter 7.02 cm), fruit weight (88.38 g), TSS (13.50° Brix) and acidity (0.28%) were observed in rainy season. However in winter season tree girth was 52.65 cm, tree height 4.74 m, tree spread (5.14 m E-W & 4.58 m N-S), tree canopy (59.13 m), fruit yield (43.09 kg tree<sup>-1</sup>) fruit size (length 5.53 cm and diameter 6.32 cm), fruit weight (79.46 g), TSS (13.850° Brix) and acidity (0.30%) were noted guava orchards in Hisar district of Haryana.

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