

# MORPHOLOGICAL CHARACTERIZATION OF PROMISING GUAVA (*PSIDIUM GUAJAVA* L.) VARIETIES UNDER SUB-TROPICAL HUMID CONDITIONS OF NORTH INDIA

DHARMENDRA SINGH\*, M. I. S. GILL AND N. K. ARORA

Department of Fruit Science,

College of Agriculture, Punjab Agricultural University, Ludhiana, Punjab - 141 004, INDIA

e-mail: dharmendrachoudhary32@gmail.com

## KEYWORDS

Guava  
Vegetative growth  
Chlorophyll index  
Flowering

## Received on :

01.01.2016

## Accepted on :

25.02.2016

\*Corresponding  
author

## ABSTRACT

The morphological studies on the performance of different guava varieties revealed that the tree height was medium (2 to 4 m) in Pant Prabhat, Arka Amulya, Shweta and Thailand. Red coloured young shoots (Anthocyanin colouration) were observed in Allahabad Safeda, Punjab Pink, L-49, Lalit, Shweta, Pear Shaped. A significant variation in leaf length was observed among different guava varieties ranging from 101.89 mm in Lalit to 151.27 mm in Punjab Pink, while, maximum leaf blade width was recorded in the variety L-49 (65.54 mm). Leaf chlorophyll index values ranged from 38.60 to 51.70 with an overall mean value of 42.84 with the maximum chlorophyll index in variety Pear Shaped. First sign of flower bud for winter season crop was noted from 21<sup>st</sup> to 25<sup>th</sup> June. In winter season crop, variety Punjab Pink was first to have open flower on 5<sup>th</sup> July. Maximum mean flower size (47.01 mm) for winter season crop was recorded in L-49. Varieties Hisar Safeda (42 days), 17-16, Lalit, G.Bilas and Pear Shaped (41 days) were found to bear flowers for longer duration.

## INTRODUCTION

Guava (*Psidium guajava* L.) is one of the most common and important commercial fruit crops cultivated in both tropical and sub-tropical regions of the world. Guava tree normally produces as many as two crops in a year; which is a unique phenomenon of the tropical and sub-tropical regions. The blooming period varies from 25 to 45 days depending upon the cultivar, season and the region where it is grown. Knowledge of floral morphology, blossom biology, mode of pollination, fruit set and drop is an essential pre-requisite for hybridization and any fruit crop improvement programme. Defined programme may also serve as a guide to the orchardists in selecting the suitable cultivars having promising traits and accordingly to adjust cultural operations in relation to the flowering and fruiting behaviour of the guava trees. The cultivars Sardar and Allahabad Safeda were the most vigorous and produced maximum stock girth, scion girth, tree height and tree volume (Kumar 1998). Under New Delhi conditions, the varieties Chittidar and Red Fleshed were the earliest to start flowering and had the longest flowering period (36-46 days), whereas Apple Colour and Seedless were at the last to come into flowering (27-34 days) (Seghal and Singh 1965). The flowering season was generally longer in autumn (28-46 days) than spring season (27-39 days). Thus, in the present investigation, the growth and flowering characteristics are studied in some promising guava varieties, under sub-tropical conditions.

For a planned breeding programme, aimed at to achieve

incremental improvement in the genotypes, the morphological characterization of existing germplasm has special significance. The present study conducted on guava will be of immense help for planning such experiment on guava improvement.

## MATERIALS AND METHODS

The characterization for vegetative and flower characters was done in 13 guava varieties (Allahabad Safeda, Punjab Pink, Pant Prabhat, 17-16, L-49, Arka Amulya, Hisar Surkha, Hisar Safeda, Lalit, Shweta, G.Bilas, Thailand and Pear Shaped) at the Fruit Research Farm, Department of Fruit Science, Punjab Agricultural University, Ludhiana. The characters of guava accessions were observed on basis of UPOV (International Union for the Protection of New Varieties of Plants) descriptors (Rodriguez *et al.*, 2010). Tree height was recorded on visual basis and the categories were recognized as tall (more than 4 meters), medium (2 to 4 meters) and small (less than 2 meters). The observations for tree foliage for current season's growth were on visual basis and the categories were recognized as scant, normal and dense. Attitude of branches were made for tree habit on visual basis. The categories recognized were spreading, spreading to drooping and drooping. Colour of young twig was recorded on visual basis and categorized as per descriptors green, red and red colour of twig which shows presence of anthocyanin colouration.

The observations for leaf chlorophyll index were recorded using Minolta SPAD 502, a non-destructive method. Ten fully mature leaves from four directions of each tree were used and

means were worked out. The leaf surface (upper side of the fully developed leaf) was recorded visually for categories namely smooth and medium. Shape of mature leaf was observed on visual basis and expressed as elliptical, lanceolate, oblong and obovate. Leaf base and apex shape of fully developed leaves was categorized as round, obtuse and acute. The leaf length, width, petiole length and flower size of ten randomly selected mature leaves and flowers were measured with the help of digital vernier caliper, Mitutoyo Inc., Japan. Colour of midrib on lower side was observed on visual basis as green or red. Presence or absence of undulation of the margin for fresh leaves was also observed visually. The season of flowering, duration and total numbers of petals per flower were also recorded. The results obtained were subjected to analysis of variance by using RBD design and the treatment means were compared using the least significant difference (LSD) values at a significance level of  $p \leq 0.05$  using procedures of the Statistical Analysis System 9.3 (Anonymous, 2011).

## RESULTS AND DISCUSSION

### Tree height, tree foliage and attitude of branches

The medium (2 to 4m) tree height was observed (Table 1) in Pant Prabhat, Arka Amulya, Shweta and Thailand. Whereas, tall (more than 4 m) tree height was observed in rest of the guava varieties. Varieties also showed variation with respect to tree foliage. Normal tree foliage was observed in Pant Prabhat, Arka Amulya, Lalit and Shweta. Rest of the guava varieties showed dense tree foliage. Dubey *et al* (2000) also recorded marked difference in plant height of different guava germplasm. Among guava varieties, under present study spreading to drooping habit (Table 1) of branches was recorded. Plants in majority of varieties (Allahabad Safeda, Pant Prabhat, 17-16, L-49, Arka Amulya, Hisar Surkha, Hisar Safeda, Lalit, Shweta, G.Bilas and Thailand) exhibited spreading plant habit, while, the guava varieties Punjab Pink and Pear Shaped revealed spreading to drooping plant habit. Singh (2003) while studying the growth and physical characters of seven guava cultivars recorded mean plant spread of 5 m in Behat Coconut and 6.67 m in BarafKhana and Seedless. Similarly, Deshmukh *et al* (2013) also observed under

mid-hills of NE India, guava hybrid RCGH 1 showed upright growth habit, whereas hybrid RCGH 4, Allahabad Safeda and Lalit had semi-spreading and L-49 and RCGH 7 possessed drooping growth habit.

### Colour of young twig, Anthocyanin colouration and leaf surface

The colour of newly emerging shoot/young twig ranged from green to red in different varieties (Table 1). Red coloured young shoots were observed in Allahabad Safeda, Punjab Pink, L-49, Lalit, Shweta, Pear Shaped and Anthocyanin colouration of young emerging leaves was also present in these varieties. Whereas, green coloured new twigs without anthocyanin colouration were observed in varieties, namely; Pant Prabhat, 17-16, Arka Amulya, Hisar Surkha, G. Bilas, Thailand and Hisar Safeda and most of the varieties showed smooth surfaced leaves, whereas, 17-16 variety had medium rough leaf surface.

### Leaf shape

Much variation was observed among different guava varieties for their leaf shape, leaf base and leaf apex as per data recorded in Table 2. Four varieties viz; L-49, Arka Amulya, Hisar Surkha and Thailand had elliptical leaf shape and all these varieties had obtuse leaf base and leaf apex. Oblong type of leaf shape was recorded in Allahabad Safeda, Pant Prabhat, G.Bilas and Hisar Safeda with round leaf base and obtuse leaf apex. Lanceolate type of leaf shape was observed among varieties viz; Punjab Pink, 17-16 and Shweta and all these varieties possessed leaves with obtuse leaf base and acute leaf apex. Varieties Lalit and Pear Shaped showed obovate leaf shape along with obtuse leaf base and round leaf apex. Similar kind of variation for leaf shape was also observed by Sharma *et al* (2010) for different guava varieties.

### Colour of midrib and undulation of the margin

The green coloured midrib on lower side of leaf was observed (Table 2) among all the varieties except Hisar Surkha, which showed red coloured midrib on lower leaf surface. Varieties were also categorized on the basis of presence or absence of leaf margin undulation. Undulation of the margin to a medium extent was observed in Allahabad Safeda, Punjab Pink, Pant Prabhat, Lalit, G.Bilas, Thailand and Pear Shaped. For rest of

**Table 1: Tree height, tree foliage, attitude of branches, colour of young twig and Anthocyanin colouration of young leaf in different guava varieties**

SrNo	Varieties	Tree height	Tree foliage	Attitude of branches	Colour of young twig	Anthocyanin colouration of young leaf
1	Allahabad Safeda	Tall	Dense	Spreading	Red	Present
2	Punjab Pink	Tall	Dense	Spreading to drooping	Red	Present
3	Pant Prabhat	Medium	Normal	Spreading	Green	Absent
4	17-16	Tall	Dense	Spreading	Green	Absent
5	L-49	Tall	Dense	Spreading	Red	Present
6	Arka Amulya	Medium	Normal	Spreading	Green	Absent
7	Hisar Surkha	Tall	Dense	Spreading	Green	Absent
8	Hisar Safeda	Tall	Dense	Spreading	Green	Absent
9	Lalit	Tall	Normal	Spreading	Red	Present
10	Shweta	Medium	Normal	Spreading	Red	Present
11	G.Bilas	Tall	Dense	Spreading	Green	Absent
12	Thailand	Medium	Dense	Spreading	Green	Absent
13	Pear Shaped	Tall	Dense	Spreading to drooping	Red	Present

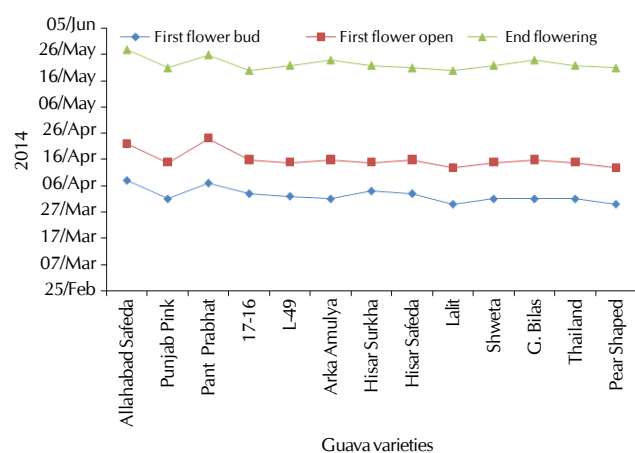
**Table 2: Leaf characteristics (Leaf shape, leaf base shape, leaf apex shape, relief on upper surface of leaf, colour of midrib on lower side and undulation of margin) of different guava varieties**

SrNo	Varieties	Leaf shape	Leaf base	Leaf apex	Relief on upper surface of leaf	Colour of midrib on lower side	Undulation of margin
1	Allahabad Safeda	Oblong	Round	Obtuse	Smooth	Green	Present
2	Punjab Pink	Lanceolate	Obtuse	Acute	Smooth	Green	Present
3	Pant Prabhat	Oblong	Round	Obtuse	Smooth	Green	Present
4	17-16	Lanceolate	Obtuse	Acute	Medium	Green	Absent
5	L-49	Elliptical	Obtuse	Obtuse	Smooth	Green	Absent
6	Arka Amulya	Elliptical	Obtuse	Obtuse	Smooth	Green	Absent
7	Hisar Surkha	Elliptical	Obtuse	Obtuse	Smooth	Red	Absent
8	Hisar Safeda	Oblong	Round	Obtuse	Smooth	Green	Absent
9	Lalit	Obovate	Obtuse	Round	Smooth	Green	Present
10	Shweta	Lanceolate	Obtuse	Acute	Smooth	Green	Absent
11	G.Bilas	Oblong	Round	Obtuse	Smooth	Green	Present
12	Thailand	Elliptical	Obtuse	Obtuse	Smooth	Green	Present
13	Pear Shaped	Obovate	Obtuse	Round	Smooth	Green	Present

**Table 3: Leaf characteristics (Leaf blade length, leaf blade width, leaf length: width ratio and petiole length) of different guava varieties**

SrNo	Varieties	Leaf blade length (mm)	Leaf blade width (mm)	Leaf length : width ratio	Petiole length (mm)
1	Allahabad Safeda	127.93 ± 4.14 <sup>cd</sup>	59.37 ± 2.51 <sup>bc</sup>	2.158 ± 0.054 <sup>defg</sup>	6.76 ± 0.23 <sup>bc</sup>
2	Punjab Pink	151.27 ± 1.75 <sup>a</sup>	65.26 ± 1.85 <sup>a</sup>	2.320 ± 0.039 <sup>cd</sup>	7.32 ± 0.21 <sup>b</sup>
3	Pant Prabhat	132.16 ± 2.84 <sup>c</sup>	63.23 ± 1.26 <sup>ab</sup>	2.091 ± 0.045 <sup>fg</sup>	8.60 ± 0.55 <sup>a</sup>
4	17-16	147.06 ± 2.86 <sup>ab</sup>	49.70 ± 0.74 <sup>ef</sup>	2.959 ± 0.037 <sup>a</sup>	5.63 ± 0.21 <sup>def</sup>
5	L-49	134.71 ± 3.03 <sup>c</sup>	65.54 ± 1.78 <sup>a</sup>	2.056 ± 0.013 <sup>g</sup>	7.38 ± 0.26 <sup>b</sup>
6	Arka Amulya	117.39 ± 2.34 <sup>ef</sup>	52.43 ± 1.57 <sup>def</sup>	2.240 ± 0.026 <sup>cdef</sup>	4.83 ± 0.37 <sup>fg</sup>
7	Hisar Surkha	122.68 ± 1.37 <sup>de</sup>	53.77 ± 1.62 <sup>de</sup>	2.284 ± 0.060 <sup>cde</sup>	5.59 ± 0.45 <sup>def</sup>
8	Hisar Safeda	122.33 ± 2.28 <sup>de</sup>	60.43 ± 0.61 <sup>abc</sup>	2.024 ± 0.018 <sup>g</sup>	4.88 ± 0.11 <sup>efg</sup>
9	Lalit	101.89 ± 2.76 <sup>h</sup>	47.82 ± 2.27 <sup>fg</sup>	2.135 ± 0.045 <sup>efg</sup>	4.36 ± 0.22 <sup>gh</sup>
10	Shweta	113.74 ± 1.14 <sup>fg</sup>	42.70 ± 1.18 <sup>g</sup>	2.666 ± 0.049 <sup>b</sup>	3.86 ± 0.12 <sup>h</sup>
11	G.Bilas	128.97 ± 1.90 <sup>cd</sup>	56.30 ± 2.49 <sup>cd</sup>	2.297 ± 0.070 <sup>cde</sup>	6.06 ± 0.50 <sup>cd</sup>
12	Thailand	107.56 ± 1.42 <sup>gh</sup>	51.87 ± 2.30 <sup>def</sup>	2.079 ± 0.071 <sup>fg</sup>	5.74 ± 0.66 <sup>de</sup>
13	Pear Shaped	143.45 ± 3.16 <sup>b</sup>	60.10 ± 2.27 <sup>abc</sup>	2.397 ± 0.140 <sup>c</sup>	6.28 ± 0.38 <sup>cd</sup>
	S.E. Mean	3.65	2.68	0.087	0.43
	LSD (p ≤ 0.05)	7.52	5.53	0.179	0.88

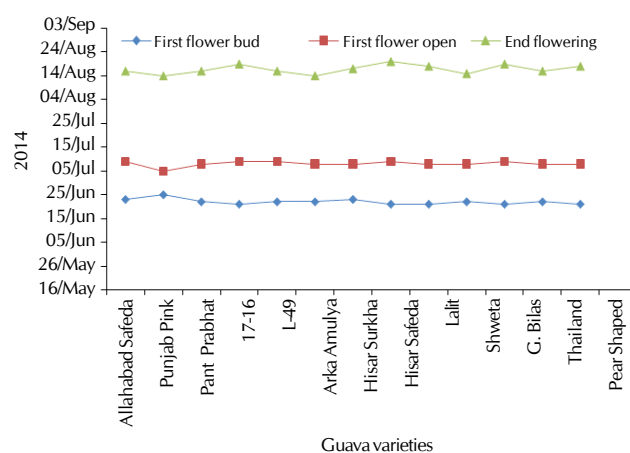
Means with the same letter are not significantly different (LSD, p ≤ 0.05). Each value represents treatment mean ± S.E. Mean (3 replications).

**Figure 1: Comparison of flowering season in different guava varieties for rainy season crop**

the varieties, (17-16, L-49, Arka Amulya, Hisar Surkha, Shweta and Hisar Safeda) undulation of the leaf margin was absent.

#### Leaf blade length (mm)

A significant variation in leaf length was observed among

**Figure 2: Comparison of flowering season in different guava varieties for winter season crop**

different guava varieties ranging from 101.89 mm in Lalit to the tune of 151.27 mm in Punjab Pink with 127.01 mm overall average leaf length (Table 3). Maximum leaf blade length was observed in Punjab Pink (151.27 mm) followed by 17-16

**Table 4: Leaf chlorophyll index, flower size and number of fully developed petals in different guava varieties for winter season crop (2014).**

SrNo	Varieties	Leaf chlorophyll index	Flower size (mm)	Number of fully developed petals
1	Allahabad Safeda	38.89 ± 1.20 <sup>f</sup>	39.84 ± 0.19 <sup>ef</sup>	6 ± 0.00 <sup>de</sup>
2	Punjab Pink	46.70 ± 0.91 <sup>bc</sup>	40.92 ± 0.42 <sup>e</sup>	7 ± 0.00 <sup>c</sup>
3	Pant Prabhat	44.32 ± 0.71 <sup>cd</sup>	39.18 ± 0.42 <sup>f</sup>	6 ± 0.00 <sup>de</sup>
4	17-16	47.92 ± 0.45 <sup>b</sup>	39.75 ± 0.32 <sup>f</sup>	6 ± 0.17 <sup>d</sup>
5	L-49	40.08 ± 1.16 <sup>ef</sup>	47.01 ± 0.26 <sup>a</sup>	8 ± 0.00 <sup>a</sup>
6	Arka Amulya	38.69 ± 0.77 <sup>f</sup>	37.23 ± 0.38 <sup>g</sup>	6 ± 0.17 <sup>d</sup>
7	Hisar Surkha	45.43 ± 0.71 <sup>bc</sup>	43.11 ± 0.33 <sup>d</sup>	7 ± 0.17 <sup>bc</sup>
8	Hisar Safeda	38.60 ± 1.11 <sup>f</sup>	44.37 ± 0.22 <sup>c</sup>	6 ± 0.33 <sup>d</sup>
9	Lalit	40.64 ± 0.47 <sup>ef</sup>	34.90 ± 0.23 <sup>h</sup>	6 ± 0.33 <sup>ef</sup>
10	Shweta	40.48 ± 1.14 <sup>ef</sup>	37.03 ± 0.31 <sup>g</sup>	6 ± 0.17 <sup>def</sup>
11	G.Bilas	41.93 ± 0.96 <sup>de</sup>	45.66 ± 0.43 <sup>b</sup>	8 ± 0.33 <sup>ab</sup>
12	Thailand	41.55 ± 0.48 <sup>e</sup>	39.35 ± 0.42 <sup>f</sup>	6 ± 0.33 <sup>ef</sup>
13	Pear Shaped	51.70 ± 0.74 <sup>a</sup>	37.50 ± 0.75 <sup>g</sup>	5 ± 0.33 <sup>f</sup>
	S.E. Mean	1.28	0.55	0.30
	LSD (p ≤ 0.05)	2.64	1.13	0.61

Means with the same letter are not significantly different (LSD, p ≤ 0.05). Each value represents treatment mean ± S.E. Mean (3 replications).

(147.06 mm). Leaf blade length in these varieties was statistically at par among each other. Minimum leaf blade length was observed in Lalit with value 101.89 mm followed by Thailand (107.56 mm). Leaf blade length in Allahabad Safeda (127.93 mm) was statistically at par with G.Bilas (128.97 mm). Likewise, in Pant Prabhat (132.16 mm) of blade length was also statistically at par with L-49 (134.71 mm).

#### Leaf blade width (mm)

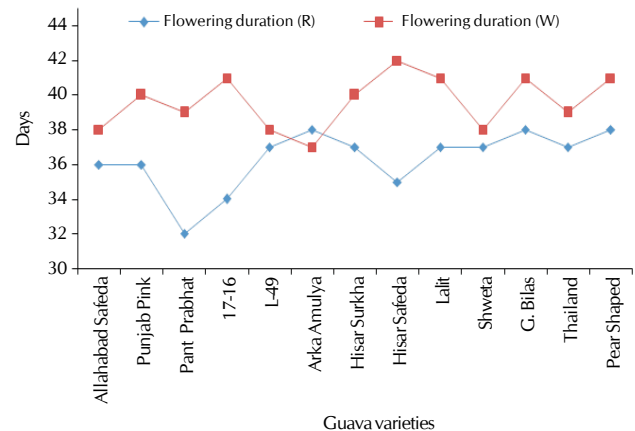
The maximum leaf blade width was recorded in the variety L-49 (65.54 mm) followed by the variety Punjab Pink (65.26 mm) and was statistically at par among each other (Table 3). The leaf blade width in Hisar Safeda (60.43 mm) variety was statistically at par with Pear Shaped (60.10 mm) and Pant Prabhat (63.23 mm). Arka Amulya (52.43 mm) variety was also statistically at par with Thailand (51.87 mm). The minimum leaf blade width (42.70 mm) was found in variety Shweta, which was significantly lower than all the varieties under study and it was followed by the varieties Lalit and 17-16 which recorded 47.82 mm and 49.70 mm leaf blade width, respectively.

#### Leaf length to width ratio

Length to width ratio of leaf blade was maximum (2.959) in 17-16 and it was significantly higher than all other varieties (Table 3). It was followed by Shweta, Pear Shaped, Punjab Pink and G. Bilas which recorded 2.666, 2.397, 2.320 and 2.297 leaf length to width ratio, respectively. Lower length to width ratio (2.024) was recorded in Hisar Safeda and it was followed by L-49 (2.056), Thailand (2.079) and Pant Prabhat (2.091) which was statistically at par among each other.

#### Petiole length (mm)

The maximum (8.60 mm) petiole length was recorded (Table 3) in variety Pant Prabhat followed by L-49 (7.38 mm), Punjab Pink (7.32 mm), Allahabad Safeda (6.76 mm) and these varieties had no significant difference among themselves. The shorter inter-node length along with minimum petiole length is responsible for dense foliage in guava variety. Shorter petiole length was recorded in Shweta (3.86 mm), Lalit (4.36 mm) and these varieties had no significant difference among each other but both were significantly different from other varieties. Arka



R - Rainy season; W - Winter season

**Figure 3: Comparison of flowering duration in different guava varieties for rainy and winter season crops**

Amulya (4.83 mm) and Hisar Safeda (4.88 mm) varieties were also statistically at par among each other, with respect to petiole length.

#### Leaf chlorophyll index

Leaf chlorophyll index ranged from 38.60 to 51.70. Maximum chlorophyll index (51.70) was found in variety Pear Shaped (Table 4) and it was significantly higher than all other varieties. It was followed by 17-16, Punjab Pink, Hisar Surkha and Pant Prabhat which recorded 47.92, 46.70, 45.43 and 44.32 leaf chlorophyll index, respectively. Minimum chlorophyll index was found in varieties Hisar Safeda 38.60 which was statistically at par with Arka Amulya (38.69), Allahabad Safeda (38.89), L-49 (40.08), Shweta (40.48) and Lalit (40.64).

#### Flower size and no. of fully developed petals

The data revealed that the maximum flower size (45.87 mm) for rainy season crop was recorded in L-49 and this was statistically at par with G.Bilas (44.81 mm) and Hisar Safeda (44.43 mm). Minimum value for the trait was observed to be 33.99 mm in variety Lalit. Data pertaining to flower size for winter season crop is given in Table 4 and it reveals maximum

flower size of 47.01 mm as recorded in L-49, followed by G. Bilas (45.66 mm) and Hisar Safeda (44.37 mm). Least average flower size of 34.90 mm was observed in variety Lalit, followed by Shweta (37.03 mm) and this was observed to be at par with Arka Amulya (37.23 mm) and Pear Shaped (37.50 mm). The number of fully developed petals ranged from a 5 petals as observed in Pear Shaped to maximum 8 petals as observed in L-49 and G. Bilas for rainy season crop and these varieties had no significant difference among them, but both were significantly different from other varieties. Most of the varieties showed 6 fully developed petals in flower for both seasons. Punjab Pink and Hisar Surkha (7 petals) were statistically at par among each other.

### Season of flowering

For rainy season crop, the date of appearance of flower bud was observed to start from 30 March during year 2014-15 (Fig. 1). The time of flower bud appearance was observed earliest in variety Lalit and Pear Shaped (30<sup>th</sup> March, each), followed by Punjab Pink, Arka Amulya, Shweta, G. Bilas and Thailand (1<sup>st</sup> April, each). While, varieties Allahabad Safeda (8<sup>th</sup> April) and Pant Prabhat (7<sup>th</sup> April) were found last to show flower bud. Dates regarding first sign of flower bud for winter season crop are illustrated in Fig. 2 and the data reveal that date of flower bud appearance ranged from 21<sup>st</sup> June to 25<sup>th</sup> June. Varieties 17-16, Hisar Safeda, Lalit, G. Bilas and Pear Shaped (21<sup>st</sup> June, each) were earliest to show the sign of flower bud. Whereas variety Punjab Pink (25<sup>th</sup> June) was observed to be late for producing flower buds. Not much significant difference for time of flower bud appearance was observed among different varieties for both the seasons during the year and it was also noted that time of flower bud appearance varied for particular variety during the year for summer as well as winter season. This variation may be attributed to environmental influence on this trait. The date of first flower opening during summer season varied from 13<sup>th</sup> April to 24<sup>th</sup> April. Varieties namely; Lalit and Pear Shaped (13<sup>th</sup> April) were earliest to open the flower and Pant Prabhat was last to open flower. For winter season crop, Punjab Pink was first to open flower on 5<sup>th</sup> July. Varieties Allahabad Safeda, 17-16, L-49, Hisar Safeda, and G. Bilas were last to show flower opening on 9<sup>th</sup> July. As observed earlier for first sign of flower bud, the date for first flower to open also showed low variation among different guava varieties. The end of flowering was observed on 20<sup>th</sup> May to 28<sup>th</sup> May for different guava varieties. Varieties viz; 17-16 and Lalit (20<sup>th</sup> May) were first to complete flowering duration. Whereas Allahabad Safeda (28<sup>th</sup> May) and Pant Prabhat (26<sup>th</sup> May) were last to end bloom among different guava varieties under investigation. Ending time of bloom varied from 14<sup>th</sup> August to 20<sup>th</sup> August for winter season crop. Punjab Pink and Arka Amulya (14<sup>th</sup> August) were earlier to end flowering, while, Hisar Safeda (20<sup>th</sup> August), G. Bilas (19<sup>th</sup> August) and 17-16 (19<sup>th</sup> August) were found to be late to complete end of flowering. The effect of micronutrients and GA<sub>3</sub> on flowering was observed by Gaur *et al.* (2014). According to Kaur (2004) during rainy season, the end of

flowering in different varieties of guava ranged from 29<sup>th</sup> of May to 9<sup>th</sup> of June. However, the variety Hisar Surkha was first to end flowering, whereas, Red Fleshed was at the last to end flowering.

### Flowering duration

Flowering duration for rainy season crop ranged from 32 to 38 days in year 2014 with varieties Arka Amulya, G. Bilas and Pear Shaped (38 days) having longer flowering duration (Fig. 3). Shorter flowering duration was observed in variety Pant Prabhat (32 days). In winter season crop, flowering duration ranged from 37 to 42 days. Varieties Hisar Safeda (42 days), 17-16 (41 days), Lalit (41 days), G. Bilas (41 days) and Pear Shaped (41 days) were found to bear flowers for longer duration. Shorter flowering duration of 37 days was observed in variety Arka Amulya. A little variation for flowering duration was observed between both the seasons. Ulemale *et al.* (2015) also recorded performance of nine guava genotypes to qualitative and yield attributes in RBD design with three replications of each genotypes. Therefore, it was noticed that existing agro-climate situation with genetic composition of being cultivars influence the result to meticulous agro-climatic circumstance.

### REFERENCES

- Anonymous, 2011.** Base SAS® 9.3 Utilities: S.A.S. Institute Inc., Cary, NC, USA. pp. 18-23.
- Deshmukh, N. A., Lyngdoh, P., Jha, A. K., Patel, R. K. and Deka, B. C. 2013.** Comparative study on newly developed guava hybrids with commercial cultivars under mid-hills of NE India. *The Bioscan*. **8(4)**: 1467-1470.
- Dubey, P. S., Hoda, M. N. and Singh, S. 2000.** Studies on growth behaviour of guava germplasm under Sabour conditions for rainy season fruiting. *Indian J. Horticulture*. **57**: 326-328.
- Gaur, B., Beer, K., Hada, T. S., Kanth, N. and Syamal, M. M. 2014.** Studies on the effect of foliar application of nutrients and GA<sub>3</sub> on fruit yield and quality of winter season guava. *The Ecoscan*. **4**: 479-483.
- Kaur, R. 2004.** Performance of different guava genotypes for flowering and fruiting M. Sc. thesis, Punjab Agricultural University, Ludhiana, India. pp. 26-28.
- Kumar, R. 1998.** Performance of guava under rainfed conditions of Bihar. *J. Hort. Science*. **27**: 145-148.
- Rodriguez, N. N. M., Fermin, G. A., Valdes-Infante, J., Velasquez, B., Rivero, D., Martinez, F., Rodriguez, J. and Rohde, W. 2010.** Illustrated descriptors for guava (*Psidium guajava* L.). *Acta Horticulture*. **849**: 103-110.
- Sehgal, O. P. and Singh, R. 1965.** The classification of some important varieties of guava (*Psidium guajava* L.) *Indian J. Horticulture*. **22**: 32-32.
- Sharma, A., Sehrawat, S. K. and Singhrot, R. S. 2010.** Morphological and chemical characterization of *Psidium* Species. *Bot. Hort. Agro. Bot.* **38**: 28-32.
- Singh, I. P. 2003.** Performance of different guava (*Psidium guajava* L.) cultivars under Tripura conditions. *Prog. Horticulture*. **35**: 55-58.
- Ulemale, P. H. and Tambe, T. B. 2015.** Performance of guava genotype to qualitative and yield attributes. *The Bioscan*. **10(2)**: 781-784.

