

Comparative performance of superior guava genotypes in Northern India: Flowering and fruit set

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ABSTRACT

An experiment was conducted to study the stigma receptivity, pollination, fruit set and fruit drop of guava cvs. Hisar Safeda, Hisar Surkha, Lucknow-49 and Allahabad Safeda during two flowering seasons *viz.*, spring (April-May) and autumn (August-September) for rainy and winter season crops respectively. Stigma became receptive just after anthesis and remained receptive till 48 h of pollination in all the cultivars. Fertilization took place after 12 h of pollination and reached its peak after 72 h of pollination in relation to removal of the style. Highest fruit set and minimum fruit drop was recorded in cultivar Lucknow-49 under natural (open) pollination followed by self-pollination by hand which was observed to have more fruit set as compared to other mode of pollination *viz.*, self-pollination by bagging and cross pollination.

Key words: Guava, flowering seasons, stigma receptivity, fruit set, fruit drop.

INTRODUCTION

Guava (*Psidium guajava* L.), a member of Myrtaceae family, is an important fruit crop of tropical and subtropical regions. It is native to tropical America, an area comprising from Mexico to Peru. Guava is the hardiest among tropical fruit trees and excels most other fruit crops in productivity and adaptability (Iqbal *et al.*, 4). It occupies a premier position by virtue of its high food value, rich in vitamin C content, pleasant aroma, rich flavour, and adaptability to varying soils conditions along with low cost of production (Kahlon *et al.*, 5). Guava is fifth most important fruit crop in production after banana, mango, citrus and papaya with a total production of 1.68 million tonnes. In northern India, guava flowers twice in a year (in April-May and August-September). In most of the commercial cultivars, presence of large number of hard seeds, wilt and fruit fly seems to be the major factors responsible for restricting its cultivation. Only a few attempts to improve its varietal wealth have been made for north Indian conditions (Dhaliwal and Singla, 1). Guavas importance can be further enhanced through the evolution of varieties possessing a combination of medium fruit size, attractive red flesh, excellent flavour and seedlessness. The need for improvement of this fruit crop is therefore, imperative and requires active consideration, hence critical evaluation of genotypes with regard to pollination and fruit set is must.

MATERIALS AND METHODS

The experiment was carried out at the Experimental Orchard of Department of Horticulture, CCS, Haryana

Agricultural University, Hisar. Observations were recorded on stigma receptivity, pollination, fruit set and fruit drop on four guava cultivars, *viz.* Hisar Surkha, Hisar Safeda, L-49 and Allahabad Safeda and analysis was worked out by Randomized Block Design with four replications and one tree as one experimental unit.

The receptivity of stigma, controlled pollination was made on emasculated flowers on five different time intervals. The buds were emasculated at appropriate stage of its development and pollinated with pollen grains collected from freshly opened flowers. The pollinated flowers were tagged and bagged immediately and the percentage of fruit set was taken as an indication of receptivity. The fruit set was recorded ten days after pollination. Fruit set in each case of pollination was recorded. The mode of pollination was observed by counting the fruit set after self-pollination on bagging, self-pollination by hand, natural or open pollination and cross-pollination. For each kind of pollination, 100 flowers buds were used and the 400 buds were selected starting 28th April to 10th May. For fruit set in all the four types of pollinations was recorded on 25th May for spring flowering season and from 10th to 21st September for autumn flowering season. The period from pollination to fertilization was also recorded. In a set of controlled cross-pollination flowers, the styles were removed completely after 6, 12, 18, 24, 48 and 72 h of pollination and fruit set was examined in the ovary of the same flower after 20 days of pollination. Observations on fruit set were recorded 30 days after the pollination and fruit drop at the time of maturity.

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Table 1. Fruit set (%) under different pollination modes in guava cultivars during spring and autumn flowering seasons.

Cultivar	Self-pollination by bagging			Self-pollination by hand			Natural pollination			Cross pollination		
	Spring	Autumn	Mean	Spring	Autumn	Mean	Spring	Autumn	Mean	Spring	Autumn	Mean
Hisar Safeda	20	15	17.50	76	78	77.00	82	80	81.00	22	36	29.00
Hisar Surkha	22	18	20.00	70	74	72.00	78	74	76.00	34	42	38.00
Lucknow-49	23	12	17.50	74	66	70.00	74	78	74.00	42	44	43.00
Allahabad Safeda	14	20	17.00	78	70	74.00	70	82	76.00	42	38	40.00
Mean	19.75	16.25		74.50	72.00		76.00	78.00		35.00	40.00	
CD at 5%	Cultivar = 8.45			9.51			10.01			12.02		
	Season = 5.82			7.96			6.33			7.60		
	S × C = 10.69			15.93			12.67			15.22		

RESULTS AND DISCUSSION

The receptivity of stigma started immediately after anthesis and continued up to 48 h after anthesis. The optimum time at which stigma became receptive was found just after anthesis to six hours after anthesis. It was also observed that Lucknow-49 exhibited higher stigma receptivity (85%), closely followed by Hisar Safeda (82.5%). Stigma receptivity was maximum at two hours after anthesis and thereafter it decreased in all the cultivars. Earlier, Dhaliwal and Singla (1) and Kahlon *et al.* (5) also reported that stigma was most receptive on the day of anthesis when Allahabad Safeda gave higher fruit set (83.9 and 86.5%) than L-49 (78.8 and 82.3%). There was a sharp decline in the fruit set even a day prior to anthesis or a day after anthesis.

Among the four types of pollination, fruit set were recorded after 10 to 15 days of pollination (Table 1). Maximum fruit set was recorded under natural pollination (open) in all the cultivars followed by self-pollination done by hand. In this study, natural pollination synchronized with the highest fruit set 74 to 81 per cent, which was remarkably higher than other mode of pollination. On the other hand, selfing by bagging yielded poor fruit set (12 to 23%). In self-pollination by hand mode of pollination, where, the fruit set ranged from 66-78 per cent was next best to natural pollination. In crossing, less fruit set (22-44%) was observed with respect to cultivars and seasons. These observations are in line with the findings of Kahlon *et al.* (5), Dutta and Banik (3) in Sardar guava and Iqbal *et al.* (4) in Red Flesh guava. The present findings are also suggestive of the fact that fruit set in these cultivars can be further improved through open-pollination by introducing honeybee colonies.

The observation were presented in Table 2 showed that fertilization started at 6 h after pollination in relation

to removal of styles and continued up to 72 h after pollination. None of the cultivars showed fruit set before 6 h and after 72 h of pollination. The optimum time for fertilization was found from 24 h after pollination to 72 h after pollination, with the peak period of fertilization from 48 h after pollination to 72 h after pollination in relation to removal of styles. There was no fruit set 6 h after pollination, indicating that fertilization had taken place till 72 h after pollination. It was also observed that fruit set was enhanced with progressing time interval, *i.e.* 6 h after pollination to 72 h after pollination in all the cultivars. These results are in line of Ray (8), and Singh (9) in guava.

Considerable difference was observed in percent fruit set and drop in the four cultivars during both the seasons (Table 3). The seasonal effect on percent fruit set and drop in all the cultivars was non-significant. Amongst different cultivars, maximum fruit set (65%) was observed in Lucknow-49, which was significantly higher as compared to other cultivars. The minimum fruit set (53%) and maximum fruit drop (47%) was observed in cv. Hisar Surkha that was significantly lower than the other cultivars. Interaction effect of season and cultivar was found non-significant, however, maximum fruit set was recorded during spring flowering season. Nagar and Rao (7), and Dubey *et al.* (2) observed the fruit set and retention were higher in the winter crop season as compared with other cropping season. In summer, the percentage of fruit set was found maximum in Apple Colour (80.8%), while during autumn it was highest in L-49 (74.4%) compared with 42.4 and 40.8 per cent, respectively in Seedless (Kundu and Mitra, 6).

REFERENCES

1. Dhaliwal, G.S. and Singla, Rachna. 2002. Studies on time of anthesis and dehiscence in different genotypes of guava in winter and rainy season crops. *Indian J. Hort.* **59**: 157-61.

Table 2. Duration for fertilization in guava cultivars during spring and autumn flowering seasons.

Cultivar	Time interval in relation to the removal of style																	
	6 h after pollination (per cent fruit set)		12 h after pollination (per cent fruit set)		18 h after pollination (per cent fruit set)		24 h after pollination (per cent fruit set)		48 h after pollination (per cent fruit set)		72 h after pollination (per cent fruit set)							
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn						
Hisar Safeda	20	-	20.00	28	25	26.50	52	40	46.00	68	64	66.00	76	72	74.00	88	80	84.00
Hisar Surkha	20	20	20.00	32	28	30.00	48	56	52.00	60	72	66.00	68	76	72.00	80	84	82.00
Lucknow-49	20	20	20.00	24	32	28.00	60	52	56.00	76	68	72.00	84	84	84.00	84	80	82.00
Allahabad Safeda	20	-	20.00	36	24	30.00	60	48	54.00	68	72	70.00	76	80	80.00	88	80	84.00
Mean	20.00	20.00	30.00	27.37	30.00	27.37	55.00	49.00	68.00	69.00	68.00	69.00	76.00	78.00	76.00	78.00	85.00	81.00
	Cultivar = NS		10.94	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	11.75	NS
	Season = NS		7.74	7.32	7.32	7.32	7.32	7.32	7.32	7.32	7.32	7.32	7.32	7.32	7.32	7.32	9.73	NS
	S x C = NS		16.90	15.99	15.99	15.99	15.99	15.99	15.99	15.99	15.99	15.99	15.99	15.99	15.99	15.99	21.24	NS

Table 3. Percentage of fruit set and fruit drop in guava cultivars during spring and autumn flowering seasons.

Cultivar	Fruit set (%)			Fruit drop (%)		
	Spring	Autumn	Mean	Spring	Autumn	Mean
Hisar Safeda	58	60	59	42	40	41
Hisar Surkha	54	52	53	46	48	47
Lucknow-49	66	64	65	34	36	35
Allahabad Safeda	62	58	60	38	42	40
Mean	60	58.5		40	41.5	
CD at 5%			Cultivar = 8.05			7.98
			Season = 5.07			5.09
			S × C = 11.34			10.40

2. Dubey, P.S., Hoda, M.N., Singh, J. and Singh, S.K. 2004. Flowering and fruiting of guava varieties during rainy season fruiting. *Orissa J. Hort.* **32**: 23-25.
3. Dutta, P. and Banik, A.K. 2007. Effect of foliar feeding of nutrients and plant growth regulators on physico-chemical quality of Sardar guava grown in West Bengal. *Acta Hort.* **335**: 407-11.
4. Iqbal, M., Khan, M.O., Jalal-ud-Din, Khalid Rehman and Munir, M. 2009. Effect of foliar application of NAA on fruit drop, yield and physico-chemical characteristics of guava (*Psidium guajava* L.) Red Flesh cultivar. *J. Agric. Res.*, **47**: 259-69.
5. Kahlon, P.S., Sharma, P.K. and Rambadi, J.L. 1987. Study of pollen grain and pollination behaviour of Allahabad Safeda and Sardar guava (*Psidium guajava* L.). *Haryana J. Hort. Sci.* **16**: 74-81.
6. Kundu, S. and Mitra, S.K. 1994. Studies on flowering and fruiting of some guava cultivars in the laterite tract of West Bengal. *Haryana J. Hort. Sci.* **23**: 213-18.
7. Nagar, P.K. and Rao, T.R. 1986. Early changes in growth regulator content of pollinated guava fruits. *Scientia Hort.* **29**: 139-46.
8. Ray, P.K. 2002. *Breeding Tropical and Sub-Tropical Fruits. Book.* Narorsa Publishing House, New Delhi.
9. Singh, S. 2002. Effect of season on the vegetative and reproductive attributes of guava cv. Chittidar. *Orissa J. Hort.* **30**: 76-79.

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