



# STUDIES ON FLOWERING AND FLORAL BIOLOGY OF FIVE MANGO (*MANGIFERA INDICA* LINN.) VARIETIES OF WEST BENGAL, INDIA

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## Abstract

Flowering and floral biology of five mango varieties (Golap Khas, Kisan Bhog, Rani Pasand, Safder Pasand and Sari Khas) were studied. Variety 'Golap Khas' produce panicles earliest (12 January) while the completion of panicle initiation was earliest in 'Rani Pasand'. The flowering duration varies between  $33.5 \pm 3.5$  days in 'Rani Pasand' and  $46.0 \pm 4.0$  days in 'Golap Khas'. The sex ratio (male: perfect) was recorded maximum in 'Rani Pasand' (4.37:1) and minimum in 'Safder Pasand' (2.37:1). In general, more than 40 per cent of total flower opening occurred in night between 6pm and 7am; during day anthesis of flower was recorded maximum between 8am and 10am while anther dehiscence was found maximum between 10am and 11am. The percentage of viable pollen varies between 86.36 percent in 'Rani Pasand' and 'Sari Khas' and 94.02 per cent in 'Safder Pasand' and the pollen germination was higher in 25 percent sucrose solution.

**Key words:** anthesis, dehiscence, pollen viability, flowering.

## Introduction

Mango is the most important fruit crop of West Bengal occupying about 97,930 hectares and producing nearly 836,070 MT of fruits during the year 2016-17. Many varieties are grown in the districts of Murshidabad, Malda, Hooghly, Nadia, Burdwan and 24- Parganas. It is believed that nearly 250 mango varieties are available in West Bengal. However, Fazli, Himsagar, Langra and Amrapally are the commercial varieties of the state. There are varieties like Golap Khas, Kisan Bhog, Rani Pasand, Safder Pasand, Sari Khas, Lakhman Bhog, Chandan Khosa, Piraphuli, Dilshad etc., which have good quality attributing characters like colour, aroma, fiber and pulp content, keeping quality, which deserved attention. Great variability exists with regard to many desirable characters among mango varieties grown in West Bengal. However, detailed information about the flowering habit and floral biology of this varieties are not available, which is important for improvement of this crop. The present investigation was undertaken to study the flowering and floral biology of five mango varieties of West Bengal.

## Materials and Methods

The study was conducted on 28 years old mango

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varieties Golap Khas, Kisan Bhog, Rani Pasand, Safder Pasand and Sari Khas growing at Horticultural Research Station, Mondouri, B.C.K.V. West Bengal. Ten panicles at random in each variety were tagged covering all the directions in a plant and there was 3 plants for each variety to study the floral biology. Observation on anthesis was recorded from 7 am to 6 pm at regular interval for a period of 7 days. Anther dehiscence was studied by marking 20 anthers at 8 am and was observed every hour upto 6 pm for 3 days. Data on percentage of viable pollen and size of pollen were recorded using acetocarmine as strainer and the percentage of germinability of pollen was recorded by culturing in different concentration (0, 5, 10, 15, 20, 25, 30 and 35 %) of sucrose solution at room temperature for 24 hours.

## Results and Discussion

The data presented in table 1 revealed that panicle emergence started between 12 January and 11 February in the five varieties studied. Panicle initiation was noted earliest (12 January) in Golap Khas followed by in Rani Pasand (17 January) and was last in Sari Khas (11 February). The panicle emergence period ended by 22 February in Rani Pasand which continued upto 3 March in Golap Khas. Singh, (1954) and Mallik, (1957) have

**Table 1:** Duration of panicle emergence and flowering in five mango varieties.

Variety	Date of emergence of first panicle	End of panicle initiation	Duration of panicle initiation (days)	First flower opening	End of flowering	Duration of flowering (days)	Colour of panicle	Colour of flower
Golap Khas	12 <sup>th</sup> Jan.	3 <sup>rd</sup> March	51±6	7 <sup>th</sup> Feb.	23 <sup>rd</sup> March	46±4	Light pink with light yellow laetrite	Light yellow
Kisan Bhog	2 <sup>nd</sup> Feb.	26 <sup>th</sup> Feb.	25±3	23 <sup>rd</sup> Feb.	13 <sup>th</sup> March	20.5±3.5	Light yellow	Light
Rani Pasand	17 <sup>th</sup> Jan.	22 <sup>nd</sup> Feb.	37±1	7 <sup>th</sup> Feb.	10 <sup>th</sup> March	33.5±3.5	Upper half redish, lower half greenish	creamy Light creamy
Safder Pasand	28 <sup>th</sup> Jan.	28 <sup>th</sup> Feb.	32.5±2.5	18 <sup>th</sup> Feb.	19 <sup>th</sup> March	31±0	Light green	Light creamy
Sari Khas	11 <sup>th</sup> Feb.	2 <sup>nd</sup> March	21±3	23 <sup>rd</sup> Feb.	15 <sup>th</sup> March	22±2	Light yellow	Light creamy

reported that emergence of panicles in mango started in January and continue till March. The duration of panicle initiation varies between 21.0±3.0 days in Sari Khas and 51.0±6.0 days in Golap Khas. Golap Khas takes exceptionally longer period to complete panicle initiation. This result is similar to the result reported by Singh, (1954). The first flower opening (7 February) was also noted earliest in Golap Khas and Rani Pasand, which was however, observed on 23 February in Kisan Bhog and Sari Khas. The flowering period ended earliest in Rani Pasand (10 March) compared to 23 March in Golap Khas. Duration of flowering was recorded maximum (46.0±4.00 days) in Golap Khas followed by in Rani Pasand (33.5±3.5 days) and it was only 20.5±3.5 days in Kisan Bhog. The days required from first panicle initiation to end of flowering was about 97 days in Golap Khas followed by 71 days and 64 days in Rani Pasand and Safder Pasand, respectively compared to 43 days in Sari Khas, which indicates that duration of panicle emergence and flowering depends on varieties. In the present experiment varieties which started panicle initiation and flowering earlier in the season takes maximum time to complete the panicle emergence and flowering cycle.

The colour of developing panicle varies among the

varieties. The colour was found light yellow in Kisan Bhog and Sari Khas, light green in Safder Pasand and in Golap Khas it was light pink with light yellow laterals. Panicle colour of Rani Pasand was some what different with upper half redish and lower half greenish in colour. Colour of floral disk was observed light yellow in Golap Khas while rest of the varieties under study have light creamy colour floral disk.

Number of male and perfect flowers per panicle were recorded highest (816.67 and 345.33, respectively) in Safder Pasand compared with 311.00 (male) and 112.00 (perfect) in Golap Khas. Average number of flowers per panicle varies between 323.00 and 1162.00 among the varieties studied. Sex ratio (male: perfect) of flowers was recorded only 2.37:1 in Safder Pasand with highest percentage (29.71) of perfect flowers followed by 2.54:1 sex ratio and 28.22 percent perfect flowers in Sari Khas compared to a sex ratio of 4.37:1 and 18.61 per cent perfect flowers in Rani Pasand. Size of mango flower among the five varieties studied varies between 3.83mm × 6.90mm (Rani Pasand) and 5.17mm × 7.50mm (Kisan Bhog). The longest flower of 5.17mm in length was recorded in Kisan Bhog while widest flower of 8.00mm was recorded in Sari Khas. Male flowers have one

**Table 2:** Flowering characters of different mango varieties.

Variety	No. of male flowers/panicle	No. of perfect flowers/panicle	Sex Ratio (male: perfect)	Percent of perfect flowers	Flower size		No. of stamens/flower	Remarks
					Length (mm)	Diameter (mm)		
Golap Khas	311.00	112.00	2.78	26.48	5.07	7.50	3.67	1 functional in most cases some time 2. 2-3 rudimentary.
Kisan Bhog	612.33	164.67	3.37	21.13	5.17	7.50	5.00	1 functional, 3-5 rudimentary
Rani Pasand	752.00	172.33	4.37	18.61	3.83	6.90	4.67	1 functional, 2-4 rudimentary
Safder Pasand	816.67	345.33	2.37	29.71	4.62	6.94	4.50	1 functional and 1-4 rudimentary
Sari Khas	552.00	217.33	2.54	28.22	4.83	8.00	4.00	Generally 1 functional some have 3 functional, 2-4 rudimentary (rare 1).

**Table 3:** Percentage of floral anthesis at different time in different varieties.

Variety	Before 7 am	7-8 am	8-10 am	10-12 am	12-2 pm	2-4 pm	4-6 pm
Golap Khas	57.63	3.39	18.64	8.47	6.78	1.69	3.38
Kisan Bhog	43.13	7.84	17.65	19.60	3.92	5.88	1.96
Rani Pasand	47.36	10.53	14.03	14.03	8.77	3.51	1.75
Safder Pasand	47.22	5.56	19.44	16.67	8.33	-	2.78
Sari Khas	42.42	9.04	18.18	12.12	15.15	3.03	-

**Table 4:** Anther dehiscence in different varieties (20 marked at 8 am).

Variety	9-10 am	10-11 am	11-12 am	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm
Golap Khas	3	7	3	1	2	1	2	1	-
Kisan Bhog	6	6	2	3	1	2	-	-	-
Rani Pasand	3	5	4	3	2	1	-	-	1
Safder Pasand	4	6	3	2	2	-	1	-	-
Sari Khas	7	5	3	-	2	-	1	1	-

**Table 5:** Pollen viability and pollen size.

Variety	Percent viable pollen in acetocarmine test	Size of pollen (In acetocarmine)	
		Length ( $\mu$ )	Diameter ( $\mu$ )
Golap Khas	88.24	35.78	34.67
Kisan Bhog	91.18	38.20	34.40
Rani Pasand	86.36	38.42	37.00
Safder Pasand	94.02	38.4	38.00
Sari Khas	86.36	35.67	33.44

**Table 6:** Pollen germination percentage in different varieties.

Variety	Germination per cent in different concentration of sucrose solution (%)							
	0	5	10	15	20	25	30	35
Golap Khas	2.04	4.29	7.94	9.68	17.91	24.53	4.69	2.00
Kisan Bhog	0.00	2.56	10.26	10.91	22.64	20.45	5.88	4.35
Rani Pasand	1.33	6.02	11.32	16.28	22.45	22.78	8.69	4.30
Safder Pasand	0.91	5.00	8.25	13.75	18.18	30.77	6.67	5.45
Sari Khas	0.00	10.81	15.38	21.74	28.54	33.33	18.18	13.04

functional stamen in general, but some time two in varieties Golap Khas and three in Sari Khas were also noted. Number of staminods (rudimentary stamen) was recorded 1-4 in Safder Pasand, 2-3 in Golap Khas, 2-4 in Rani Pasand and Sari Khas and 3-5 in Kisan Bhog.

Anthesis of flower continue through out the night and day. In general more than 40 percent of total anthesis occurred in night between 6 pm and 7am depending on varieties. It was recorded more than 50 percent in Golap Khas. Similar observation have been reported by Randhawa and Damodaran, (1961). During day maximum anthesis was recorded between 8 and 10 am followed by 10 and 12 am. Sen *et al.*, (1946) reported maximum opening of flowers in mango between 9 and 10 am. Anther dehiscence continue throughout the day with a peak between 10 and 11am in most of the varieties and it was between 9 and 10am in Sari Khas. This results are similar

to the observations made by Mukherjee, (1951) and Mallik, (1957).

Pollen viability in acetocarmine test was recorded maximum (94.02%) in Safder Pasand followed by 91.18 percent in Kisan Bhog compared with 86.36 percent in Rani Pasand and Sari Khas. Randhawa and Damodaran, (1961) obtained 94.3 percent pollen germination in cv. Chausa. The size of pollen in acetocarmine was recorded largest  $38.40\mu \times 38.00\mu$  in Safder Pasand followed by  $38.42\mu \times 37.00\mu$  in Rani Pasand and was only  $35.67\mu \times 33.44\mu$  in Sari Khas (Table 5).

Pollen germinability was recorded in different concentration of sucrose solution. Maximum pollen germination was found in 25 percent sucrose solution in most of the varieties under study followed by in 20 percent sucrose solution. Among the varieties, Sari Khas showed maximum pollen germination (33.33%) in 25 percent sucrose solution followed by 30.77 percent in Safder Pasand which was recorded maximum in Kisan Bhog (22.64%) at 20 percent sucrose solution. The over all germination of pollen was found very low in artificial media in comparison to percentage of viable pollen. Randhawa and Damodaran, (1961) reported maximum 28.2 percent pollen germination in cv. Chausa. However, Spencer and Kennard, (1955) obtained as high as 66.3 to 91.8 percent pollen germination in 20 percent sucrose solution.

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