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## INFLUENCE OF LOCAL MANGO POLLINIZER VARIETIES ON FRUIT PARAMETERS

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### ABSTRACT

An investigation was conducted at Fruit Research Station, Sakkarbaug, Junagadh Agricultural University, Junagadh, during the years 2021-22 and 2022-23. The experiment was laid out in Randomized Block Design (RBD) with comprising ten treatments with three replications. Result revealed that maximum fruit weight (288.67, 341.67 and 315.17 g) was noted in Kesar × Rajapuri (T<sub>4</sub>) whereas, minimum (130.00, 130.33 and 130.17 g) was reported in Kesar × Dudhpendo (T<sub>6</sub>) in both the years as well as in pooled, respectively. The maximum fruit diameter (7.10 cm) was noted in Kesar × Kesar (T<sub>1</sub>) and minimum (4.36 cm) was noted in Kesar × Jamadar (T<sub>3</sub>) during the year 2021-22. It was found non-significant for year 2022-23 and in pooled, respectively. The maximum fruit length (12.03 cm) was recorded in Kesar × Dashehari (T<sub>9</sub>), whereas minimum (8.14 cm) was noted in Kesar × Dudhpendo (T<sub>6</sub>) during the year 2021-22. During the year 2022-23, maximum fruit length (12.20 cm) was reported in Kesar × Dudhpendo (T<sub>6</sub>) whereas, minimum (8.86 cm) was noted in Kesar × Amrutang (T<sub>2</sub>) and found non-significant for pooled. The minimum stone weight (23.40 g) was observed in Kesar × Jamadar (T<sub>3</sub>) during the year 2021-22 and (29.17 g) was noted in Kesar × Khodi (T<sub>7</sub>) in pooled, while found non-significant in the year 2022-23. However, maximum (40.67 and 43.92 g) was reported in Kesar × Rajapuri (T<sub>4</sub>) and Kesar × Dashehari (T<sub>9</sub>) during the year 2021-22 and in Kesar × Dashehari (T<sub>9</sub>) during pooled, respectively. The minimum stone width (3.19 and 3.39 cm) was recorded in Kesar × Amrutang (T<sub>2</sub>) and maximum (4.61 and 4.46 cm) was reported in Kesar × Dudhpendo (T<sub>6</sub>) during the year 2022-23 and in pooled, respectively; whereas, found non-significant for 2021-22 year. The minimum stone length (7.33 cm) was noted in Kesar × Jamadar (T<sub>3</sub>) during the year 2021-22 and (7.10 and 7.39 cm) was recorded in Kesar × Khodi (T<sub>7</sub>) during the year 2022-23 and in pooled, respectively. However, maximum (10.40, 11.15 and 10.77 cm) was noted in Kesar × Dudhpendo (T<sub>6</sub>) in both the years as well as in pooled, respectively.

**Key words :** Mango, Kesar, Pollinizer, Fruit parameters.

### Introduction

Existence of post-zygotic sporophytic self-incompatibility in mango needs to compatible pollen for increased production. It is known fact that pollen parent have strong impact on physical and biochemical quality of fruits as reported in some fruit crops like date, aonla and custard apple.

Pollinizers can improve the pollination-fertilization mechanism which leads to increased production owing to larger and better shaped and quality fruit. It can also enhance the number of fruit per tree ultimately increased yield. All male plants producing pollen cannot be

considered as a good pollinizer. In hybridization program, the success of hybrids fruits depends upon the male flowers used in pollination because female parents behave differently with different male parents. Therefore, it is necessary to select a pollen donor variety that must be compatible to commercial variety which plays a key role in boosting fruit yield by significantly enhancing the fruit set and good harvest. There is no report so far available on Kesar as female parent for further improvement of desirable characters to use in further breeding program through to study the effect of different pollen donors. The aim of the study was to find the compatibility behavior of the cultivars which will be helpful

for the breeders in deciding the parental combinations where hybridization can be achieved successfully.

### Materials and Methods

An investigation was conducted at Fruit Research Station, Sakkarbaug, College of Horticulture, Junagadh Agricultural University, Junagadh during the year 2021-22 and 2022-23. The experiment was laid out in Randomized Block Design (RBD) with comprising ten treatments with three replications. The traditional method involving the continued hand pollination of flowers on a panicle over several days when the flowers were open.

In selfing treatment, selection of healthy panicles at lower branches of cv. Kesar as female parent. These panicles were bagged with muslin cloth bags to prevent unwanted cross pollination by insects or wind by foreign pollen. Selection of hermaphrodite flowers which open on preceding evening anthesis were emasculated and kept for pollination. All other flowers, male flowers and unopened buds were removed. After that panicles were bagged carefully. On the next day, for self-pollination, opened flowers were collected from panicles of same tree or different tree in the morning before dehiscence of their anthers in separate petri dishes. They were kept in sunlight for dehiscence of anthers. As soon as they dehisced, they were taken for pollination. The bags from panicles of female parent were removed. Pollination was done by brushing the dehisced anthers of the flowers on the stigma of female parent. After pollination, panicles were rebagged immediately. The bags were removed after fruit set. Emasculatation and pollination were performed continuously until majority of flowers in panicle were pollinated.

In case of bad weather re-pollination was also done. In case of cross pollination, opened flowers were collected from panicles of different pollen parent in the morning before dehiscence of their anthers in separate petri dishes.

In open pollination treatment of parent varieties, five healthy panicles per tree were tagged in four different direction of the tree before anthesis of the flowers were allowed for natural pollination by action of pollinators such as insects or wind.

Selected plants were maintained under uniform cultural practices such as application of manure and fertilizers, irrigation and plant protection was followed as per recommendation.

Weight of freshly harvested fruits were measured through electrical weighing balance and expressed in gram.

Maximum linear distance between two shoulders of the fruit was considered as fruit diameter which was measured with the help of vernier calliper in millimetres and then converted into centimetre of freshly harvested fruits.

Length of freshly harvested fruits from stalk base to the apex of fruit was measured with the help of vernier calliper in millimetres and then converted into centimetre.

Weight of stone was measured through electrical weighing balance after extraction of stone from ripened fruits and expressed in gram.

Length of stone was measured with the help of vernier calliper in millimetres and then converted into centimetre after extraction of stone from ripened fruits.

Width of stone was measured with the help of vernier calliper in millimetres and then converted into centimetre after extraction of stone from ripened fruits.

Various characters under study were statistically analysed by using analysis of variance technique for Randomized Block Design (RBD) as described by Panse and Sukhatme (1985). All characters were studied for significance by "F" test. Standard error of mean (SEM $\pm$ ) and critical differences (CD) were worked out at 5% level of significance. The statistical analysis was carried out in Computer Cell in Department of Agricultural Statistics, College of Agriculture, Junagadh Agricultural University, Junagadh.

### Results and Discussion

#### Fruit weight (g)

Significantly maximum fruit weight (288.67, 341.67 and 315.17 g) was noted in Kesar  $\times$  Rajapuri ( $T_4$ ) during both the years as well as in pooled, respectively; it was found at par with Kesar  $\times$  Vanraj ( $T_5$ ) and Kesar  $\times$  Dashehari ( $T_9$ ) during the year 2021-22; Kesar  $\times$  Kesar ( $T_1$ ) during the year 2022-23; also with Kesar  $\times$  Kesar ( $T_1$ ), Kesar  $\times$  Vanraj ( $T_5$ ) and Kesar  $\times$  Dashehari ( $T_9$ ) in pooled, respectively. Whereas, minimum fruit weight (130.00, 130.33 and 130.17 g) was reported in Kesar  $\times$  Dudhpendo ( $T_6$ ) in both the years as well as in pooled analysis, respectively (Table 1). These might be due to that metaxenia effect of compatible pollen source being Rajapuri as big sized variety which increase the weight of fruit. The similar kind of findings were recorded by Singh *et al.* (2001) in aonla; Muhtaseb and Ghnaim (2006) in datepalm; Jalikop and Kumar (2007) in Annona; Rymbai *et al.* (2015) in mango; Javid *et al.* (2017) in apple; Singh *et al.* (2017) in guava; Sarkar and Sarkar (2022) in guava.

**Table 1** : Effect of cross compatibility on fruit weight (g) and fruit diameter (cm).

Treatments	Cross combinations	Fruit weight (g)			Fruit diameter (cm)		
		2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
T <sub>1</sub>	Kesar × Kesar	224.00	287.33	255.67	7.10	7.19	7.15
T <sub>2</sub>	Kesar × Amrutang	185.00	184.83	184.92	6.81	6.37	6.59
T <sub>3</sub>	Kesar × Jamadar	198.33	277.50	237.92	4.36	6.34	5.35
T <sub>4</sub>	Kesar × Rajapuri	288.67	341.67	315.17	6.93	7.33	7.13
T <sub>5</sub>	Kesar × Vanraj	279.83	230.30	255.07	6.83	6.58	6.71
T <sub>6</sub>	Kesar × Dudhpendo	130.00	130.33	130.17	6.55	7.04	6.80
T <sub>7</sub>	Kesar × Khodi	194.33	196.67	195.50	6.22	6.67	6.45
T <sub>8</sub>	Kesar × Sonpari	245.67	234.62	240.14	7.04	6.70	6.87
T <sub>9</sub>	Kesar × Dashehari	272.00	266.00	269.00	6.96	6.87	6.91
T <sub>10</sub>	Kesar (OP)-Control	165.33	252.00	208.67	7.04	7.07	7.05
S.Em. ±		9.08	18.62	22.64	0.24	0.28	0.35
C.D. at 5 %		26.96	55.32	72.44	0.73	NS	NS
C.V. %		7.20	13.43	11.07	6.42	7.00	6.73
<b>Year</b>							
S.Em. ±		–	–	4.63	–	–	0.08
C.D. at 5 %		–	–	13.28	–	–	NS
<b>Y × T</b>							
S.Em. ±		–	–	14.65	–	–	0.26
C.D. at 5 %		–	–	42.01	–	–	0.75

### Fruit diameter (cm)

Maximum fruit diameter (7.10 cm) was noted in Kesar × Kesar (T<sub>1</sub>), it was found at par with all other treatments except Kesar × Khodi (T<sub>7</sub>); however, minimum fruit diameter (4.36 cm) was noted in Kesar × Jamadar (T<sub>3</sub>) during the year 2021-22. It was found non-significant for year 2022-23 and in pooled (Table 1). These might be due to that efficiently used food materials from one panicle one fruit would developed which reduce the competition of food reservoir rather than bunch bearing habit. More fruit from one panicle reduce the fruit size. Also attributed to metaxenia effect of pollen parent. Similar results were demonstrated by Singh *et al.* (2001) in aonla; Rymbai *et al.* (2015) in mango; Javid *et al.* (2017) in apple; Patel *et al.* (2011) and Singh *et al.* (2017) in guava; Sarkar and Sarkar (2022) in guava.

### Fruit length (cm)

Maximum fruit length (12.03 cm) was recorded in Kesar × Dashehari (T<sub>9</sub>) it was found at par with Kesar × Jamadar (T<sub>3</sub>), Kesar × Rajapuri (T<sub>4</sub>) and Kesar × Sonpari (T<sub>8</sub>); whereas, minimum fruit length (8.14 cm) was noted in Kesar × Dudhpendo (T<sub>6</sub>) during the year 2021-22. During the year 2022-23, maximum fruit length (12.20 cm) was reported in Kesar × Dudhpendo (T<sub>6</sub>), it was found at par with Kesar × Kesar (T<sub>1</sub>), Kesar × Jamadar (T<sub>3</sub>), Kesar × Rajapuri (T<sub>4</sub>) and Kesar × Dashehari (T<sub>9</sub>);

whereas, minimum fruit length (8.86 cm) was noted in Kesar × Amrutang (T<sub>2</sub>). The result found non-significant for pooled analysis (Table 2). These might be due to that efficiently used food materials from one panicle one fruit would developed, which reduce the competition of food reservoir rather than bunch bearing habit. More fruit from one panicle reduce the fruit size. Also attributed to metaxenia effect of pollen parent. The similar kind of findings were recorded by Rymbai *et al.* (2015) in mango; Brijwal *et al.* (2016) in litchi; Javid *et al.* (2017) in apple; Singh *et al.* (2017) in guava; Sarkar and Sarkar (2022) in guava.

### Stone weight (g)

Minimum stone weight (23.40 g) was observed in Kesar × Jamadar (T<sub>3</sub>) during the year 2021-22 and it was found at par with Kesar × Khodi (T<sub>7</sub>). It was found non-significant in the year 2022-23. For pooled analysis, minimum stone weight (29.17 g) was noted in Kesar × Khodi (T<sub>7</sub>), it was found at par with Kesar × Amrutang (T<sub>2</sub>) and Kesar × Jamadar (T<sub>3</sub>). However, maximum stone weight (40.67 and 43.92 g) was reported in Kesar × Rajapuri (T<sub>4</sub>) and Kesar × Dashehari (T<sub>9</sub>) during the year 2021-22 and in Kesar × Dashehari (T<sub>9</sub>) during pooled, respectively (Table 2). This might attributed to metaxenia effect of pollen parent.

**Table 2 :** Effect of cross compatibility on fruit length (cm) and stone weight (g).

Treatments	Cross combinations	Fruit length (cm)			Stone weight (g)		
		2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
T <sub>1</sub>	Kesar × Kesar	10.32	11.03	10.67	37.00	38.94	37.97
T <sub>2</sub>	Kesar × Amrutang	8.18	8.86	8.52	35.33	32.00	33.67
T <sub>3</sub>	Kesar × Jamadar	10.66	11.15	10.91	23.40	36.50	29.95
T <sub>4</sub>	Kesar × Rajapuri	12.00	11.42	11.71	40.67	38.33	39.50
T <sub>5</sub>	Kesar × Vanraj	8.28	10.25	9.26	35.00	36.75	35.88
T <sub>6</sub>	Kesar × Dudhpendo	8.14	12.20	10.17	39.00	40.00	39.50
T <sub>7</sub>	Kesar × Khodi	10.02	9.63	9.83	30.00	28.33	29.17
T <sub>8</sub>	Kesar × Sonpari	11.96	9.93	10.94	38.33	37.58	37.96
T <sub>9</sub>	Kesar × Dashehari	12.03	11.64	11.83	40.67	47.17	43.92
T <sub>10</sub>	Kesar (OP)-Control	10.59	10.56	10.58	38.67	42.00	40.33
S.Em. ±		0.48	0.50	0.82	2.55	3.62	2.21
C.D. at 5 %		1.42	1.47	NS	7.57	NS	6.35
C.V. %		8.09	8.06	8.08	12.32	16.63	14.75
<b>Year</b>							
S.Em. ±		–	–	0.15	–	–	0.99
C.D. at 5 %		–	–	0.44	–	–	NS
<b>Y × T</b>							
S.Em. ±		–	–	0.49	–	–	3.13
C.D. at 5 %		–	–	1.40	–	–	NS

**Table 3 :** Effect of cross compatibility on stone length (cm) and stone width (cm).

Treatments	Cross combinations	Stone length (cm)			Stone width (cm)		
		2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
T <sub>1</sub>	Kesar × Kesar	9.49	9.05	9.27	3.94	3.88	3.91
T <sub>2</sub>	Kesar × Amrutang	7.49	7.34	7.42	3.58	3.19	3.39
T <sub>3</sub>	Kesar × Jamadar	7.33	7.81	7.57	3.44	3.80	3.62
T <sub>4</sub>	Kesar × Rajapuri	8.81	9.54	9.18	3.44	3.48	3.46
T <sub>5</sub>	Kesar × Vanraj	7.85	9.24	8.55	4.57	3.67	4.12
T <sub>6</sub>	Kesar × Dudhpendo	10.40	11.15	10.77	4.31	4.61	4.46
T <sub>7</sub>	Kesar × Khodi	7.68	7.10	7.39	3.50	3.53	3.51
T <sub>8</sub>	Kesar × Sonpari	8.95	8.32	8.64	3.87	3.81	3.84
T <sub>9</sub>	Kesar × Dashehari	9.44	9.80	9.62	4.06	3.94	4.00
T <sub>10</sub>	Kesar (OP)-Control	7.70	8.10	7.90	3.94	3.74	3.84
S.Em. ±		0.30	0.49	0.29	0.25	0.18	0.15
C.D. at 5 %		0.90	1.45	0.82	NS	0.53	0.44
C.V. %		6.15	9.67	8.15	11.24	8.17	9.87
<b>Year</b>							
S.Em. ±		–	–	0.13	–	–	0.07
C.D. at 5 %		–	–	NS	–	–	NS
<b>Y × T</b>							
S.Em. ±		–	–	0.41	–	–	0.22
C.D. at 5 %		–	–	NS	–	–	NS

**Stone length (cm)**

The data revealed that significantly minimum stone length (7.33 cm) was noted in Kesar × Jamadar (T<sub>3</sub>), it

was found at par with Kesar × Amrutang (T<sub>2</sub>), Kesar × Vanraj (T<sub>5</sub>), Kesar × Khodi (T<sub>7</sub>) and Kesar (OP)-Control (T<sub>10</sub>) during the year 2021-22; whereas also minimum

(7.10 and 7.39 cm) was recorded in Kesar × Khodi (T<sub>7</sub>) during the year 2022-23 and in pooled, respectively; it was found at par with Kesar × Amrutang (T<sub>2</sub>), Kesar × Jamadar (T<sub>3</sub>), Kesar × Sonpari (T<sub>8</sub>) and Kesar (OP)-Control (T<sub>10</sub>) during the year 2022-23; also with Kesar × Amrutang (T<sub>2</sub>), Kesar × Jamadar (T<sub>3</sub>) and Kesar (OP)-Control (T<sub>10</sub>) in pooled data. However, maximum stone length (10.40, 11.15 and 10.77 cm) was noted in Kesar × Dudhpendo (T<sub>6</sub>) in both the years and in pooled, respectively (Table 3). Female parent behave differently with different male parent attributed to metaxenia effect.

#### Stone width (cm)

The data showed that minimum stone width (3.19 and 3.39 cm) was recorded in Kesar × Amrutang (T<sub>2</sub>), it was found at par with Kesar × Rajapuri (T<sub>4</sub>), Kesar × Vanraj (T<sub>5</sub>) and Kesar × Khodi (T<sub>7</sub>) during the year 2022-23; also with Kesar × Jamadar (T<sub>3</sub>), Kesar × Rajapuri (T<sub>4</sub>) and Kesar × Khodi (T<sub>7</sub>) in pooled, respectively. Whereas, maximum stone width (4.61 and 4.46 cm) was reported in Kesar × Dudhpendo (T<sub>6</sub>) during the year 2022-23 and in pooled, respectively. The data revealed that it was found non-significant for 2021-22 year (Table 3). This might attributed to metaxenia effect of pollen parent.

#### Conclusion

In case of cross combinations, all varieties found cross compatible; in fruit and stone characters are changed with pollen parent indicated that metaxenial effect of parent.

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