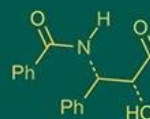


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Impact of pollen varieties on quality parameters in mango

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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 eight treatments with three replications. Result revealed that maximum pulp to stone ratio (8.06 and 6.76) was noted in Vanraj (P₄) during the year 2021-22 and in pooled, respectively. During the year 2022-23, maximum ratio (7.17) was recorded in Rajapuri (P₃). Minimum ratio (1.63, 1.63 and 1.63) was noticed in Khodi (P₆) during in both the years as well as in pooled, respectively. Significantly the highest TSS (22.8 °Brix) was reported in Khodi (P₆) and the lowest TSS (14.18 °Brix) was noted in Jamadar (P₂) during the year 2021-22. During the year 2022-23, the highest TSS (18.90 °B) was recorded in Sonpari (P₇), while the lowest TSS (14.03 °B) was observed in Vanraj (P₄). It was found non-significant for pooled data. The lowest acidity (0.21%) was noted in Dudhpendo (P₅) and Dashehari (P₈) during the year 2021-22. During the year 2022-23, lowest acidity (0.23%) was recorded in Amrutang (P₁). However, the highest acidity (0.53 and 0.40%) was observed in Sonpari (P₇) during both the years, respectively. It was found non-significant for pooled analysis. Effect of pollen varieties on total sugar, reducing and non-reducing was observed non-significant for both the years as well as for pooled analysis. The maximum shelf life (14.00 and 14.67 days) was reported in Rajapuri (P₃) and Jamadar (P₂) during the year 2021-22 and 2022-23, respectively, it was followed by Dudhpendo (P₅) (12.50) in the year 2022-23. Whereas, minimum shelf life (5.00 and 8.33 days) was reported in Dudhpendo (P₅) and Dashehari (P₈) during the year 2021-22 and 2022-23, respectively. It was found non-significant for pooled data.

Keywords: Mango, pollen varieties and quality

1. Introduction

Existence of post-zygotic sporophytic self-incompatibility in mango needs to compatible pollen for increased production. It is known fact that pollen varieties have strong impact on physical and biochemical quality of fruits as reported in some fruit crops like date, annona fruits and aonla. 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. Using compatible pollen source is one of the most efficient and environmentally friendly agricultural practices to improve the yield and fruit quality of self-incompatible varieties. The aim of the study was to find the behavior of the cultivars which will be helpful for the breeders in deciding the parental combinations where hybridization can be achieved successfully.

2. Material 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 eight treatments with three replications.

In pollen 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.

Pulp and stone weight was measured through electrical weighing balance from ripened fruits after extraction of stone and pulp. The pulp: stone ratio was calculated with the help of following formula.

$$\text{Pulp: stone ratio} = \frac{\text{Pulp weight (g)}}{\text{Stone weight (g)}}$$

TSS of the pulp was determined through digital hand refractometer. By putting a drop of pulp on the prism the readings were recorded for each sample and recorded value was expressed in degree brix (⁰Brix).

For acidity measurement, 0.5 g of pulp was taken in volumetric flask and volume was made up with distilled water to 10 ml and titrated against 0.1 N NaOH by using 2 drops of phenolphthalein as an indicator. At the end, appearance of yellow to pink colour and reading of burette was noted. Acidity was calculated by using following formula and expressed in percentage.

$$\text{Acidity (\%)} = \frac{\text{Reading} \times \text{Normality of NaOH} \times \text{Eq. wt. of acid}}{\text{Wt. of sample (0.5 g)} \times 1000} \times 100$$

Total sugar was determined by following procedure:

Sample of 0.1 g was crushed in 10 ml of 80% methanol. Then 0.1 ml aliquot was taken and added 0.9 ml distilled water to make final volume of 1.0 ml. 1.0 ml of phenol 5% and 5.0 ml of 96% H₂SO₄ were added one by one. Then all samples were put in ice bath for 10-15 minutes. Spectrophotometer reading was taken at 490 nm wavelength (Rangana, 1986). Total sugar was calculated by using following formula and expressed in percentage.

$$\text{Total sugar (\%)} = \frac{\text{Graph value (mg)} \times \text{Total volume (10 ml)}}{\text{Aliquot used (0.1 ml)} \times \text{Wt. of sample (100 mg)} \times 1000}$$

Reducing sugar was determined by following procedure:

Sample of 0.1 g was crushed with 10 ml of 80% methanol. Then 0.1 ml aliquot was taken and added 0.9 ml distilled water to make final volume of 1.0 ml. 3.0 ml of dinitrosalicylic acid was added. Then all samples were put in water bath for 10-15 minutes. Spectrophotometer reading was taken at 565 nm wavelength. Reducing sugar was calculated by using following formula and expressed in percentage.

$$\text{Reducing sugar (\%)} = \frac{\text{Graph value (mg)} \times \text{Total volume (10 ml)}}{\text{Aliquot used (0.1 ml)} \times \text{Wt. of sample (100 mg)} \times 1000}$$

Non-reducing sugar was calculated by subtracting reducing sugar from total sugars.

The shelf life of fruits was recorded under room temperature as the days required from harvesting to optimum eating stage and expressed in days.

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) [2]. All characters were studied for significance by "F" test. Standard error of mean (SEm.±) 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.

3. Results and Discussion

3.1 Pulp to stone ratio

The data revealed that maximum pulp to stone ratio (8.06 and 6.76) was noted in Vanraj (P₄) during the year 2021-22 and in pooled, respectively; which was at par with all other treatments except Dudhpendo (P₅) in pooled. During the year 2022-23, maximum pulp to stone ratio (7.17) was recorded in Rajapuri (P₃). Minimum pulp to stone ratio (1.63, 1.63 and 1.63) was noticed in Khodi (P₆) during in both the years as well as in pooled, respectively (Table 1). This variation might attributed due to genetic make-up of varieties. Lower ratio attributed to its smaller fruit size. The results of the present study was in accordance with previous studies reported by Patel *et al.* (2017) [4] in mango.

3.2 Total soluble solids (TSS) (⁰Brix)

The data reflected that significantly the highest TSS (22.8 ⁰Brix) was reported in Khodi (P₆) it was at par with Amrutang (P₁) and the lowest TSS (14.18 ⁰Brix) was noted in Jamadar (P₂) during the year 2021-22. During the year 2022-23, the highest TSS (18.90 ⁰Brix) was recorded in Sonpari (P₇) it was at par with Amrutang (P₁), Jamadar (P₂), Dudhpendo (P₅) and Khodi (P₆); while, the lowest TSS (14.03 ⁰Brix) was observed in Vanraj (P₄). It was found non-significant for pooled data (Table 1). This variation might attributed due to genetic make-up of varieties also affected by plant nutrition and prevailing climatic conditions during harvesting. These finding fall in the range reported by several workers in mango (Rymbai *et al.* 2015; Bora *et al.* 2017; Patel *et al.* 2017; Patel *et al.* 2022; Senjaliya *et al.* 2022 and Tandel *et al.* 2023) [6, 1, 4, 3, 7, 8].

3.3 Acidity (%)

The lowest acidity (0.21%) was noted in Dudhpendo (P₅) and Dashehari (P₈) which was found at par with Amrutang (P₁) and Jamadar (P₂) during the year 2021-22. During the year 2022-23, lowest acidity (0.23%) was recorded in Amrutang (P₁) which was at par with Jamadar (P₂). However, the highest acidity (0.53 and 0.40%) was observed in Sonpari (P₇) during both the years, respectively. It was found non-significant for pooled analysis (Table 1). This might highly depends upon the varieties and prevailed micro climatic conditions. These finding fall in the range reported by several workers in mango (Rymbai *et al.* 2015; Bora *et al.* 2017; Patel *et al.* 2017; Patel *et al.* 2022 and Senjaliya *et al.* 2022) [6, 1, 4, 3, 7].

3.4 Total sugar (%)

Effect of pollen varieties on total sugar was observed non-significant for both the years as well as for pooled analysis (Table 2).

3.5 Reducing sugar (%)

Effect of pollen varieties on reducing sugar was observed non-significant for both the years as well as pooled analysis (Table 2).

3.6 Non-reducing sugar (%)

Effect of pollen varieties on non-reducing sugar was observed non-significant for both the years as well as pooled analysis (Table 2).

3.7 Shelf life (Days)

The data revealed that maximum shelf life (14.00 and 14.67 days) was reported in Rajapuri (P₃) and Jamadar (P₂) during

the year 2021-22 and 2022-23, respectively, it was followed by Dudhpendo (P₅) (12.50) in the year 2022-23. Whereas, minimum shelf life (5.00 and 8.33 days) was reported in Dudhpendo (P₅) and Dashehari (P₈) during the year 2021-22 and 2022-23, respectively. It was found non-significant for

pooled data (Table 3). This might highly depends upon the varietal characters and prevailed micro climatic conditions. The results of the present study was in accordance with previous studies reported by Patel *et al.* (2017)^[4] in mango.

Table 1: Impact of pollen varieties on pulp to stone ratio, total soluble solids (TSS) and acidity (%)

Treatments	Varieties	Pulp to stone ratio			Total soluble solids (TSS) (°Brix)			Acidity (%)		
		2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
P ₁	Amrutang	5.65	6.03	5.84	19.17	17.15	18.16	0.24	0.23	0.23
P ₂	Jamadar	4.28	4.17	4.23	14.18	17.23	15.71	0.24	0.24	0.24
P ₃	Rajapuri	4.17	7.17	5.67	14.93	15.27	15.10	0.27	0.35	0.31
P ₄	Vanraj	8.06	5.45	6.76	15.63	14.03	14.83	0.40	0.35	0.37
P ₅	Dudhpendo	4.06	2.99	3.52	15.73	18.70	17.22	0.21	0.39	0.30
P ₆	Khodi	1.63	1.63	1.63	22.08	18.06	20.07	0.45	0.36	0.41
P ₇	Sonpari	5.04	4.85	4.95	16.13	18.90	17.52	0.53	0.40	0.47
P ₈	Dashehari	4.41	4.77	4.59	17.22	15.56	16.39	0.21	0.35	0.28
S.E.m.±		0.32	0.34	0.79	1.03	0.75	1.36	0.02	0.02	0.05
C.D. at 5%		0.97	1.03	2.63	3.13	2.27	NS	0.05	0.06	NS
C.V. %		11.92	12.64	12.28	10.58	7.68	9.25	9.61	10.26	9.95
Year										
S.E.m.±		—	—	0.12	—	—	0.32	—	—	0.01
C.D. at 5%		—	—	NS	—	—	NS	—	—	NS
Y × T										
S.E.m.±		—	—	0.33	—	—	0.90	—	—	0.02
C.D. at 5%		—	—	0.95	—	—	2.61	—	—	0.05

Table 2: Impact of pollen varieties on total sugar (%), reducing sugar (%) and non-reducing sugar (%)

Treatments	Varieties	Total sugar (%)			Reducing sugar (%)			Non-reducing sugar (%)		
		2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
P ₁	Amrutang	17.75	15.30	16.52	3.07	3.82	3.44	11.44	11.47	11.46
P ₂	Jamadar	13.73	14.85	14.29	3.44	4.03	3.73	10.93	10.83	10.88
P ₃	Rajapuri	14.79	15.70	15.25	4.82	3.78	4.30	10.73	11.92	11.32
P ₄	Vanraj	16.54	15.68	16.11	3.96	4.28	4.12	11.45	11.73	11.59
P ₅	Dudhpendo	13.28	15.67	14.48	4.61	4.14	4.38	11.85	11.53	11.69
P ₆	Khodi	16.87	15.68	16.28	3.97	4.69	4.33	11.68	10.99	11.33
P ₇	Sonpari	14.66	15.85	15.26	3.94	3.68	3.81	10.85	12.09	11.47
P ₈	Dashehari	16.50	15.43	15.96	4.23	4.67	4.45	11.55	11.16	11.36
S.E.m.±		1.05	0.52	0.59	0.31	0.28	0.32	0.44	0.42	0.31
C.D. at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %		11.76	5.79	9.27	13.27	11.62	12.45	6.74	6.41	6.58
Year										
S.E.m.±		—	—	0.29	—	—	0.10	—	—	0.16
C.D. at 5%		—	—	NS	—	—	NS	—	—	0.47
Y × T										
S.E.m.±		—	—	0.83	—	—	0.29	—	—	0.46
C.D. at 5%		—	—	NS	—	—	NS	—	—	1.34

Table 3: Impact of pollen varieties on shelf life (Days)

Treatments	Varieties	Shelf life (Days)		
		2021-22	2022-23	Pooled
P ₁	Amrutang	9.50	10.00	9.75
P ₂	Jamadar	10.00	14.67	12.33
P ₃	Rajapuri	14.00	10.00	12.00
P ₄	Vanraj	7.00	10.50	8.75
P ₅	Dudhpendo	5.00	12.50	8.75
P ₆	Khodi	8.00	9.17	8.58
P ₇	Sonpari	9.00	9.00	9.00
P ₈	Dashehari	7.67	8.33	8.00
S.E.m.±		0.54	0.41	1.73
C.D. at 5%		1.65	1.24	NS
C.V. %		10.73	6.71	8.62
Year				
S.E.m.±		—	—	0.17
C.D. at 5%		—	—	0.49
Y × T				
S.E.m.±		—	—	0.48
C.D. at 5%		—	—	1.39

4. Conclusion

Among quality parameters, highest TSS was reported in Khodi and Sonpari, whereas, lowest acidity was noted in Dudhpendo and Dashehari. Rajapuri and Jamadar gave maximum days for shelf life.

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