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Evaluation of Sucking Purpose Seedling Origin Mango Genotypes from South Gujarat

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ABSTRACT

A survey was carried out for sucking type seedling mango genotypes in five districts (Navsari, Valsad, Tapi, Surat & Dang) of South Gujarat region during year of 2021 to 2023. Trunk circumference ranged from 39 to 285 cm, plant spread from 1.85 to 24.51 m, leaf length from 19.33 to 33.64 cm, leaf width from 5.26 to 10.15 cm, petiole length from 2.60 to 6.16 cm, number of fruit per tree from 35 to 453, yield from 6.17 to 178 kg/tree, fruit weight from 90.49 to 500.67 g, fruit length from 6.42 to 13.82 cm, fruit width from 5.33 to 10.27 cm, pulp from 49.14 to 73.91%, peel from 10.74 to 35.50%, stone from 12.05 to 28.84%, pulp/stone ratio from 0.45 to 2.54, TSS from 11.9 to 26.3 °Brix, acidity from 0.06 to 1.25%, ascorbic acid from 10.56 to 52.59 mg/100 g, total sugars from 7.61 to 20.76 %, reducing sugars from 2.22 to 13.66%, non-reducing sugars from 0.88 to 16.59%, TSS/acid ratio from 13.76 to 279.98. Six superior genotypes, namely NMS-18, NMS-30, NMS-48, NMS-50, NMS-132, and NMS-149 were identified on the basis of desirable characteristics that was fruit weight (>150 g), pulp percentage (>60.00 %), peel percentage (<20.00 %), stone percentage (<20.00 %) and TSS (>17 °Brix).

Keywords Mango, Sucking type, Selection, Variability, Characterization.

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INTRODUCTION

Mango (*Mangifera indica* L.) has been considered as "king of fruits" in tropical world due to its excellent flavor, beautiful color, attractive fragrance and delicious taste. It is excellent source of vitamin A and phenolic compounds along with volatile organic compound (VOCs) found in luscious fruits which are significant to human health and are used as medicines (Tandel *et al.* 2023a). India is the largest mango producer and share of 56% in total global mango production. Gujarat has in 5th position in area (1.63 lakh ha) and 6th position in production (9.97 lakh tonne) of mango in India (Anon 2021). South Gujarat region has occupied maximum area (0.99 lakh ha) and had maximum production (5.05 lakh MT) of mango in state of Gujarat (DOH 2022). Mango has been documented to have a wide range of phenotypic variations due to alloploidy, outbreeding, repeated grafting, and phenotypic differences in agroclimatic conditions in different mango growing regions (Ravishankar *et al.* 2000). India has world's largest mango germplasm, where more than thousand varieties or wild types are cultivated. Majority of these have been selected as superior chance seedling arisen from open cross pollination. Due to long history of cultivation in country, mangoes are also known for sucking qualities. They possess ideal physico-chemical attributes like oblong shape, unrupturable skin, thin and abundant juice, scanty fibers, small stone, superior TSS/acid blend and flavor (Singh and Sharma 2005). Presence of genetic diversity within mango offers various opportunities to utilize genomic resources and technologies to manipulate desirable traits (Bora *et al.* 2017). India is the center of origin for mango and numerous seedlings of known and unknown varieties are available in the farmer's fields and many of them are of importance locally as they are being maintained particularly for special purposes. Assessment of genetic variation within natural populations and among breeding lines is crucial for effective conservation and exploitation of genetic resources for crop improvement programs, Hence, mango growing South Gujarat region were surveyed for the exploitation of variability in the local germplasm and carried out physico-chemical characterization of sucking types seedling mango genotypes.

MATERIALS AND METHODS

A survey was carried out for sucking types seedling genotypes of mango from five districts (Navsari, Valsad, Tapi, Surat & Dang) South Gujarat region of Gujarat state, India, during 2021-22 and 2022-23. The experiment site was situated in South Gujarat at between latitude of 21.1995 °N and longitude of 73. 2765 °E, with altitudes varying from 100 to 1000 m. Climatic condition of southern Gujarat is hot summers ranging from 25°C to 35°C and mild winters ranging from 10°C to 15.5°C and total rainfall of 1651.4 mm per year. The soil in this region is often fine to medium texture (clay to loam clay) and deep black in color. Total 24 sucking types seedlings strain were identified from the farmer's field/backyard/roadside and further physico-chemical characterization of tree, leaf, fruit and quality parameters. The age of tree ranged from 15 to 60 year old. The sucking types seedling stain were given the name Navsari Mango Selection (NMS). Experimental analysis was done in Completely Randomized Design (CRD) with three replications for fruit and quality parameters with in single tree while tree and leaf characters subjected to descriptive statistics. For fruit and biochemical parameters fifteen fruit sample was taken from three direction of single individual seedling tree. Data were subjected to analysis of variance (ANOVA) at p values < 0.05 were considered as significant by using OPSTAT for all quantitative traits (Sheoran *et al.* 1998).

Trunk circumference, plant spared (E-W and N-S) was measured with measuring tape. The trunk circumference was measured at 50 cm height from ground level. Leaf length, width, petiole length was measure by measuring scale of mature leaf. Fruit weight, stone weight and peel weight recorded by using digital balance while, length and width of fruit measured with vernier calipers. All genotypes were categorized based on five commercially important characteristics such as fruit weight (>150 g), pulp percentage (>60.00 %), peel percentage (<20.00 %), stone percentage (<20.00 %) and TSS (>17 °Brix). The total soluble solids (TSS) were determined with a hand refractometer. Acidity was determined by titrating the sample extracted in water against 0.1N NaOH using phenolphthalein as indicator (Ranganna 1986). The ascorbic acid concentration was measured using the dye method described by Ranganna (1986). The titrimetric approach of Lane and Eynon (1923), described by Ranganna (1986) was used to determine reducing sugars. The filtrate collected from the reducing sugar estimation was utilized to calculate total sugar. Non-reducing sugars have been calculated by subtracting reducing sugars from total sugars and multiplying the result by 0.95, as suggested by Ranganna (1986).

RESULTS AND DISCUSSION

Tree and leaf characteristics

The higher variation was observed in tree, leaf and yield characteristics of sucking types seedling mango strain (Table 1). The trunk circumference was recorded maximum in NMS- 6 (285 cm) and minimum in NMS-28 (39 cm) with the mean value of 139.50 cm. The plant spread was maximum in NMS-3 (24.51 m) and minimum in NMS-28 (1.85 cm) with mean value of 10.61 m among the 24 mango strain. Vari-

Table 1. Variability in tree, leaf and yield parameters of sucking types mango genotypes

Genotypes	Age of tree	Trunk circumference (cm)	Plant spread (m)	Leaf length (cm)	Leaf width (cm)	Petiole length (cm)	Number of fruits/ tree	Yield (kg/tree)
NMS-3	50-55	282.60	24.51	20.63	5.26	3.50	169	68.33
NMS-6	50-55	285.00	17.88	25.62	6.90	3.50	276	85.67
NMS-7	20	139.50	8.85	21.83	6.11	3.20	190	65.67
NMS-8	25	165.40	11.85	25.20	6.70	5.36	200	31.60
NMS-14	10-12	68.10	6.35	30.50	6.70	4.34	203	46.33
NMS-16	30	191.00	12.29	22.52	6.90	3.37	180	70.67
NMS-17	15-20	106.00	7.65	22.80	6.75	3.77	104	19.00
NMS-18	40-45	207.40	17.81	33.28	5.80	6.16	330	122.00
NMS-24	10-12	103.20	9.60	22.43	7.83	4.43	120	41.87
NMS-27	28	142.00	10.64	24.33	6.42	3.06	201	59.67
NMS-28	7-8	39.00	1.85	19.33	6.83	2.60	35	6.17
NMS-30	20-25	151.00	9.95	24.47	6.50	2.97	246	66.67
NMS-32	20	130.50	8.33	25.20	6.94	3.55	65	27.67
NMS-41	25-28	158.50	12.23	22.26	6.03	4.20	396	178.00
NMS-44	22-25	142.70	13.00	24.66	6.56	3.06	136	88.60
NMS-48	22-25	180.00	9.80	27.11	6.14	2.63	218	106.00
NMS-50	15-18	84.23	7.37	21.22	5.52	3.12	156	46.00
NMS-55	15-20	120.00	9.25	28.74	7.41	4.35	294	66.33
NMS-116	12-15	85.42	5.51	33.64	10.15	5.23	96	45.77
NMS-128	12-15	87.40	6.86	26.71	6.13	5.43	453	107.33
NMS-132	10-12	50.30	5.07	23.53	6.45	5.02	201	45.40
NMS-140	20-25	132.80	15.86	25.82	6.27	4.32	277	75.33
NMS-141	20-25	171.60	13.03	22.32	5.63	4.61	342	88.33
NMS-149	20	124.30	9.10	23.53	5.50	2.60	247	75.33
Minimum	-	**39.00**	**1.85**	**19.33**	**5.26**	**2.60**	**35**	**6.17**
Maximum	-	**285.00**	**24.51**	**33.64**	**10.15**	**6.16**	**453**	**178.00**
Mean ± SEm		**139.50 ± 12.61**	**10.61 ± 0.99**	**24.90 ± 0.75**	**6.56 ± 0.20**	**3.93 ± 0.20**	**213.96 ± 20.82**	**68.07 ± 7.51**
SD	**-**	**61.78**	**4.86**	**3.66**	**0.98**	**1.00**	**102.02**	**36.81**

ation in trunk girth also reported by Selvan *et al.* (2010) and Indian *et al.* (2020) and in plant spared by Joshi *et al.* (2013) and Rai *et al.* (2023) in different mango germplasm. Leaf length and leaf width was observed maximum in NMS-116 (33.64 cm and 10.15 cm, respectively) and minimum leaf length in NMS-28 (19.33 cm), leaf width in NMS-3 (5.26 cm) while maximum petiole length was in NMS-18 (6.16 cm) and minimum in NMS-28 (2.60 cm).The mean value of leaf length was 24.90 cm, leaf width was 6.56 cm and petiole length was 3.93 cm among 24 mango strain. Similar results for leaf length, width and petiole length also reported by Bhamini *et al.* (2018), Indian *et al*. (2020), Kumar *et al.* (2020), Khadivi *et al.* (2022) and Muniyappan et al. (2023) in mango genotypes. The number of fruits per tree was recorded maximum in NMS-128 (453) and yield in NMS-41 (178 kg/tree) while minimum in NMS-28 (35 and 6.17 kg/tree, respectively). The mean value of number of fruits per tree was 213.96 and yield was 68.07 across 24 mango strain. Differences in number of fruits per tree and yield was in agreement with Barhate *et al.* (2012) and Kundu *et al.* (2013). The variation in different tree, leaf and yield parameters in mango due to prevailing climatic condition of the region along with the genetic make up (Muniyappan *et al.* 2023, Rai *et al*. 2023).

Fruit characteristics

There was significant variation was observed among fruit characteristics (Table 2). The maximum fruit weight (500.67 g), fruit length (13.82 cm), fruit width

Table 2. Variability in fruit parameters of sucking types mango genotypes.

Genotypes	Fruit weight (g)	Fruit length (cm)	Fruit width (cm)	Pulp %	Peel %	Stone %	Pulp/stone ratio
NMS-3	213.69	10.15	6.65	54.43	23.39	15.08	1.68
NMS-6	193.55	9.01	6.84	60.41	24.50	14.09	1.74
NMS-7	231.05	9.03	7.40	54.73	28.39	16.04	1.77
NMS-8	90.49	6.42	5.33	63.92	10.74	23.71	0.45
NMS-14	160.23	9.32	5.77	52.7	16.98	28.84	0.59
NMS-16	160.23	9.32	5.77	58.42	24.69	15.98	1.55
NMS-17	264.26	9.70	7.43	52.39	22.70	23.83	0.95
NMS-18	340.23	9.24	9.03	73.46	13.64	12.05	1.13
NMS-24	223.77	9.49	7.33	60.42	16.56	21.96	0.75
NMS-27	181.47	12.14	6.15	50.53	27.34	28.82	1.31
NMS-28	94.07	7.20	5.39	51.88	18.75	28.04	0.67
NMS-30	281.37	11.17	7.46	65.44	18.80	15.04	1.25
NMS-32	212.18	9.57	6.42	61.43	17.37	20.19	0.86
NMS-41	405.06	13.39	8.59	72.84	14.13	12.08	1.17
NMS-44	500.67	13.82	10.27	73.91	13.17	12.38	1.06
NMS-48	375.43	11.98	8.86	69.64	16.88	12.40	1.36
NMS-50	165.80	8.41	6.32	60.91	19.70	18.03	1.09
NMS-55	167.50	8.74	5.87	60.85	16.53	21.77	0.76
NMS-116	386.57	10.92	7.14	63.7	16.89	18.22	0.93
NMS-128	199.77	9.26	7.27	53.21	21.79	23.83	0.91
NMS-132	172.30	10.71	5.91	63.16	17.79	17.87	1.00
NMS-140	206.90	8.79	7.69	49.14	35.50	13.98	2.54
NMS-141	232.20	9.30	7.00	59.07	16.15	23.35	0.69
NMS-149	244.89	9.94	7.11	71.01	13.74	13.84	0.99
Minimum	**90.49**	**6.42**	**5.33**	**49.14**	**10.74**	**12.05**	**0.45**
Maximum	**500.67**	**13.82**	**10.27**	**73.91**	**35.50**	**28.84**	**2.54**
Mean ± SEm	**270.66 ± 9.55**	**9.89 ± 0.14**	**7.07 ± 0.12**	**60.12 ±0.33**	**19.50 ± 0.39**	**18.47 ± 0.20**	**1.13 ± 0.03**
CD at 5%	**27.24**	**0.38**	**0.33**	**0.94**	**1.12**	**0.58**	**0.08**
CV %	**6.87**	**2.37**	**2.83**	**0.93**	**3.47**	**1.89**	**4.49**

(10.27 cm) and pulp per cent (73.91 %) in genotype NMS-44, peel per cent (35.50 %) and pulp/stone ratio (2.54) in NMS-140, stone per cent (28.84 %) in NMS-14. Minimum fruit weight (90.49 g), fruit length (6.42 cm), fruit width (5.33 cm), peel per cent (10.24 %) and pulp/stone ratio (0.45) in NMS-8, pulp per cent (49.14 %) in NMS-28 and stone per cent (12.05 %) in NMS-18. Significant variation was observed by Tandel *et al.* (2023b) for different mango cultivars for fruit weight, length, pulp per cent, peel weight and stone weight in South Gujarat condition. The similar results for variation in different fruit characteristics was reported by Rymbai *et al.* (2015), Kabir *et al.* (2017), Bhoyar and Kumar (2020), Mahesh *et al*. (2022a). This variation in fruit physiological characteristics of mango might be due to different agro-climatic interaction, genetic composition and genotypes under study (Singh and Sharma 2005, Bakshi *et al.* 2013, Tripathi *et al.* 2019)

Quality characteristics

Quality parameters also showed significant variation among different sucking genotypes (Table 3). The TSS was range from 11.9 °Brix (NMS-44) to 26.3 °Brix (NMS-50), acidity from 0.06 % (NMS-132) to 1.25% (NMS-48), total sugars from 7.61% (NMS-44) to 20.76% (NMS-14), reducing sugars from 2.22% (NMS-27) to 13.66% (NMS-30), non-reducing sugars from 0.88% (NMS-30) to 16.59 % (NMS-14), TSS/acid ratio from 13.76 (NMS-27) to 279.98 (NMS-132). The minimum ascorbic acid (10.56 mg/100 g) was recorded in genotype NMS-32 which was statistically at par with NMS-149, NMS-27, NMS-30, NMS-55, NMS-14, NMS-7, NMS-3, NMS-132 and NMS-24. The variation in quality parameter due to variation in soil and climatic conditions and different genotype of mango or varietal characters (Kaur *et al.*

Table 3. Variability in quality parameters of sucking types mango genotypes.

Genotypes	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100 g)	Total sugars (%)	Reducing sugars (%)	Non reducing sugars (g)	TSS/ acid ratio
NMS-3	15.5	0.33	12.45	11.87	3.02	8.41	47.29
NMS-6	16.9	0.19	25.45	11.26	4.24	6.67	86.95
NMS-7	16.3	0.20	12.32	13.67	3.85	9.33	83.18
NMS-8	19.7	0.13	31.97	18.45	6.13	11.70	156.44
NMS-14	21.0	0.19	12.11	20.76	3.33	16.56	108.44
NMS-16	16.4	0.28	52.59	10.64	7.12	3.34	63.80
NMS-17	19.2	0.19	15.48	16.50	3.16	12.67	98.65
NMS-18	21.8	0.19	22.81	19.10	4.32	14.04	112.99
NMS-24	12.7	0.32	14.14	12.67	3.25	8.95	42.05
NMS-27	16.6	1.24	11.19	8.58	2.22	6.04	13.76
NMS-28	14.6	0.13	41.69	14.52	3.30	10.66	116.93
NMS-30	21.6	0.57	11.20	14.59	13.66	0.88	37.68
NMS-32	14.9	0.45	10.56	10.27	2.86	7.04	33.18
NMS-41	13.3	0.13	21.16	7.87	5.86	1.91	105.57
NMS-44	11.9	0.13	21.33	7.61	5.24	2.25	94.93
NMS-48	19.8	1.25	17.44	14.41	5.85	8.13	15.86
NMS-50	26.3	0.31	31.95	18.97	4.61	13.64	115.42
NMS-55	15.7	0.07	11.50	13.34	3.47	9.38	236.37
NMS-116	16.2	0.35	26.08	10.42	3.34	6.73	46.09
NMS-128	17.8	0.32	33.05	12.57	6.24	6.01	55.70
NMS-132	18.0	0.06	12.95	11.57	4.16	7.04	279.98
NMS-140	14.9	0.51	42.14	12.62	2.42	9.69	29.12
NMS-141	18.7	0.13	22.14	16.69	5.63	10.51	95.88
NMS-149	**17.4**	**0.26**	**10.85**	**12.72**	**4.24**	**8.05**	**67.50**
Minimum	**11.9**	**0.06**	**10.56**	**7.61**	**2.22**	**0.88**	**13.76**
Maximum	**26.3**	**1.25**	**52.59**	**20.76**	**13.66**	**16.56**	**279.98**
Mean ± SEm	**17.4 ± 0.49**	**0.33 ± 0.03**	**21.86 ± 1.68**	**13.40 ± 0.17**	**4.65 ± 0.15**	**8.32 ± 0.16**	**89.32 ±11.33**
CD at 5%	**1.40**	**0.10**	**4.78**	**0.49**	**0.44**	**0.46**	**32.31**
CV %	**4.90**	**18.29**	**13.30**	**2.25**	**5.74**	**3.33**	**21.97**

2014, Bora *et al.* 2017, Muniyappan *et al.* 2023). The present finding in agreement with Singh *et al.* (2012), Rymbai *et al.* (2015), Kabir *et al.* (2017), Sampath *et al.* (2017), Mahesh *et al.* (2022b) and Tandel *et al.* (2023b) who reported variation in quality parameters of different mango germplasm.

Table 4. Sucking type seedling mango genotypes identified for different fruit characteristics.

Fruit characters	Genotypes	Total number and percentage of genotype (n=24)
1. Fruit weight (>150 g)	NMS-3, NMS-6, NMS-7, NMS-14, NMS-16, NMS-17, NMS-18, NMS-24, NMS-27, NMS-30, NMS-32, NMS-41, NMS-44, NMS-48, NMS-50, NMS-55, NMS-116, NMS-128, NMS-132, NMS-140, NMS-141, NMS-149	22 (91.66 %)
2. Pulp content (>60 %)	NMS-6, NMS-8, NMS-18, NMS-24, NMS-30, NMS-32, NMS-41, NMS-44, NMS-48, NMS-50, NMS-55, NMS-116, NMS-132, NMS-149	14 (58.33 %)
3. Peel content (<20 %)	NMS-8, NMS-14, NMS-18, NMS-24, NMS-28, NMS-30, NMS-32, NMS-41, NMS-44, NMS-48, NMS-50, NMS-55, NMS-116, NMS-132, NMS-141, NMS-149	16 (66.66 %)
3. Stone content (<20 %)	NMS-3, NMS-6, NMS-7, NMS-16, NMS-18, NMS-30, NMS-41, NMS-44, NMS-48, NMS-50, NMS-116, NMS-132, NMS-140, NMS-149	
3. TSS (>17 ° Brix)	NMS-8, NMS-14, NMS-17, NMS-18, NMS-30, NMS-48, NMS-50, NMS-128, NMS-132, NMS-141, NMS-149	11 (45.83 %)

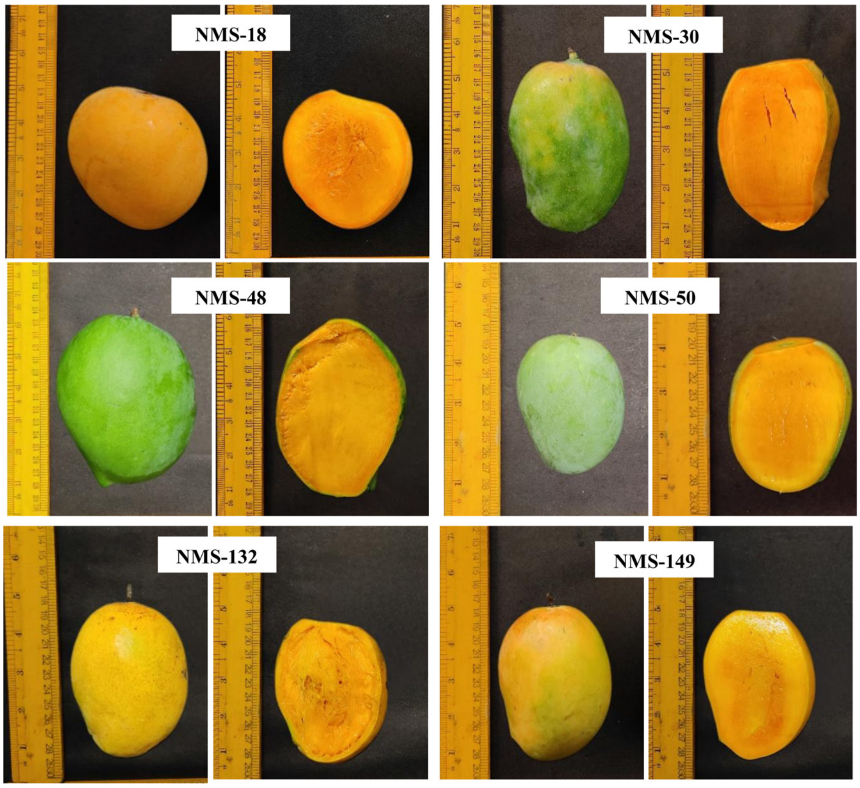

Fig. 1. Mature fruits of sucking type seedling mango strain.

Identification of superior genotype

The twenty-four sucking type mango genotypes were characterized on the basis of five commercially important characteristics: Fruit weight (>150 g), pulp percentage (>60.00 %), peel percentage (<20.00 %), stone percentage (<20.00 %) and TSS (>17 °Brix). The five genotypes that possessed all five desired characteristics were NMS-18, NMS-30, NMS-48, NMS-50, NMS-132, and NMS-149 (Table 4 and Fig. 1).

CONCLUSION

In the present study revealed that considerable variation was reported among 24 sucking types of seedling mango genotypes from South Gujarat region. Genotype NMS-18, NMS-30, NMS-48, NMS-50, NMS-132, and NMS-149 had five important desirable characters, this can be exploited for selection of elite genotypes or particular desirable characters of genotypes might be used in future after evaluating their performance at large scale for crop improvement program.

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