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Morphological characterization of newly evolved mango hybrids

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ABSTRACT

An investigation was carried out to study the morphological characters of namely evolved mango hybrids at IARI, New Delhi. Hybrids of cross Amrapali x Sensation produced large to medium sized tree, while hybrids of Amrapali x Lal Sundri cross produced dwarf statured trees. Early flowering was noticed in Amrapali x Sensation hybrids and the maximum flowering during was observed in H-13-1. Sex ratio was intermediate in all the hybrids compared to their parents. Hybrids H-13-1 recorded the maximum yield in comparison to other hybrids.

Key words: Mango, hybrids, characterization.

INTRODUCTION

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae it is a predominant fruit crop of India and considered as the 'King of the fruits'. India has the richest wealth of mango germplasm (nearly 1,000 varieties) and it is the 'National fruit of India Mukherjee (5). As mentioned above, there are hundreds of mango cultivars, of which only 25 to 40 varieties are of commercial importance (Chadha and Pal, 1). Almost all the commercially grown cultivars have been identified on the basis of leaf, panicle, fruit and stone characters. However, these characters may change with environmental conditions (Lakshminarayana, 4). Moreover, most of the existing Indian commercial mango varieties are the selections as superior chance seedlings. Most of the varieties have undesirable characters like vigorous tree growth, biennial bearing habit, malformation, spongy tissue, susceptibility to different abiotic and biotic stresses etc. Therefore, to overcome the above mentioned problems, attempts were made from time to time at different research organizations to evolve superior varieties or hybrids using conventional breeding methods.

MATERIALS AND METHODS

Sixteen mango new hybrids and three parents were included in the study. The hybrids are under field evaluation for their future possible release. Whereas, one hybrid (H-13-1) has been released as Pusa Arunima during February, 2002 by IARI, New Delhi. These are grouped in two categories based on their parentage (Table 1).

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Table 1. Newly evolved mango hybrids and parents used for the study.

Parent	Hybrids	No. of hybrids
Amrapali x Sensation	H-1-1, H-1-4, H-1-6, H-1-9, H-3-5, H-3-7, H-4-1, H-4-2, H-13-1, H-13-7 and H-13-8	11
Amrapali x Lal Sundari	H-2-1, H-2-2, H-2-3, H-2-6 and H-2-11	5
	Total	16

Field evaluation was carried out with 16 hybrids alongwith three parents (Amrapali, Sensation and Lal Sundari), which were used for the hybridization programme. All the hybrids and parents are of nine to ten-year-old except the hybrids like H-13-1, H-13-7 and H-13-8, which were of over twenty-year-old. All the quality morphological parameters were recorded as per standard procedure. The experiment was laid out in the Randomized Block Design (RBD).

RESULTS AND DISCUSSION

The maximum plant height (10.26 m) was recorded in H-13-7, which was closely followed by H-13-1. Hybrid H-2-2 gave the minimum plant height (2.36 m). (H-13-1) recorded the maximum trunk girth (106.75 cm), while minimum trunk girth was recorded in H-2-3 (24.20 cm). The maximum east-west spread (6.70 m) and north-south plant spread (6.43m) recorded in H-13-1. The maximum tree volume (217.13 cm^3) was recorded in H-13-1, which was significantly higher than other hybrids. This was mainly due to the major genotypic effect of male parent,

sensation on the hybrids. The maximum leaf area was found in H-4-1 (164.8 cm^2). Whereas as H-13-8 (82.4 cm^2) had minimum leaf aria (Table 2). The maximum bearing shoot length was recorded in hybrid H-2-2 (146.7 cm), which was closely followed by H-1-6 (143.3 cm). The hybrids namely, H-1-1, H-1-4, H-1-6 and H-1-9 flowered in between February 11 to 17, which were rated as 2. Whereas, hybrids H-2-1, H-2-2, H-2-3, H-2-6 and H-2-11 flowered after March, 03 and were considered late flowering (Table 1). The maximum flowering duration was recorded in H-13-1 (20.5 days), while the minimum duration 14.5 days was recorded in H-1-9. These findings were corroborated with the results of Ferreira and Donadio (2). The maximum number of panicles per plant was recorded in H-13-1 (240).

The maximum flower numbers per panicle were recorded in H-2-11 (1,267) closely followed by H-2-6 (1,262) and H-13-7 (1,258). H-13-7 had the maximum number of hermaphrodite flowers (310) per panicle, which was at par with H-13-8 (289). However, 21 hermaphrodite flowers per panicle would certainly have their impact on the final yield. This fruit set in mango is reported to be directly proportions to the number of perfect flowers (Singh, 7). Hybrids H-4-1 and H-4-2 had 7.73 and 8.38 sex-ratio respectively, which were significantly more than the remaining hybrids and other two parents namely, Amrapali and Lal Sundari. Earlier similar findings were noted by Iyer and Subramanyam (3). Narayanaswamy and Thimmaraju (6) also stated that sex ratio in unique character which does not change due to change in climate. The maximum number of fruits per panicle was harvested from H-1-9 (4.67), Whereas, H-3-7 gave minimum number (1.17) of fruits up to maturity (Table 3). The maximum number of fruits per plant was recorded in H-1-1 (203.5). The maximum fruit yield per plant was recorded in H-13-1 (47.4 kg), which was significantly higher than all other hybrids but statistically at par with its male parent Sensation (44.3 kg). The minimum fruit yield per plant was observed in Lal Sundari (2.35 kg) followed by H-2-11 (Table 3).

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Table 2. Vegetative and floral characters and yield parameters newly evolved mango hybrids and their parents.

Sl. No.	Genotype	Plant height (cm)	Trunk girth (cm)	Plant spread (m) E-W	Plant spread (m) N-S	Tree volume (cm^3)	Leaf area (cm^2)	Bearing shoot length (cm)	Panicle emergence length (cm)	Flowering duration (days)
1.	H-1-1	5.57	63.65	4.28	4.70	59.21	117.8	136.7	2	17.5
2.	H-1-4	4.60	39.80	2.82	2.73	18.95	95.6	115.0	2	16.0
3.	H-1-6	4.43	43.25	2.70	1.73	11.73	107.0	143.3	2	18.5
4.	H-1-9	4.47	44.05	2.10	2.13	10.80	115.3	131.7	2	14.5
5.	H-3-5	5.00	43.90	2.90	4.01	31.94	126.8	94.2	3	15.0
6.	H-3-7	5.48	40.80	3.72	2.70	30.14	99.3	117.5	3	16.0
7.	H-4-1	5.84	43.85	2.80	2.93	25.60	164.8	97.2	3	18.5
8.	H-4-2	3.77	30.85	2.22	2.50	11.35	156.3	116.7	3	20.0
9.	H-13-1	9.60	106.75	6.70	6.43	217.13	159.0	118.3	1	20.5
10.	H-13-7	10.26	77.80	4.00	4.20	91.10	139.2	92.5	1	17.5
11.	H-13-8	8.88	57.80	3.70	3.53	61.28	82.4	100.8	1	17.0
12.	H-2-1	2.97	38.75	3.55	3.88	21.82	89.0	129.2	5	19.0
13.	H-2-2	2.36	28.80	2.50	2.43	7.80	137.6	146.7	5	19.5
14.	H-2-3	2.83	24.20	1.75	2.67	7.65	141.4	126.3	5	16.5
15.	H-2-6	2.90	31.80	2.70	3.65	15.75	129.6	128.3	5	17.5
16.	H-2-11	3.29	27.70	2.60	2.45	11.36	97.5	92.5	5	19.5
17.	Amrapali (P_1)	4.20	69.65	4.80	4.98	53.23	95.4	117.5	2	20.5
18.	Sensation (P_2)	5.18	67.70	5.53	4.90	74.29	102.2	97.5	2	18.5
19.	Lal Sundari (P_3)	4.23	81.85	5.07	4.70	53.51	112.2	98.3	4	15.5
	CD at 5%	0.12	0.36	0.12	0.10	21.76	34.6	16.4	-	3.3

P_{-1} = Amrapali as a female parent in all the hybrids; P_2 = Sensation as a male parent in hybrids (S. No. 1 to 11); P_3 = Lal Sundari as a male parent in hybrids (S. No. 12 to 16).

Table 3. Inflorescence characters and yield parameters of newly evolved mango hybrids and their parents.

Sl. No.	Genotype	No. of panicle	Panicle length (cm)	Panicle breadth (cm)	No. of rachis perpa-nicle	No. of flowers perpa-nicle	No. of bisexual flowers perpa-nicle	No. of male flowe-rsper perpa-nicle	Sex ratio (Male: Hermap-hrodite)	No. of fruits perpa-nicle	No. of fruits per plant	Fruit yield per plant (kg)
1.	H-1-1	125.0	34.55	18.15	33.67	1090	257	833	3.24	2.83	203.5	36.69
2.	H-1-4	132.5	25.70	12.35	22.67	1029	211	818	3.88	1.67	111.5	20.63
3.	H-1-6	78.0	20.90	8.40	21.67	856	194	662	3.41	2.83	104.5	24.45
4.	H-1-9	72.0	23.95	10.35	23.00	942	169	773	4.57	4.67	99.5	21.48
5.	H-3-5	28.0	21.25	14.40	30.34	1228	238	990	4.16	2.34	191.0	36.67
6.	H-3-7	85.0	20.65	10.55	37.34	988	195	793	4.07	1.17	38.5	7.32
7.	H-4-1	140.0	37.45	21.40	42.17	1065	122	943	7.73	1.34	99.0	21.28
8.	H-4-2	77.5	19.25	9.65	36.83	1060	113	947	8.38	1.84	43.5	9.15
9.	H-13-1	240.0	26.45	11.45	34.67	1137	240	897	3.74	2.00	195.0	47.38
10.	H-13-7	95.0	25.20	9.25	28.34	1258	310	948	3.06	2.17	145.0	26.83
11.	H-13-8	107.5	14.70	8.10	25.84	1245	289	956	3.31	1.50	76.5	14.76
12.	H-2-1	112.5	20.95	17.40	31.17	1226	251	975	3.88	3.17	196.5	38.32
13.	H-2-2	87.5	22.60	15.85	32.34	1211	242	969	4.00	2.00	197.5	38.51
14.	H-2-3	95.0	20.85	17.05	25.34	1245	257	988	3.84	2.84	171.0	33.00
15.	H-2-6	79.0	20.85	16.20	24.34	1262	257	1005	3.91	1.34	111.5	21.63
16.	H-2-11	94.0	21.35	17.25	24.50	1267	270	997	3.69	1.67	32.5	6.82
17.	Amrapali (P_1)	175.0	24.35	15.10	27.50	956	228	728	3.19	2.00	268.0	38.86
18.	Sensation (P_2)	85.0	21.20	13.25	33.67	1034	86	948	11.00	4.17	286.0	44.33
19.	Lal Sundari (P_3)	36.0	20.45	12.20	23.67	590	115	475	4.13	1.50	21.0	2.35
	CD at 5%	39.1	4.72	2.66	6.05	57	28	51	0.73	1.88	23.9	4.97

P_1 = Amrapali as a female parent in all the hybrids; P_2 = Sensation as a male parent in hybrids (S. No. 1 to 11); P_3 = Lal Sundari as a male parent in hybrids (S. No. 12 to 16).

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