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STUDIES ON MORPHOLOGICAL CHARACTERS OF PROMISING MANGO GENOTYPES FOR AMCHUR

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ABSTRACT

Studies were carried out on the mango genotypes for “Amchur” during the year 2016-17 by survey with the help of GPS locator device to identified promising genotypes and collection of different mango genotypes from *Dhadgaon* tahsil of Nandurbar district of Maharashtra. The promising 20 mango genotypes evaluated for distinct amchur characters revealed wide variability in morphological characters of fruit *viz.*, Date of flowering (19 Jan to 07 Feb), Date of fruit set (23 Feb to 09 March), Days to fruit set (30 to 34 days), Colour of inflorescence (light green to light green with red patches), Days to maturity (120.28 to 140.31 days), Number of fruit per panicle (1.00 to 4.66) were found most promising as they having distinct morphological characters for preparation of Amchur.

Key words : Mango, Amchur, Genotypes, Fruit set, Morphological.

Introduction

Mango (*Mangifera indica* L.), belonging to the family Anacardiaceae is one of the ancient fruit of India and its cultivation appeared to have begun 4000 years ago (Condole, 1984). The fruit is believed to have originated in the Eastern India, Asam, Burma or in the Malayan region (Mukherjee, 1997a). The genus *Mangifera* consists of 41 species of mango. But all the edible cultivars of mango belong to single species *Mangifera indica* L. A large variability exists in mango germplasm throughout the country (Gupta *et al.*, 1996). Being an ancestral home for mango, India is a treasurer of more than thousand varieties, which are widely distributed in different agro climatic zones. Mango trees perform well both under tropical and subtropical climatic conditions. It requires good rainfall during its growing season (June to October) and rainless dry weather from November onwards. Flowering season of mango tree is mainly influenced by climatic conditions especially temperature. Rains during pre-flowering and flowering period lead to delayed flowering and increase vegetative growth. Besides pickles and chutney, amchur a

dehydrated product made from raw green mangoes is also popular product of mango. Though there are no mentioned records, but annually there is of turnover 5 to 6 crores from Nadurbar district. Traditionally amchur is an Indian spice made from raw green mangoes that are cut, cabinet-dried, and pounded into powder. The word amchur is made from the word *Aam* in Hindi means mango and *chur* means crushed powder. Amchur is generally used as an acidulent in place of tamarind especially in North Indian states.

Materials and Methods

The present investigation entitled “Studies on morphological characters of promising mango genotypes for amchur” was carried out during the year 2016-17 by survey with the help of GPS locator device to identified promising genotypes and collection of different mango genotypes from *Dhadgaon* tahsil of Nandurbar district of Maharashtra.

Experiment details

For evaluation of mango genotypes for Amchur, mango fruit were collected during the harvesting season

Table 1 : Details of different mango genotypes collected for amchur preparation.

S. no.	Genotypes	Name of farmer	Village	GPS location (N & S)	Elevation (Feet)
1	DAM-01	Kalusingh Galiya Paradake	Dhadgaon	N-21°49.359 E-74°08.261	1157
2	DAM-02	Chomarya Parashivalve	Dokahudipada, Surwani	N-21°49.533" E-74°08.532"	1006
3	DAM-03	Chomarya Parashivalve	Dokahudipada, Surwani	N-21°49.541" E-74°08.514"	1003
4	DAM-04	Chomarya Parashivalve	Dokahudipada, Surwani	N-21°49.544" E-74°08.515"	1003
5	DAM-05	Jatanya Olya Padvi	Kundal	N-21°49.401" E-74°07.706"	1022
6	DAM-06	Hanya Poharya Valvi	Khuntamodi	N-21°48.313" E-74°05.666"	1310
7	DAM-07	Revala Jalma Padvi	Umarigwanpada, Khuntamodi	N-21°48.699" E-74°06.799"	1099
8	DAM-08	Singa Burji Padvi	Umarigwanpada, Khuntamodi	N-21°48.684" E-74°06.837"	1107
9	DAM-09	Vishnu Devala Padvi	Umarigwanpada, Khuntamodi	N-21°48.661" E-74°06.760"	1069
10	DAM-10	Shipa Motya Padvi	Umarigwanpada, Khuntamodi	N-21°48.639" E-74°09.502"	1078
11	DAM-11	Nobalya Khandya Valvi	Mundalwad	N-21°47.494" E-74°09.502"	1499
12	DAM-12	Kallya Jatrya Padvi	Tembhapada, Mundalwad	N-21°47.583" E-74°09.520"	1499
13	DAM-13	Kallya Jatrya Padvi	Tembhapada, Mundalwad	N-21°47.581" E-74°09.518"	1506
14	DAM-14	Kallya Jatrya Padvi	Tembhapada, Mundalwad	N-21°47.567" E-74°09.516"	1493
15	DAM-15	Harisingh Sama Vasave	Piprighat nadi (river), Talai	N-21°44.228" E-74°07.665"	2173
16	DAM-16	Mona Tembharya Valvi	Patilwada, Kalibhel	N-21°44.856" E-74°09.055"	2070
17	DAM-17	Bhila Gavalya Valvi	Patilwada, Kalibhel	N-21°44.825" E-74°09.090"	2065
18	DAM-18	Diwalya Gavalya Valvi	Patilwada, Kalibhel	N-21°44.782" E-74°09.125"	2050
19	DAM-19	Chandrasingh Ramsingh Paradake	June Dhadgaon	N-21°49.202" E-74°13.083"	1185
20	DAM-20	Krusha Chikitsalaya Nursery	Dhadgaon	N-21°49.528" E-74°12.800"	1210

of mango in 2016. Fully developed, mature but unripe fruit were collected as suggested by Wagh (1995), 10 fruit (2-3 kg) of mango fruit per treatment were taken.

Procedure for Amchur preparation

- To prepare the amchur powder recipe (dry mango powder), wash and pat dry the mangoes. Make

use of the best quality kachi kairi which would be very sour, juicy with thick flesh.

- Peel the skin using a peeler. While peelings ensure no green skin is visible on the body as this will lead to blackening of the amchur powder later.
- Using the same peeler, peel the mangoes into thin strips or chips. It is very important to use a good quality peeler as you would require really thin strips of mangoes. You can make use of a sharp knife or vegetable mandolin if you do not have a peeler.
- Spread the mangoes in a large steel plate. You can even make use of 2-3 plates to make the drying process faster.
- Cover it well with a dry muslin cloth and keep it in the sun to dry for 4 to 5 hours. Covering the plate with muslin prevents the dust or dirt particles to settle with the mango chips.
- Next day remove the muslin cloth, toss it and cover it again with a muslin cloth, and keep it in the sun to dry for 4 to 5 hours. The tossing helps in spreading the chips evenly so, the once which have not come in contact with the sun can now dry.
- Third day, remove the muslin cloth, toss it again, it must have shrunk by this time and also partially dried, cover it again with a muslin cloth and keep it to dry in the sun approx. 5 hours.
- Repeat step 5 to dry it for 1 more day or till the mango slices turn crisp. To understand, if they have been dried perfectly or no, try breaking a mango chip with your hand and if they break easily and become powdery then they are ready to be grinded.
- Blend it in a mixer till smooth and our homemade amchur powder is ready. 5 medium sized raw mangoes yields half a cup of dried mango powder.
- Store the dry mango powder in an air-tight container and use as required. Amchur powder is widely used in North-Indian cuisine to provide a tangy flavour especially in Punjabi subzis like chole, rajma, parathas stuffing etc.

Treatment details

Different promising twenty local mango genotypes were collected from various locations of Dhadgaon tahsil of Nandurbar district for morphological characteristics.

Results and Discussion

Date of flowering

It is observed from date of flowering (Table 2), a wide variation was observed in date of flowering of mango genotypes. The six mango genotypes *viz.*, DAM-03,

DAM-12, DAM-13, DAM-14, DAM-15 and DAM-17 exhibited early flowering. The eight genotypes DAM-01, DAM-04, DAM-05, DAM-07, DAM-11, DAM-16, DAM-18 and DAM-20 possessed mid flowering, whereas, six genotypes DAM-02, DAM-06, DAM-08, DAM-09, DAM-10 and DAM-19 had late flowering. Though, the promising 20 mango genotypes were classified early, mid and late date of flowering, at the time of flowering season. Iqbal and Niamatullah (2012) found that time of flowering, days to fruit setting, fruit weight, days to fruit maturity and yield. The results indicated that Yakta, Malda and Langra were the earliest cultivars (*i.e.*, fruit maturity on June 7th), while Fajri and Alishan were the late ones (*i.e.* fruit maturity in the 3rd week of July). Heaviest weight (455.90 gm) of a single fruit was noted in cultivar Fajri, while highest yield was obtained from cultivar langra (140 kg/tree). It was concluded that cultivars Langra, Malda, Fajri, Safed Chaunsa and Anwar Ratual were successfully grown and had the highest yields (kg/tree).

Date of fruit set

Table 2 : Date of flowering, date of fruit set and Days to fruit set of promising genotypes of mango Amchur.

S. no.	Genotypes	Date of flowering	Date of Fruit set	Days to fruit set
1	DAM-01	24-26 Jan	26-28 Feb	32
2	DAM-02	03-05 Feb	06-08 March	31
3	DAM-03	23-25 Jan	24-26 Feb	31
4	DAM-04	25-27 Jan	26-28 Feb	32
5	DAM-05	27-29 Jan	1-3 March	33
6	DAM-06	26-28 Jan	2-4 March	34
7	DAM-07	30 Jan-01 Feb	3-5 March	34
8	DAM-08	05-07 Feb	6-8 March	32
9	DAM-09	04-06 Feb	07-09 March	33
10	DAM-10	31 Jan-02 Feb	03-05 March	33
11	DAM-11	26-28 Jan	01-03 March	32
12	DAM-12	20-22 Jan	23-25 Feb	32
13	DAM-13	22-24 Jan	24-26 Feb	30
14	DAM-14	21-23 Jan	22-24 Feb	31
15	DAM-15	23-25 Jan	25-27 Feb	31
16	DAM-16	28-30 Jan	01-03 March	32
17	DAM-17	19-21 Jan	21-23 Feb	30
18	DAM-18	28-30 Jan	01-03 March	32
19	DAM-19	01-03 Feb	05-07 March	31
20	DAM-20	29-31 Jan	02-04 March	33
			S. D.	1.20
			Variance	1.44
			S. E. ±	0.26
			C. V.	3.73

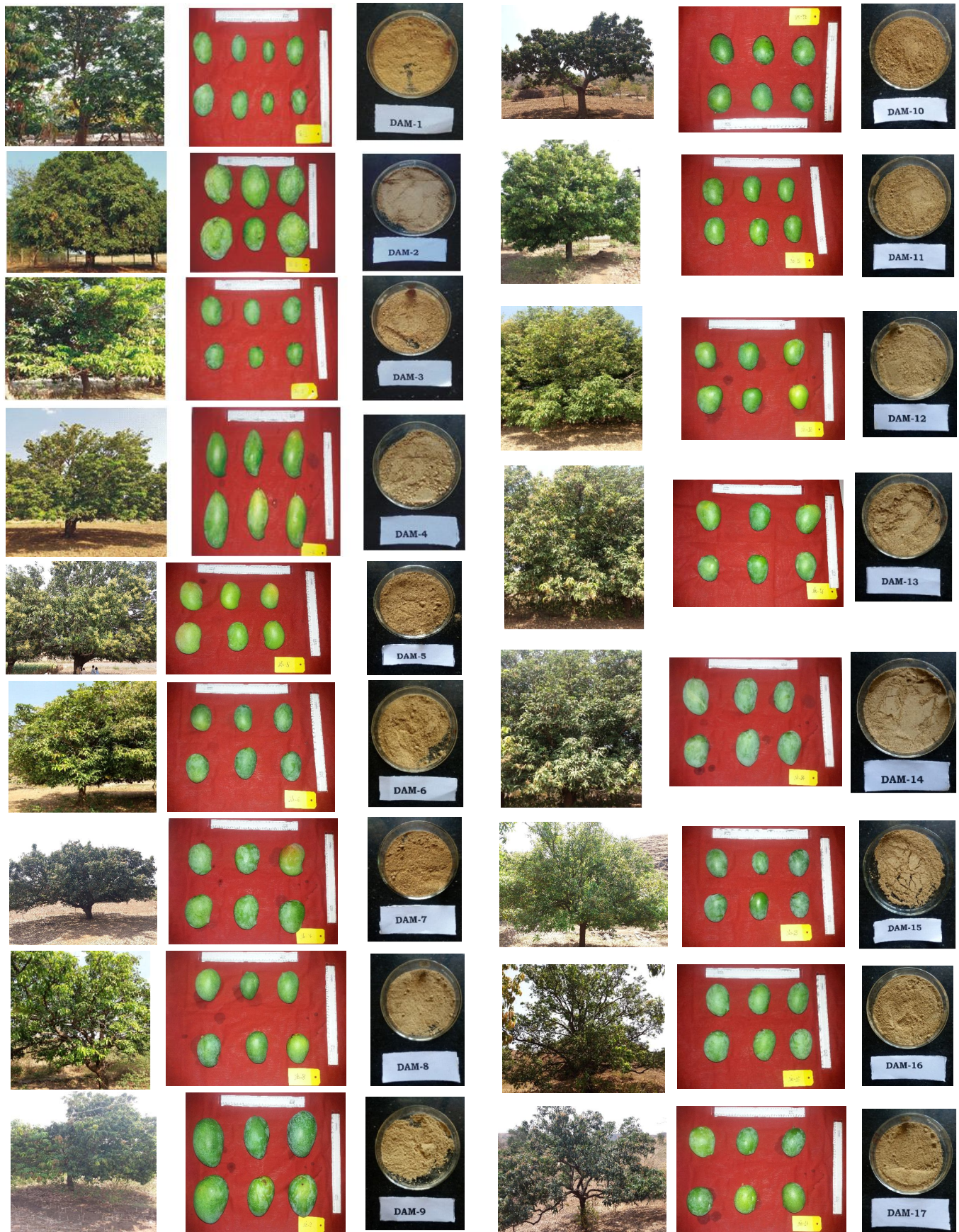


Plate 1 : Different genotypes for mango Amchur.

Plate 1 continued...

Plate 1 continued...

It is observed from date of flowering (Table 2), a wide variation was observed in date of flowering of mango genotypes. The six mango genotypes DAM-03, DAM-12, DAM-13, DAM-14, DAM-15 and DAM-17 exhibited early fruit set. The eight genotypes DAM-01, DAM-04, DAM-05, DAM-07, DAM-11, DAM-16, DAM-18 and DAM-20 possessed mid fruit set, whereas, six genotypes DAM-02, 06, 08, 09, 10 and 19 had late fruit set. Though, the promising 20 mango genotypes were classified early, mid and late date of fruit set, at the time of fruit setting. Muhammad *et al.* (2002) observed the cultivars which flowers earlier led to earlier fruit setting Malda, Langra and Yakta cultivars showed first fruit set on March 1st, Sindhuri and Dashehari were the next by setting the fruit at March 5th followed by Alishan by setting fruit on March 7th. Fruit set in Anwar Ratual started on March 10th. Rest of cultivars showed first fruit set in the beginning of 3rd week of March.

Days to fruit set

In regard days required to fruit set, wide variation was observed. The two mango genotypes DAM-13 and DAM-17 required 30 days to fruit set. The four genotypes DAM-02, DAM-03, DAM-14 and DAM-15 required 31 days to fruit set, Similarly, The seven mango genotypes DAM-01, DAM-04, DAM-08, DAM-11, DAM-12, DAM-16 and DAM-18 required 32 days to fruit set. The four mango genotypes DAM-05, DAM-09, DAM-10 and DAM-20 required 33 days to fruit set. Whereas, three genotypes DAM-06, DAM-07 and DAM-19 required 34 days to fruit set. Jilani *et al.* (2010), observed Malda and Langra both took minimum number of days to fruit setting (27 and 28 days). Alphonso, Anwar Retual and Dusehri

took 30 days for fruit setting, while maximum days to fruit setting were recorded in Sanglaxhi. Non-significant difference may be due to environmental conditions prevailing at that time, which caused a non-significant behaviour for days to fruit setting. Ravi *et al.* (2002) evaluated 20 mango cultivars and reported that these cultivars differed in nature of producing flowers, setting fruit and ripening period.

Colour of inflorescence

A wide variation was observed in colour of inflorescence of mango genotypes. The eleven mango genotypes DAM-02, DAM-05, DAM-07, DAM-08, DAM-09, DAM-10, DAM-11, DAM-12, DAM-14, DAM-15 and DAM-18 exhibited light green colour of inflorescence. The eight mango genotypes DAM-01, DAM-03, DAM-04, DAM-13, DAM-16, DAM-17, DAM-19 and DAM-20 possessed green with red patches colour of inflorescence, whereas, only one genotypes DAM-06 had dark red colour inflorescence. Though, the promising 20 mango genotypes were classified as per colour variation, at the time of flowering season. Majumder *et al.* (2011) stated that were distinct variations among the 20 genotypes eleven genotypes (DAM- 02, DAM-05, DAM-07, DAM-08, DAM-09, DAM-10, DAM-11, DAM-12, DAM-14, DAM-15 and DAM-18) are light green and eight genotypes are light green to red patches (DAM-01, DAM-03, DAM-04, DAM-13, DAM-16, DAM-17, DAM-19 and DAM-20) of the germplasm on colour of inflorescence fruit characters and yield. The inflorescence colour in most of the varieties varied from light green to light green with red patch and the position varied from terminal axillaries to terminal.

Days to maturity

As regards days to maturity, a wide variability in the days to maturity the 20 genotypes, which varied from 120.3 to 140.3 days. The maximum days to maturity (above 135.00 to 140.31 days) was obtained from the fruit of five genotypes viz., DAM-02, DAM-03, DAM-04, DAM-09 and DAM-18. The mid days to maturity (128.00 to 134.9 days) was recorded from fruit of ten genotypes viz., DAM-01, DAM-05, DAM-06, DAM-07, DAM-10, DAM-11, DAM-15, DAM-16, DAM-19 and 20. However, minimum days to maturity (below 120 to 127.9 days) were recorded in five genotypes viz., DAM-08, DAM-12, DAM-13, DAM-14 and DAM-17. Among the selected promising 20 mango genotypes, mango genotype DAM-02 had maximum days to maturity (140.3 days). These results were found similar to the observations of Hossain (1989), who reported that mango

Table 3 : Colour of inflorescence, Days to maturity and No. of fruit per panicle of promising genotypes of mango Amchur.

S. no.	Genotypes	Colour of inflorescence	Days to maturity	No. of fruit per panicle
1	DAM-01	Light green	129.71	3.88
2	DAM-02	Green with red patches	140.31	1.00
3	DAM-03	Light green with red patches	138.13	3.28
4	DAM-04	Green with red patches	136.62	3.06
5	DAM-05	Light green	128.00	3.21
6	DAM-06	Dark red	131.45	4.31
7	DAM-07	Light green	128.76	4.12
8	DAM-08	Light green	127.68	3.74
9	DAM-09	Light green	135.57	3.18
10	DAM-10	Light green	130.26	2.84
11	DAM-11	Light green	129.33	3.34
12	DAM-12	Light green	122.79	4.66
13	DAM-13	Light green with red patches	125.37	3.38
14	DAM-14	Light green	123.27	2.11
15	DAM-15	Light green	131.09	3.08
16	DAM-16	Light green with red patches	133.02	2.94
17	DAM-17	Light green with red patches	120.28	3.37
18	DAM-18	Light green	137.59	4.08
19	DAM-19	Light green with red patches	130.22	4.31
20	DAM-20	Light green with red patches	130.86	2.62
			S. D.	0.84
			Variance	0.70
			S. E. ±	0.19
			C. V.	3.73

under Bangladesh conditions takes about four to six months to reach maturity after flowering. These findings differed from that of Sardar *et al.* (1998), who consented that harvesting time varied from 92 to 134 days in some popular mango cultivars under the climatic conditions of Rajshahi. This might be due to environmental fluctuation over the year and the locality. Mukherjee (1997) observed the yellowish green to bright yellow skin colour of the fruit of ripened mango and reported that fruit colour at maturity was dependent on genotype.

No. of fruit per panicle

It is evident from the data number of fruit panicle-1, there was a wide variability in the number of fruit per panicle the 20 genotypes, which varied from 1.00 to 4.66 nos. The maximum number of fruit per panicle (above 3.29 no.) was observed in ten mango genotypes viz., DAM-11, DAM-17, DAM-13, DAM-08, DAM-01, DAM-18, DAM-07, DAM-06, DAM-19 and DAM-12. The medium number of fruit per panicle (2.50 to 3.28 nos.) was obtained in eight mango genotypes. However, minimum number of fruit per panicle (below 2.49 nos.) was observed in two mango genotypes and very low

(1.00) in one genotype viz., DAM-02. Among the selected promising 20 mango genotypes, mango genotype DAM-12 had highest fruit per panicle (4.66 no.). Mukherjee (1997) observed the highest percentage of fruit harvested per panicle was in MI94 (5.46%), but the highest number of fruit was observed in MI28 (60.33). Similarly, highest percentage of fruit harvested per panicle was in DAM-12 (4.66%) followed by DAM-19 (4.31%), 06 (4.31%), 07 (4.12%) and 18 (4.08%).

Conclusion

The overall assessment, it can be concluded that, promising nine mango genotypes viz., 02, 11, 12, 01, 08, 07, 15, 13 and 06 were found suitable for most of the characters all those genotypes, which were taken for studies for amchur. These promising genotypes had morphological character viz., early to medium date of flowering, fruit set, colour of inflorescence, and days to maturity and number of fruit per panicle.

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