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MORPHOLOGICAL CHARACTERIZATION OF SOME LEADING MANGO (*MANGIFERA INDICA* L.) CULTIVARS IN BIHAR CONDITION

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ABSTRACT

Morphological characterization of different genotypesof mango is a tools for breeder to identify desired genotype for breeding programme. So, keeping in view, theinvestigationwas carried out in experimental area of BAU, Sabour with objectiveof morphological characterization of some leading mango cultivars in Bihar agro-climatic condition. Twenty mango cultivars Dashehari, Langra, Fazali, Chausa, Mallika, Alphonso, Kesar, Mankhurd, Fernandin, Vanraj, Beneshan, Bangalora, Mulgoa, Neelum, Swarnrekha, Zardalu, Bombai, Bombai Green, Hemsagar, Krishnabhog were characterized with using morphological charactersof the cultivars during the year 2008-09.The cultivars significantly varied in terms of number of leaf per shoot (5 to12 leaf per shoot) ,panicle Length (18.88 to 35.67cm), flowering intensity (48.75 to 80.42%), hermaphrodite flowers (18 to 78 %), number of flowers per panicle (265.33 to 955.33 flowers per panicle),fruit length (6.45 to 14.91 cm) and breadth (4.45 to 9.88cm), numbers of panicle per tree (557.33 to 2148.67 panicle per tree) and maturity of fruits (99.67 to133.67 days), The cultivars showing the superior performance may be good genetic resources for farmers and breeders also for future programme.

Key words : *Mango, morphology, characterization, flowering, hermaphrodite.*

Mango **(***Mangifera indica* L.) belongs to the family Anacardiaceae, is most leading fruit crop in India.It is a commercial fruit crop of tropics and sub-tropics and occupies an important socio-economic position in India and south-east Asian countries. India has rich varietal wealth and mango germplasm in South-East Asia. The cultivation of mango is believed to have started as four to six thousand years back (Mukherjee, 1950).India is considered as a centre ofdiversity for mango with a rich diversity of named localcultivars and unnamed local land races. Mango isconsidered to be an allopolyploid, most probablyamphidiploid and outbreeding species having chromosome number 2n=40. It is highly heterozygous as performance varies with the climatewhich resulted in a high level of genetic diversity.At several occasions due to lack of information on flowering and fruiting behaviour of parental cultivar, breeding efforts are under-performed. The information pertaining to number of leaf per shoot,panicle Length (cm), flowering intensity (%), hermaphrodite flowers (%), number of flowers per panicle,fruit length and breadth (cm), maturity of fruits (days), *etc*. has significant implications on success of breedingeffort. Furtherconfusion exists in the nomenclature of mangoes due todifferent local names for the same cultivar. Knowledgeof the magnitude of genetic variation among the landraces of morphological characteristics is important for developmentof new varieties of mango with improved quality is thekey of market demand. As keeping the view of morphological characterization of some leading mango cultivars in Bihar agro climatic condition was undertaken with the main objective of isolation and identification of superiorgenotype for future breeding programmes.

MATERIALS AND METHODS

The present investigation was carried out in Experimental Research Area under Bihar Agricultural University, Sabour,Bhagalpur, Bihar on leading mango cultivars of India i.e. Dashehari, Langra, Fazali, Chausa, Mallika, Alphonso, Kesar, Mankhurd, Fernandin, Vanraj, Beneshan, Bangalora, Mulgoa, Neelum, Swarnrekha, Zardalu, Bombai, Bombai Green, Hemsagar, Krishnabhog during the year-2008-09. The climate of Sabour is semiarid, subtropical along with hot desiccating summer and cold frostless winter. The study was laid out in a randomized block design (RBD) with four replications. Trees were 25 years old and maintained under uniform cultural practices during the course of the investigation. The experimental plot had welldrained sandy loam soil of good fertility with the leveled surface. Trees were spaced at 10×12 mirrigatedvia modified basin system. The data on the followingcharacters were recorded.

Table-1 : Morphological characters of mango cultivars.

Cultivars	No. of leaf per shoot	Panicle Length (cm)	Flowering intensity (%)	Hermaphrodite flowers (%)	No. of flowers per panicle
Dashehari	7.00	27.00	70.00	22.67	586.33
Langra	6.00	26.00	80.42	78.00	955.33
Fazali	5.00	25.33	61.25	44.00	501.00
Chausa	6.00	35.67	60.42	38.00	402.00
Mallika	12.00	30.00	70.00	30.00	713.00
Alphonso	7.00	27.67	75.00	52.00	448.33
Kesar	7.00	22.33	55.00	28.00	497.67
Mankhurd	8.00	24.67	60.00	38.00	328.33
Fernandin	6.00	22.00	56.67	48.00	561.00
Vanraj	8.00	25.67	52.50	46.00	327.67
Beneshan	7.00	25.33	60.42	50.00	462.33
Bangalora	6.00	27.83	61.25	22.00	386.67
Mulgoa	9.00	30.03	60.42	32.00	342.00
Neelum	10.00	21.00	70.42	30.00	273.00
Swarnrekha	6.33	32.44	68.33	18.00	265.33
Zardalu	7.33	25.56	75.42	42.00	310.67
Bombai	10.33	30.76	65.42	34.00	328.67
Bombai Green	8.33	18.88	56.67	32.00	356.67
Hemsagar	7.33	26.60	48.75	46.00	315.00
Krishnabhog	8.00	22.34	55.00	28.00	715.00
SEm ±	0.57	1.78	3.81	2.14	24.36
CD (P=0.5)	1.63	5.08	10.90	6.13	69.73
CV %	12.98	11.67	10.44	9.78	9.30

No. of leaf per shoot : The five shoots of current year growth were randomly selected in all directions and numbers of leaf per shoots were counted in every cultivar and replication and average of twenty shoots were taken for calculating a mean value for total numbers of leaves per shoots.

Panicle length : Panicle length was measured using a measuring scale from base of panicle to apex of panicle. An average of ten panicles was taken for calculating mean value for panicle length and it was expressed in centimeter (cm).

Flowering intensity : Reproductive shoots (panicle bearing) per square meter canopy were counted in all directions in the replicates and the flowering intensity was worked out with the following formula :

$$\text{No. of flowering shoots} \quad \frac{\text{No. of flowering shoots}}{\text{Total number of tagged shoots}} \quad 1000$$

Hermaphrodite flower : When the panicle fully bloomed was cut off from each experimental tree and 100 flowers were randomly taken on a paper. The number of hermaphrodite and staminate flowers were separated and counted which is the also percentage ofhermaphrodite and staminate flowers.

Number of flowers per panicle : The ten fully opened panicles of all around the tree were randomly selected and covered with a paper bag and tagged. The bag was opened in the alternate day to record the dropped flowers in each panicle. This process was repeated till fruit setting. After fruit set the total number of flowers was counted from the bag and number of fruit set was also added and an average of ten panicles was taken for calculating a mean value for total numbers of flower per panicle.

Fruit length : The length of the fruit from stalk end to the apex of the fruit was determined at harvest stage with the help of vernier caliper and expressed in centimeters.

Fruit breadth : The breadth of fruit was determined as the maximum linear distance between two shoulders of the fruit with the help of vernier caliper and expressed in centimeters.

Table-2 : Morphological characters of different cultivars of mango.

Cultivars	Fruit length (cm)	Fruit breadth (cm)	No.s of panicle per tree	Maturity of fruits (days)
Dashehari	6.45	4.55	1345.33	104.67
Langra	7.89	6.20	2148.67	110.00
Fazali	14.91	9.88	903.67	129.00
Chausa	9.23	5.85	1223.33	133.67
Mallika	12.35	7.59	1804.67	118.00
Alphonso	8.15	6.67	1155.00	115.33
Kesar	8.37	5.40	1136.00	118.67
Mankhurd	7.28	6.12	805.33	128.67
Fernandin	7.34	6.19	936.33	118.67
Vanraj	9.16	8.39	1262.00	124.67
Beneshan	10.78	8.42	1811.33	127.33
Bangalora	13.24	7.49	1227.33	125.33
Mulgoa	9.90	8.50	1108.33	123.33
Neelum	8.16	6.17	557.33	133.00
Swarnrekha	10.86	7.94	1189.33	121.67
Zardalu	10.22	6.55	1712.00	99.67
Bombai	8.81	6.65	1311.33	101.00
Bombai Green	8.56	6.52	1380.00	108.33
Hemsagar	8.87	6.66	1086.00	96.00
Krishnabhog	8.27	7.22	1761.67	125.00
SEm ±	0.32	0.21	73.80	4.13
CD (P=0.5)	0.93	0.59	211.26	11.81
CV %	5.93	5.15	9.88	6.05

Number of panicle per tree : It was recorded by counting the total number of panicles per branch selected in the four directions of the tree. An average of ten branches was taken for computing mean panicle for thetree.

Maturity of Fruits : When first matured fruit was dropped from the tree, it was recorded by counting the days taken from bud break (maximum buds were opened) to the maturation of fruits in individualtrees.

RESULTS AND DISCUSSION

The data pertaining to number of leaves per shoot (current year growth), panicle length, flowering intensity, hermaphrodite flowers and number of flowers per panicle exhibited significantly differences among the different cultivars of mango (Table-1). The number of leaf per shoot varied from 05.00 to 12.00 leaves in different cultivars of mango. The maximum of was observed in cultivar Mallika (12.00 leaf per shoot) followed by Bombai (10.33 leaf per shoot) and Neelum (10.00 leaf per shoot) whereas; minimum was found in Fazali (5.00 leaf per panicle) followed by Langra, Chausa, Fernandin, Bangalora with having same footing value of 6.00 leaf per panicle and Swaarnrekha (6.33 leaf per panicle), This happen due to variation in genetic make-up under the present set of environmental conditions and edaphic eco-geographical conditions (Srivastava et al., 1987). The panicle length was found maximum in cultivar Chausa (35.67 cm) followed by Swarnrekha (32.44cm), Bombai (30.76 cm), Mulgoa (30.03 cm) and Mallika (30.00 cm). The minimum panicle length was observed in Bombai Green (18.88 cm) whereas; rest of the cultivars produced from 21.00 cm to 27.87 cm. The variation in panicle size might be due to genetic makeup of the particular cultivar. Environmental conditions may also contribute for difference in panicle size (Kumar and Jaiswal, 2004).

Flowering intensity percentage of different cultivars were significantly varied from 48.75 to 80.42 per cent. Maximum flowering intensity percentage was observed in cultivars Langra (80.42%) followed by Zardalu (75.42 %), Alphonso (75.00%), Neelum (70.42 %), Dashehari (70.00 %) and Mallika (70.00 %) whereas; minimum intensity was exhibited by the cultivar Hemsagar (48.75 %) followed by Kesar and Krishnabhog with having same footing value of 55.00 per cent.The variations in flowering intensity among the mango cultivars aredue to the differences in genetic makeup of the parental mango genotypes. Flowering in mango is commonly related with dormancy of the terminalgrowth which is controlled by low temperature in subtropics (Chacko *et al*., 1971). The similar type of finding was reported by Kostermans and Bompard (1993). The more percentage of hermaphrodite flowers was found in cultivar Langra (78.00 %) and lower percentage in Swarnrekha (18.00%). The remaining cultivars showed the percentage of hermaphrodite flowers from 22.67 per centto 52.00 per cent in Dashehari and Alphonso respectively. The variation in sex ratio of different mango cultivars is due to control by physiological and environmental conditions (Davenport and Nunez-Elisea, 1997). According to Campbell and Malo (1974) the sex ratio of the *Mangifera* species are variable in different genotype of mango. The similar findings were observed by the researcher Mukherjee (1985).

The number of flowers per panicle was also significantly varied from 265.33 to 955.33. The maximum flowers per panicle was counted in the cultivar Langra (955.33 flower per panicle) followed by Mallika (713.00 flowers per panicle) whereas; minimum flowers exhibited by the cultivar Swarnrekha (265.33 flowers per panicle).The variation in panicle size might be due to genetic makeup of the particular cultivar. Environmental conditions may also contribute for difference in panicle size (Kumar &Jaiswal, 2004; Randhawa & Damodaran 1961).

Morphological variations of mango cultivars in respect to fruit length, fruit breadth, maturity of fruits and number of panicles per tree are presented in Table-2. Among the twenty mango cultivars, thebigger fruitlength was measured in cultivar Fazali (14.91 cm) followed by Bangalora (13.24 cm), Mallika (12.35 cm), Swarnrekha (10.86 cm),Beneshan (10.78 cm) and Zardalu (10.22 cm) whereas; the corresponding breadth size of the cultivars was showed maximum by the cultivar Fazali (9.88cm) followed by Mulgoa (8.50 cm), Beneshan (8.42 cm) and Vanraj (8.39 cm). The remaining cultivars exhibited fruit length from 6.45 cm (Dashehari) to 9.90 cm (Mulgoa) and fruit breadth from 4.55 cm (Dashehari) to 7.94 cm (Swarnrekha). The major reason behind the variation in fruit length and breadth due to change in geographical location or inherent genetic makeup (Sharma and Josan, 1995). The presentobservations are in agreement with the results of previous studies by the researchers Bally *et al*., (1996), Singh *et al*., (2009), Human and Rheeder (2004) and Kher and Sharma (2002).

Fruit maturity was significantly varied among the different cultivars. The more time was taken for maturity of fruits by the cultivar Chausa (133.67 days) followed by Neelum (133.00 days), Fazali (129.00 days), Mankhurd (128.67 days), Beneshan (127.33 days), Bangalora (125.33 days), Krishnabhog (125.00 days) and Vanraj (124.67 days) whereas; minimum time was consumed by the cultivar Hemsagar (96.00 days) followed by Zardalu (99.67 days),Bombai (101.00 days) and Dashehari (104.67 days). The remaining cultivars were spent time for fruit maturity from 108.33 days (Bombai Green) to 123.33 days (Mulgoa).The variation observed in terms of fruit maturity might be due to the differences in genetic composition of parental mango cultivars. Phenology pattern is strongly under environmental control in mango(kher*et al*., 2002). Schnell and Knight (1998) also observed that the duration of fruit maturity in mango is dependent on prevailing weather conditions.

The number of panicles per tree was observed significantly variable among the different cultivars of mango. These were varied from 557.33 to 2148.67 panicle per tree. The more number of panicles were produced by the cultivar Langra (2148.67 panicles per tree) followed by Beneshan (1811.67 panicles per tree), Mallika(1804.67 panicles per tree) and Zardalu (1712.00 panicle per tree) whereas; lower number of panicle was exhibited by the cultivar Neelum (557.33 panicle per tree) followed by Mankhurd (805.33 panicle per tree), Fazali (903.67 panicle per tree) and Fernandin (936.33 panicle per tree).The variation in number of panicles in mango cultivars might be due to genetic composition and more specifically the physiological condition of the shoot on which panicle arise. In the same line of work was reported by Chandra *et al*. (2001).

CONCLUSION

Based on the results, it may be concluded that differentmorphological characters of mango cultivars varied significantly in Bihar agro-climatic condition.

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