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Ankur Kumar Rai
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Samik Sengupta
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Suman Kumari
Department of Horticulture (Fruit and Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Ravindra Kumar
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Sanjay Sahay
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Pawan Kumar
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Ankit Kumar Pandey
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Roopendra Kumar
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Md. Rizwanullah
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Gautam Pratap Singh
Department of Horticulture (Vegetable & Floriculture), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Ashutosh Kumar
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Nishant
Department of Horticulture, (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Corresponding Author:
Suman Kumari
Department of Horticulture (Fruit and Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Study of morphological leaf characters of mango (*Mangifera indica* L.) genotypes under Bihar

Ankur Kumar Rai, Samik Sengupta, Suman Kumari, Ravindra Kumar, Sanjay Sahay, Pawan Kumar, Ankit Kumar Pandey, Roopendra Kumar, Md. Rizwanullah, Gautam Pratap Singh, Ashutosh Kumar and Nishant

Abstract
The present investigation entitled "Study of phenotypic characters and diversity assessment of primary genotypes of mango (*Mangifera indica* L.) in Bihar" was carried out in the Department of Horticulture (Fruit & Fruit Technology), Bihar Agricultural College, Sabour, Bhagalpur, Bihar. Twenty five mango genotypes were studied for their leaf characteristics and flowering behavior. Wide variability was recorded among various phenotypic traits of Leaf apex shape was varied from acuminate to acute shape, Leaf base shape of mango genotypes was obtuse to acute shape found in most of the genotypes. Young leaf colour of mango genotypes was observed light green colour, deep coppery tan colour, light brick red colour and light green with brownish tinge colour in the almost genotypes. Fully developed leaf colour of mango genotypes was found to be dark green colour in all the mango genotypes. Leaf blade shape of mango genotypes was observed ovate to lanceolate in most of the genotypes. So it could be used as one of the parent in mango breeding programme for enhancing photosynthetase accumulation and enhancing the yield per plant. This study may also be useful for examine the leaf shape, leaf colour and leaf margin to observe morphological variation in mango genotypes.

Keywords: Phenotypic, primary genotypes, diversity, assessment, leaf margins

Introduction
Mango (*Mangifera indica* L.) is a member of the dicotyledonous family Anacardiaceae, in the order Sapindales which consist of 73 genera and about 830 species and is believed to be originated in the Indo-Burma region (De Candole, 1904; Popenoe, 1927) [3, 17]. Mango is an important and oldest fruit crop of India as well as world. Mango is known as "King of Fruits" in India. India ranks first in production among the mango producing countries, where it occupies an area of 2.26 million ha with an annual production of 19.68 MT (NHB, 2018) [14] while Area, production and productivity of mango in Bihar is 1.52 lakh hectare, 14.81 lakh tons and 8 t/ha respectively (Anonymous, 2018) [1].

The mango fruit occupies an important socio-economic position in India and south-east Asian countries where it is held in high esteem. Mango has been reported to have extensive diversity due to alloploidy, out breeding, continuous grafting and phenotypic differences arising from varied agro-climatic conditions in different mango growing regions (Ravishankar *et al*., 2000) [15]. Mukherjee (1953) [13] opines that mango has been under cultivation for at least 4000 years with over 1000 varieties in cultivation. Large diversity is seen in the case of monoembryonic mango genotypes. Almost all of them are selections made from naturally occurring open-pollinated seedlings. There are seven centers of diversity for *Mangifera indica* L. in India (Yadav and Rajan, 1993) [18] and five wild species (*M. indica*, *M. andamanica*, *M. camptosperma*, *M. khasiana and M. sylvatica*) are native to India.

Characterization and assessment of diversity is essential to utilize these unique cultivars in crop improvement programmes and also for better conservation of genetic resources. Utilization of the conserved germplasm in the breeding programme requires precise information on the genetic relationships among the cultivars while information on the genetic distance among the cultivars will also be of help in avoiding duplicates, thus, clearing the ambiguity in nomenclature, widening the genetic base of the core collections and ultimately help in preserving the valuable diversity. Several procedures for the identification and characterization of mango genotypes have been developed based on outstanding fruit morphological traits. However, those traits are visually evaluated in most cases and are thereby subjective morphological characteristics that can improve characterizations for defining the

potential use of any genotype (Jaramillo and Baena, 2000) [8]. The International Plant Genetic Resources Institute (IPGRI) of Rome, Italy, has established a list of descriptors for mango that includes the morphological traits of plant, leaves, flowers, fruits and seeds and provides a universal format for the characterization of mango genetic resources (IPGRI, 2006) [6]. The need of proper selection criteria has always been felt. Moreover, the assessment of the genetic variability, heritability, expected genetic advance and development of association among growth and yield characters are of immense value for the selection. As with other field and horticultural crops, precise estimation of genetic variability is an important pre-requisite for the genetic improvement of mango. It provides the fruit breeder with an accurate description of the germplasm material which is essential for their identification, conservation, management and utilization in genetic improvement programmes. Knowledge about the extent of genetic diversity/relatedness in mango germplasm is vital for developing coherent strategies for future gains in productivity and quality.

Materials and Methods

Experimental site

The present study was undertaken to evaluate the popular mango cultivars of Bihar for flowering traits at Bihar Agricultural University, Sabour, Bhagalpur, Bihar. The university is situated between 25º15'40" North longitude and 45.72 meters above mean sea level. The climate of Sabour is semi-arid, subtropical with hot desiccating summer and cold frostless winter. The experiment was conducted during the flowering season of mango beginning from January 2020-21 at AICRP (Fruits) garden at sabour, Bhagalpur on twenty five genotypes of mango. The observations were made on a daily basis to determine the time of emergence of panicles from January to March.

Leaf parameters (As per IPGRI descriptor -2006)

The morphological data like leaf apex shape, leaf base shape, leaf margin, colour of young leaf, colour of fully developed leaf etc was taken on the basis of descriptor of IBPGR (2006).

Results

Observations tabulated in Table 1 ascertained that the mango genotypes Leaf apex shape was varied from acuminate to acute shape. Leaf base shape of mango genotypes was obtuse to acute shape found in most of the genotypes.

Table 1: Morphological leaf characters of 25 mango genotypes.

Genotype	Leaf apex shape	Leaf base shape	Colour of young leaf	Colour of fully developed leaf	Leaf blade shape	Leaf margin
G-01	Acuminate	Obtuse	Light green	Dark green	Ovate	Wavy
G-02	Acuminate	Acute	Deep coppery tan	Dark green	Oblong	Wavy
G-03	Acute	Acute	Deep coppery tan	Dark green	Oblong	Entire
G-05	Acute	Obtuse	Deep coppery tan	Dark green	Oblong	Entire
G-06	Acuminate	Acute	Deep coppery tan	Dark green	Lanceolate	Entire
G-09	Acute	Acute	Deep coppery tan	Dark green	Lanceolate	Entire
G-11	Acute	Acute	Light green	Dark green	Lanceolate	Wavy
G-12	Acuminate	Acute	Deep coppery tan	Dark green	Oblong	Entire
G-16	Acute	Acute	Light brick red	Dark green	Oblong	Entire
G-18	Acuminate	Acute	Deep coppery tan	Dark green	Oblong	Entire
G-19	Acute	Acute	Deep coppery tan	Dark green	Oblong	Wavy
G-20	Acuminate	Acute	Deep coppery tan	Dark green	Oblong	Wavy
G-21	Acute	Obtuse	Deep coppery tan	Dark green	Oblong	Wavy
G-22	Acuminate	Acute	Light green	Dark green	Lanceolate	Wavy
G-23	Acuminate	Acute	Deep coppery tan	Dark green	Lanceolate	Entire
G-27	Acuminate	Obtuse	Deep coppery tan	Dark green	Oblong	Wavy
G-28	Acute	Acute	Deep coppery tan	Dark green	Lanceolate	Wavy
G-29	Acuminate	Acute	Deep coppery tan	Dark green	Lanceolate	Entire
G-30	Acuminate	Obtuse	Deep coppery tan	Dark green	Ovate	Wavy
G-31	Acuminate	Obtuse	Light green with brownish tinge	Dark green	Ovate	Entire
G-37	Acute	Acute	Deep coppery tan	Dark green	Obovate	Entire
G-42	Acute	Acute	Deep coppery tan	Dark green	Lanceolate	Wavy
G-44	Acuminate	Acute	Light green with brownish tinge	Dark green	Lanceolate	Wavy
G-50	Acute	Acute	Deep coppery tan	Dark green	Oblanceolate	Entire
G-51	Acuminate	Obtuse	Deep coppery tan	Dark green	Lanceolate	Wavy

Young leaf colour of mango genotypes was observed light green colour, deep coppery tan colour, light brick red colour and light green with brownish tinge colour in the almost genotypes.

Fully developed leaf colour of mango genotypes was found to be dark green colour in all the mango genotypes. Leaf blade shape of mango genotypes was observed ovate to lanceolate in most of the genotypes. Leaf margins of mango genotype was observed wavy to entire in most of the genotypes. Inflorescence shape of mango was found conical, pyramidal and broadly pyramidal in maximum genotypes. Inflorescence colour of mango was observed light green, yellowish green, green with red patches, dark pink and light red in most of the genotypes.

Discussion

In India, only a little amount of effort has been done to identify mango genotypes based on morphology. For any one attribute, none of the twenty-five genotypes could yield a consistent outcome. Sarkar *et al.* (2003) [16] for example, reported similar findings. They looked at ten genotypes' vegetative, floral, and fruit characteristics. They also

discovered that, due to the extremely heterozygous nature of the traits, genotypes differed greatly for all of them. At different phases of growth, the leaves of mango types revealed distinct colour variations. According to Christopher *et al*. studies these colour development patterns often differ with cultivars (Christopher, 2017) [2]. They discovered that immature or young leaves are initially net carbon importers who only begin to contribute to the shoot's carbon economy as they grow. Likewise, mature leaf colour was found dark green in all mango genotypes (Fivaz, 2008) [5].

Conclusion

Based on the results, it may be concluded that morphological data of leaf and flowers of mango genotypes differ significantly. Dark green colour of fully developed leaf colour was found in all the genotypes. So it could be used as one of the parent in mango breeding programmes for enhancing photosynthetase accumulation and enhancing the yield per plant. This study may also be useful for examine the leaf shape, leaf colour, time of flowering and duration of flowering to observe morphological variation in mango genotypes.

References

1. Anonymous. Horticultural Statistics at a Glance, Department of Agriculture Cooperation and Farmers Welfare. Horticultural Statistics Division, 2018, 180. http://agricoop.nic.in/sitesdefault/files.
2. Christopher M, Menzela MD, Lagadec L. Can the productivity of mango orchards be increased by using high-density plantings. Scientia Horticulturae. 2017;219:222-263.
3. De Candolle A. Origin of Cultivated Plants.Kegan Paul, Trench, London; c1904.
4. Ferreira ME, Camargo LA, Tivang JG, Osborn TC. Comparison of RFLP and RAPD markers to estimating genetic relationships within and among cruciferous species. Theoretical and Applied Genetics. 1994;88:973-980.
5. Fivaz J. Botanical aspects. In: de Villiers, E.A., Joubert, P.H. (Eds.), The Cultivation of Mango. ARC Institute for Tropical and Subtropical Crops, Florida, USA; c2008. p. 9-20.
6. IPGRI. Descriptors for mango (*Mangifera indica* L).International Plant Genetic Resources Institute, Rome, Italy; c2006.
7. Islam MS, Bhuyan MJ, Biswas M, Islam MN, Hossain AK. Studies on the growth, flowering and fruit characteristics of eight mango cultivars. Bangladesh Horticulture. 1995;23(1 & 2):59-65.
8. Jaramillo S, Baena M. Conservation ex situ de Recursos Fitogenéticos. Instituto Internacional de Recursos Fitogenetics (IPGRI), 2000, 92.
9. Joshi R, Kundu M, Singh CP. A Morphological Characters: Efficient Tool for Identification on Different Mango Cultivars. Environment & Ecology. 2013;31(1A):385-388.
10. Kulkarni VJ. The tri-factor hypothesis for flowering in mango. Acta Horticulturae. 2004;645:61-70.
11. Majumder PK, Sharma DK. Mango. In: Fruits: Tropical and Subtropical (T.K. Bose and S.K. Mitra Ed.), Nayaprokash, Calcutta, India; c1990. p. 1- 62.
12. Majumder PK, Sharma DK. Mango. In: Fruits: Tropical and Subtropical (T.K. Bose and S.K. Mitra Ed.), Nayaprokash, Calcutta, India; c1990. p. 1- 62.
13. Mukherjee SK. Origin, distribution, and phylogenetic affinity of the species of Mangifera L. Journal of the Linnean Society, Botany. 1953;55:65-83.
14. NHB. National Horticulture Board data base; c2018. (http://nhb.gov.in/)
15. Ravishankar KV, Lalitha A, Dinesh MR, Anand L. Assesment of genetic relatedness among mango cultivars of India using RAPD markers. Journal of Horticultural Science Biotechnology. 2000;15(2):198-201.
16. Sarkar SK, Reddy YN. Effect of post-harvest treatments on shelf-life and quality of Banganpalli mango. Indian Journal of Horticulture. 2003;60 (2):135-139.
17. Popenoe H. A report of certain significant deficiencies of the accomplishment quotient. The Journal of Educational Research. 1927 Jun 1;16(1):40-7.
18. Yadav IS, Rajan S. Genetic resources of Mangifera. Advances in horticulture: fruit crops. 1993;1:77-93.