

Varietal Diversity in Mango: Importance, Challenges and Conservation Strategies

Mango, popularly known as the King of Fruits, holds significant cultural and economic importance in India. Indian farmers cultivate a wide array of mango varieties, ranging from popular ones like Alphonso and Dasherri to lesser-known types such as Langra and Himsagar. The diversity in mango cultivars is primarily influenced by factors such as climate, soil, and traditional agricultural practices across different regions of the country. Each variety exhibits distinct characteristics in terms of flavour, aroma, texture, and appearance, catering to diverse consumer preferences and culinary applications. Moreover, the geographical distribution of mango varieties in India reflects a rich diversity, with specific regions being renowned for the cultivation of particular cultivars.

MANGO (*Mangifera indica* L.) stands as one of the most beloved and economically significant fruits in India. The vast expanse and diverse climatic conditions in India host an array of mango cultivars, each possessing unique attributes that cater to a wide spectrum of preferences and culinary traditions. As per the available data, about 1,500 varieties of mango are grown in India, which includes 1,000 commercially cultivated varieties, and each variety has a unique size, shape, taste, and flavour. Understanding the plethora of mango varieties in India not only unveils the intricate interplay between climate, soil, and traditional agricultural practices but also underscores the need for conservation efforts to preserve this invaluable genetic resource. Further, recognizing the cultural importance of mango in India goes beyond mere consumption, as it is deeply ingrained in festivals, rituals, and culinary traditions. This article provides an insight into the extensive varietal diversity of mango cultivars found in India, highlighting their unique attributes, geographical distribution, and conservation strategies for future generations.

Importance of mango in the Indian economy

Mango cultivation is a major agricultural activity in many parts of India. It provides employment to a large number of people, especially in rural areas, including farmers, labourers, and traders. India is one of the largest producer of mango in the world. The country export a substantial quantity of mango to various countries, including the United States, the United Kingdom, and the Middle East. Export revenue from mango contributes significantly to India's foreign exchange earnings. India exported 22,963.76 MT of fresh mangoes to the world worth ₹378.49 crores/48.53 USD million during the year 2022–23 according to the APEDA. In addition, mango festivals and events are held in different parts of the country, attracting tourists, promoting cultural exchange, and creating awareness to conserve the rich varietal diversity of mangoes for future generations. For instance, recently, ICAR – Indian Institute of Horticultural Research, Bengaluru, organised the “Triphal Diversity Show,” where more than 400 mango varieties from different parts of the country were displayed along with nearly 100 varieties of banana and jackfruit. These events



Achar pasand



Abbas



Agarbathi



All season

not only celebrate the fruit but also showcase various mango varieties, traditional cultivation techniques, and culinary uses. Such events contribute to tourism and cultural heritage preservation.

Further, mango cultivation, processing, and trading create employment opportunities across the value chain. From farming activities such as planting, pruning, and harvesting to postharvest processing, transportation, and marketing, the mango industry provides livelihoods to millions of people across the country. Along with this, mango cultivation offers a source of income diversification for farmers, especially those in regions with favourable climatic conditions for mango cultivation. It serves as a valuable crop alongside other staples, contributing to farmers’ resilience against market fluctuations and climatic risks.

Major varieties of mango and their significance

Alphonso: This variety is considered the most premium and is known for its rich creamy texture, sweet taste, and intense aroma. They are primarily grown in the Konkan region of Maharashtra and are exported worldwide. Alphonso mango is used in making various desserts, juices, and even alcoholic beverages as well.

Dussehri: Originating from the northern state of Uttar Pradesh, *Dussehri* mango is characterized by their elongated shape, greenish-yellow skin, and sweet and tangy flavour. They are typically harvested early in the mango season, making them one of the first variety available in the market. *Dussehri* mango is often eaten fresh and use in making jam, chutney, and pickle.

Langra: *Langra* mango, primarily grown in the northern states of Uttar Pradesh and Bihar, is known for their distinct green skin, fibreless flesh, and sweet flavour. Despite their small size and irregular shape, *Langra* mango is highly prized for its unique taste and often consumed fresh or used in desserts and beverages.

Kesar: Named after its saffron-like colour and aroma, *Kesar* mango is primarily cultivated in the state of Gujarat. They are characterized by their small to medium size, golden-yellow skin, and sweet, juicy flesh. *Kesar* mango has a unique flavour profile with hints of citrus and popularly use in making sweet, ice cream, and juice.

Totapuri: Widely cultivated in southern India, especially in the states of Andhra Pradesh, Karnataka, and Tamil Nadu *Totapuri* mango is recognized by their distinctive beak-like shape and yellow skin with a reddish blush. They have a tangy flavour and firm flesh, making them ideal for pickle, chutney, and savory dishes. *Totapuri* mango is use in the preparation of mango pulp and concentrate.

Neelam: *Neelam* mango is predominantly grown in the southern states of Andhra Pradesh, Telangana, and Karnataka. It is medium to large-sized mango with smooth, yellow skin tinged with red. *Neelam* mango is known for their sweet, aromatic flavour and juicy flesh. They are often consumed fresh and use in making juice, jam, and dessert.

In addition, each mango variety has its unique characteristics, flavour profiles, and regional significance, contributing to the rich diversity of mango culture. Other important mango varieties with their characteristic features are mentioned in Table 1.

Table 1. Some other important mango varieties grown in India

Variety Name	Growing state	Avg. fruit weight (g)	Pulp content (%)	TSS (°Brix)
<i>Sundar shan</i>	Andhra Pradesh	194.00	65.20	23.80
<i>Rebello</i>	Goa	450.50	81.31	17.30
<i>Peddarasam</i>	Andhra Pradesh	463.70	71.90	14.80
<i>Goa bunder</i>	Goa	265.50	72.84	19.40
<i>Harsha</i>	Tamil Nadu	463.40	84.20	19.40
<i>Olour</i>	Kerala	187.50	49.10	18.50
<i>Amrapali</i>	New Delhi	186.00	72.10	23.20
<i>Mallika</i>	New Delhi	347.00	65.80	27.00
<i>Elephant head</i>	Andhra Pradesh	951.40	77.33	17.00



Alphonso



Bombay darshan



Banganapalli



Dori

Cont.

Variety Name	Growing state	Avg. fruit weight (g)	Pulp content (%)	TSS (°Brix)
<i>Vellaikulamban</i>	Kerala	161.00	67.60	18.70
PKM – 1	Tamil Nadu	235.00	70.34	19.10
PKM – 2	Tamil Nadu	351.00	57.72	17.70
<i>Danti mamidi</i>	Karnataka	460.70	73.90	21.40
<i>Miranda</i>	Goa	211.50	70.68	22.10
<i>Mulgoa black</i>	Karnataka	454.04	67.92	16.07
<i>Cherukurasam</i>	Andhra Pradesh	331.00	75.77	17.50
<i>Raspuri</i>	Karnataka	307.50	67.40	20.30
Bennet alphonso	Karnataka	308.70	73.10	22.50
<i>Balakrishnan</i>	Tamil Nadu	781.20	77.18	20.40
Bombay green	Andhra Pradesh	350.00	65.00	21.50
<i>Bandariya</i>	Andhra Pradesh	221.10	70.54	22.50
<i>Balakondapari</i>	Andhra Pradesh	647.00	79.30	16.20
<i>Himsagar</i>	West Bengal	322.50	67.00	18.80
<i>Kalneelum</i>	Tamil Nadu	291.00	71.90	22.60
<i>Neeleshan Gujarat</i>	Gujarat	233.50	63.87	15.66
<i>Cipia</i>	Gujarat	387.00	68.09	18.70
<i>Fakirwala</i>	Andhra Pradesh	233.70	59.90	20.00
<i>Kadikai</i>	Karnataka	292.70	75.65	15.90
KU – 8	Tamil Nadu	450.53	74.33	18.50
<i>Kalkuni</i>	Karnataka	97.50	57.15	22.70
<i>Thatnur</i>	Tamil Nadu	539.40	83.40	19.60
<i>Sai sugandh</i>	Maharashtra	688.00	80.33	20.30
<i>Sanakalu</i>	Andhra Pradesh	672.00	73.66	17.50
<i>Sharbathi bagri</i>	Maharashtra	175.00	67.00	18.90
<i>Kaju</i>	Maharashtra	190.00	68.00	19.00
<i>Khudadath</i>	Karnataka	897.00	81.78	20.70
CISH M – 2	Uttar Pradesh	227.18	67.81	16.76
<i>Kesar</i>	Gujarat	250.00	67.70	17.80
<i>Langra</i>	Uttar Pradesh	261.20	66.90	21.50
<i>Moreh</i>	Tripura	237.00	61.44	17.50
<i>Neeleshwari</i>	Gujarat	256.00	57.00	20.00
<i>Sindhu</i>	Maharashtra	167.00	81.58	27.40
<i>Chausa</i>	Uttar Pradesh	443.30	65.00	17.70
<i>Kacha meeta</i>	West Bengal	242.00	36.50	18.50
<i>Dashehari</i>	Uttar Pradesh	170.50	62.30	19.00



Fakir



Goamavu



Gulab khas



Hamlet

Variety Name	Growing state	Avg. fruit weight (g)	Pulp content (%)	TSS (°Brix)
<i>Mahmood bahar</i>	Bihar	311.00	59.60	19.40
NR – 34 local	Odisha	195.00	70.52	20.50
Halmet	Kerala	898.00	69.00	14.30
Litchi	Andhra Pradesh	110.00	59.40	18.40
<i>Muvandan</i>	Kerala	172.50	58.40	14.70
<i>Nekkare</i>	Karnataka	170.00	43.20	15.50
<i>Navneetam</i>	Andhra Pradesh	440.00	75.07	20.70

Challenges

Genetic erosion: Traditional mango varieties are gradually disappearing due to the adoption of high-yielding and commercially viable cultivars. This results in the loss of unique genetic traits and flavours.

Climate change: Erratic weather patterns, including unseasonal rains, droughts, and temperature fluctuations, can negatively impact mango cultivation. Certain varieties are more susceptible to these changes.

Pests and diseases: Mango trees are susceptible to various pests and diseases, such as mango hoppers, anthracnose, and powdery mildew. These threats can lead to the decline or loss of specific mango varieties.

Urbanization and land use changes: Rapid urbanization and land conversion for non-agricultural purposes lead to the destruction of mango orchards and natural habitats, further reducing varietal diversity.

Lack of awareness: Many consumers and even farmers are unaware of the importance of conserving traditional mango varieties. As a result, there is little incentive to protect these diverse mango varieties.

Conservation Strategies

Gene banks and germplasm repository: Conservation of traditionally grown mango varieties is of utmost importance for future use. Research institutes such as ICAR-NBPGR and ICAR-IIHR are maintaining collections of mango germplasm to preserve genetic diversity. These gene banks serve as repository for various mango varieties.

On-farm conservation: Farmers play a crucial role in conserving mango diversity by continuing to grow traditional varieties on their farms. NGOs and governmental organizations often provide support and incentives for farmers to maintain these varieties.

Awareness campaign: Educational program and campaigns are conducted to raise awareness among farmers, consumers, and policymakers about the importance of conserving mango diversity. This includes highlighting the cultural, economic, and ecological significance of traditional mango varieties.

Community initiative: Local communities and organizations have to take the lead in conserving mango diversity through community seed banks, orchard management programs, and cultural festivals celebrating traditional mango varieties.

International collaboration: Collaboration with international organizations and initiatives allows for the exchange of genetic material and expertise, contributing to the conservation of mango diversity on a global scale.

Research and development in mango

Research and development (R&D) in mango varieties in India is a vital component of innovation, aimed at enhancing the productivity, quality, and resilience of mango cultivation in the country. India, being one of the largest producers and exporters of mangoes globally, invests significantly in R&D to address various challenges faced by mango growers. The R&D efforts in mango varieties in India encompass several key areas.

Firstly, breeding programs focus on developing new varieties with improved traits such as high yield, disease resistance, enhanced fruit quality, extended shelf life, and adaptation to different agro-climatic regions. These programs often involve traditional breeding methods such as controlled pollination and selection, as well as advanced biotechnological tools like marker-assisted selection and genetic engineering to expedite the breeding process and introduce specific traits.

Secondly, research initiatives aim to optimize



Kesar



Kurukkan



Muffarai



Nati



Olour



PKM-1



Sensation



Totapuri

agronomic practices for mango cultivation, including irrigation management, nutrient supplementation, pest and disease control strategies, and post-harvest handling techniques. These efforts contribute to increased efficiency, sustainability, and profitability of mango production across the country.

Further, collaboration between agricultural research institutions, universities, government agencies, private sector organizations, and mango growers is crucial for the success of R&D in mango varieties in India. By continuing innovations and adapting to emerging challenges and opportunities, India remains at the forefront of mango cultivation and trade globally.

CONCLUSION

India hosts an extensive varietal diversity of mangoes, with over a thousand varieties grown across the country.

These varieties vary in shape, size, colour, taste, and aroma. Some popular mango varieties include Alphonso, *Dasheri*, *Langra*, *Kesar*, *Banganapalli*, and *Totapuri*, each cherished for its unique flavour profile and culinary uses. The diversity of mango cultivars in India reflects the country's rich agricultural heritage and the adaptation of mango cultivation to diverse climatic conditions across different regions. Further, the cultural significance of mango in India is profound, with the fruit being celebrated in festivals, rituals, and traditional cuisines.

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Chilli

Arka Neelachal Prabha: It is a mid-season chilli variety. The fruits mature in 65-75 days. Fruits are medium long (5-6 cm), with high capsaicin content. Green fruit yield is 10-12 t/ha. Adaptable to tropical humid climatic conditions and recommended for cultivation in Odisha.

Arka Dhriti and Arka Nihira: These are suitable for dual medium and dual thick market segments, respectively. Both F1 hybrids *Arka Dhriti* and *Arka Nihira* are high yielding with 30-35 t fresh and 7.5-8 t/ha dry produce and have combined resistance to *Phytophthora* root rot and chilli leaf curl virus (ChLCV) Raichur-isolate. The fruits of *Arka Dhriti* are green and turn dark red (80-90 ASTA value) on maturity and pungent (80,000-90,000 SHU). In *Arka Nihira*, fruits are dark green and turn dark red (110-120 ASTA value) on maturity with medium pungency (35,000-40,000 SHU).

Kashi Garima: This is CMS-based hybrid for table purpose with robust plant type, attractive green fruits suitable for export and recommended for cultivation in Uttar Pradesh. The fruits are of 7-9 cm length, 0.8-1.0 cm width and thin pericarp. The yield potential of this hybrid is 20-25 t/ha green fruits in 7-8 months duration. It has field tolerance against ChLCV disease.



Arka Dhriti F1 hybrid



Arka Nihira F1 hybrid

Source: ICAR Annual Report 2023-24, p.39