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Original article

Melon (Cucumis melo L.) Diversity: Horticultural Groups, Key Features and their Utilization

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ABSTRACT

Melon (*Cucumis melo* L.) is a large polymorphic taxon, encompassing a large number of botanical and horticultural varieties of groups. These groups differ significantly in fruit morphology, nutritional value and climatic requirements. Based on their utilization, melon can be grouped into dessert melons, pickling melons, vegetable melons and winter melons. Dessert melons are consumed fresh due to their sweet and juicy flesh, while pickling melons are small and firm, ideal for preserving. Vegetable melons are valued for their crisp texture and mild flavour, suitable for cooking. Winter melons are highly regarded for its long post-harvest life and ability to grow under protected environment. Dessert melons are rich sources of vitamins, minerals, particularly high in potassium and low in sodium content. It contains a meagre amount of both cholesterol and fat, making it ideal for consumers to quench thirst during hot summer. This article highlights the horticultural classification of melons, their characteristics, significance and cultivation practices.

INTRODUCTION

Melon [*Cucumis melo* L.(2n=24)], also known as '*Kharbooja*' in India, is a popular vegetable crop that is grown all over the world. India ranks as the second largest producer of melons globally after China, producing 1.49 million tonnes from a cultivated land area of 0.068 million hectares (Anonymous, 2025). Although melon was initially believed to originate Africa, recent phylogenetic studies indicate that they actually originated in Asia, particularly in India and East Asia, where they display the highest diversity. Indian melon genetic resources have been identified as a significant source of diversity. Melon is a highly diverse and variable species within the Cucurbitaceae family, leading to different horticultural classifications by numerous researchers. India being proposed as one of the centres of origin and domestication, diverse genetic resources of indigenous melon are found all over the country. These indigenous landraces or wild relatives are low yielding, subpar fruit quality and cracked at maturity and are utilized for culinary purposes, nevertheless these fruits may serve as a valuable repository of beneficial genes, thereby contributing to the preservation and enhancement of melon genetic resources (Dhillon et al. 2015). Melon bred for market-class varieties, which prioritize higher yield, superior nutritional quality and large-scale cultivation, are experiencing a decline in genetic variability due to reliance on limited genetic resources. Therefore, landraces or wild relatives will play a pivotal role in preserving and widening genetic diversity through breeding. Harnessing these untapped resources is critical for developing resilient melon varieties with improve agronomic yield, fruit quality and resistance or tolerance to biotic and abiotic stresses.

Historical overview of melon classifications

The widely used horticultural classification of melon has six different groups *viz*., *cantalupensis*, *inodorus*, *momordica*, *flexuosus*, *dudaim* and *conomon* (Munger and Robinson, 1991) grouped according to their horticultural usage. The cultivation and conservation of these groups not only help uplift farmers' economy but also ensure nutritional security, promote a healthy and diversified diet and contribute to crop improvement and enhanced productivity.

Characteristics of different horticultural groups of melon

1. ***Cucumis melo* var. *cantalupensis* Naud. (Cantaloupe)**

The cantaloupe melon exhibits an andromonoecious sex form with long hairs on the ovary. Its fruits are of moderate weight and can be flat, round or oval shape. The skin of the fruit has a netted texture and can range in color from white to light-green to dark-green. The flesh color is typically orange; peduncle of the fruit is dehiscent and detached the fruit from the vine on maturity. These cantaloupe melons are known for their high sugar content, juicy texture and aromatic flavour, therefore taken as salads or refreshing desserts. They are climacteric and have a relatively short shelf life (4-5 days) at room temperature. It is most commonly grown during spring summer while it can be harvested earlier following diara cultivation. Improved varieties in India includes, Arka Siri, Kashi Madhu, Hara Madhu, Pusa Madhurima, Pusa Madhuras, etc.


Cantaloupe melon

2. ***Cucumis melo* var. *inodorus* H. Jac. (Winter melon)**

This melon group exhibits an andromonoecious sex form, characterized by long hairs on the ovary. The fruits are medium-sized, round to oval, with a smooth surface and may or may not have netting. The skin is thick, while the flesh is thick and light-green in color. These fruits mature late in the season and have a non-dehiscent peduncle, making them suitable to cultivate under protected environment. The fruits of this variety possess low aroma but high sugar content and low ethylene evolution, leading to extended shelf- life up to 15-20 days at room temperature. It is often referred to as a 'winter melon' because of its propensity to last longer in storage. Owing to these tremendous economic potential, two varieties namely, Pusa Sarda and Pusa Sunehari were bred for adaption in India **(**Tara et al. 2023, 2024).

Winter melon

3. ***Cucumis melo*** **var.** ***momordica*** **Roxb*.* (Snapmelon or Phut or Phoot or kakadia)**

The snapmelon exhibits a monoecious sex form with short, appressed hairs on the ovary. The fruits are small to medium in weight and can have a flat, oval or elongated shape. They may have a uniform color or display speckles, spots or stripes. The surface of the fruit is smooth, very thin exocarp, early maturing, splits on maturity and have a short shelf life. The flesh inside is light-green, although it can occasionally be white or slightly orange. These melons have low sugar content, a mealy texture, minimal aroma and dehiscent-peduncle. Mature snapmelon fruits are typically consumed as a dessert, while immature fruits are often used as a vegetable. This variety is primarily cultivated in India and southeast Asia and forms an important repository of useful genes for breeding for biotic and abiotic stresses in melon (Dhillon et al. 2015). Mostly local varieties or landraces are primarily cultivated in India in the states of Uttar Pradesh, Punjab, Rajasthan, Haryana and some pockets in northeastern India. The fruits are cooling properties and nutritional value therefore in Kerala juice prepared from the fruits are consumed during scorching summer. In 2023, 'Kodungallur Pottuvellari', a local variety from Kerala earned GI tag. Some of the improved varieties include Pusa Shandar, AHS 10, AHS 82 and Konkan Madhur.

Snap melon (Phut)

4. *Cucumis melo* var. *flexuosus* (L.) Naud. (Snake melon or kakri)

The snakemelon exhibits monoecious sex form with long hairs on the ovary and exceptionally long ovary and fruit (upto 2 meters). The immature fruits display a light-green or dark-green color, while the cream-colored exocarp becomes uniform at maturity. The flesh inside the fruit is light-green or slightly orange in color, with a mealy texture, no sugar content or aroma and has a very short shelf life. These unique fruits are primarily cultivated in regions spanning from Morocco to India and along the northern Mediterranean coast. It is cultivated in north India during summer months and can be grown in Diara land or river bed cultivation. Some of the improved varieties of long melon are Arka Sheetal, Pusa Utkarsh, Kashi Santushti, Thar Sheetal, Pant Kakri-1 and Punjab Long melon-1.

Snake melon

5. *Cucumis melo* var. *dudaim* (L.) Naud. (Pomegranate melon)

The dudaim melon exhibits an andromonoecious sex form, identified by long hairs on the ovary. This variety showcases a wide range of diversity in terms of fruit size, ranging from about 5 cm in diameter to as large as 10 kgs or even more. Immature fruits are light green with dark green spots; at maturity, they turn yellow with ochre stripes, are smooth and range from round to ovoid, with a thin exocarp and a dehiscent peduncle. The flesh colour is white and thin, lacking sugar content with relatively short shelf-life. Dudaim melons are predominantly cultivated in regions including Turkey, Afghanistan and extending north to Turkmenistan. These fruits are highly valued for their ornamental qualities and are primarily used for their fragrance, often utilized to add a pleasant aroma to rooms. It is not cultivated in India.


Pomegranate melon

6. *Cucumis melo* var. *conomon* Thunb. (Oriental pickling melon or Culinary melon)

It exhibits andromonoecious sex form with small hairs on the ovary. The fruits are oval or elongated in shape. The flesh colour of the fruit is light-green or white and lacks sugar content and aroma, with high extended shelf life, ranging from 3 to 6 months. As these melons ripen, their smooth-skinned fruits develop a sweet and fragrant pulp. They are typically consumed at this stage. However, the unripe fruits can also be consumed in various ways, such as raw, roasted, candied, or pickled. Despite their versatility and historical significance, however their commercial importance in China and Japan has declined over time, leading to a decrease in popularity. They are predominantly cultivated in the southern states of India, particularly Kerala, Karnataka, Andhra Pradesh and Tamil Nadu, where mainly local varieties such as Siddapur-1, Siddapur-2, IIHR-381 and Sirsi Local-3 are grown, along with improved varieties released by KAU, including Mudicode Local, Soubhagya and Arunima.


Oriental melon

Economic importance of this group for farmers

Market Demand: The different groups of melon cater to various consumer preferences. This diversity can lead to a higher demand for melon overall, benefiting growers by expanding their potential customer base.

Export Opportunities: Some melon varieties are more suitable for export due to their extended shelf life and resistance to handling and transportation. This can open up economic opportunities for growers to access international markets.

Diversification: Planting a variety of melon groups can help reduce the risk of crop failure due to pests, diseases or adverse weather conditions. This diversification can protect the income of farmers who rely on melon cultivation.

Price Differentiation: Different melon groups often have varying prices in the market. This can allow growers to target higher-value markets by cultivating specific varieties that command premium prices.

Season Extension: By planting different groups of melon with varying maturation times, growers can extend the harvest season. This can result in a more consistent income stream and better utilization of resources.

CONCLUSION

Melon is a lucrative crop that is expanding globally. Owing to diverse and polymorphic species with the *Cucumis* genera, categorization of melons into horticultural usage allows growers and consumers to make informed choices based on their specific needs and preferences. The long storage trait of winter melon could be exploited with low shelf-life melon (cantaloupe), in order to develop new breeds for long postharvest shelf life with desirable fruit quality traits. The native snapmelon landraces possess high fruit acidity coupled with beneficial genes for various stresses, therefore, snapmelon could also be utilized to breed melon cultivars with unique flavours and to develop tolerance/ resistance against biotic and abiotic stresses.

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