

# Cucurbitaceae (Vine Crops)

**Todd C Wehner** North Carolina State University, Raleigh, North Carolina, USA

**Donald N Maynard** University of Florida, Bradenton, Florida, USA

 Introductory

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The Cucurbitaceae or vine crop family is a distinct family without any close relatives and includes many important vegetables such as cucumber, melon, watermelon, squash, pumpkin and gourds.

## Family Characteristics

The Cucurbitaceae or vine crop family includes many important vegetables collectively referred to as cucurbits. Cucumber, melon and watermelon are major crop species originally from the Old World (cucumber from India; melon and watermelon from Africa). They are in the same family as squash and pumpkin, which are from the New World (Central and South America). Gourds have fruit (often bitter) that are used for food, decoration, containers, utensils or sponges. The exception is wax gourd, which is used much like a watermelon.

The Cucurbitaceae is a distinct family without any close relatives. All of the cultivated species are found in subfamily Cucurbitoideae. Plants included in this essay are dispersed among several tribes: Melothrieae (bur gherkin, melon, cucumber); Joliffieae (bitter melon); Benincaseae (wax gourd, watermelon, angled luffa, smooth luffa); Cucurbiteae (pumpkin, squash); and Sicyeae (chayote).

Cucurbit plants are trailing or vining, tendril-bearing, frost-sensitive annuals. They are mostly monoecious (separate staminate and pistillate flowers, sometimes referred to as male and female flowers) and require various insects, especially bees, to effect pollination. The

fruit are variously shaped, multiseeded, specialized berries called pepos. Fruit of *Cucurbita maxima* is the largest known fruit of all flowering plants, and are often used in contests for the largest pumpkin category. According to the *Guinness Book of Records*, the largest pumpkin weighed 450 kg. **See also:** Pollen: structure, development and function; Stamen and pollen development; Pollination by animals

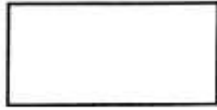
Based on world production, the most popular cucurbit is watermelon, followed by cucumber (Table 1), and the leading producers of cucurbits are China and Turkey (Table 2). Based on the amount eaten per person, watermelon is the favourite cucurbit in the United States, followed by melon (Table 3). Except for the hard-rind winter squashes and netted melons, which are rich in beta-carotene and vitamin A, cucurbit fruit generally are low in nutritional value. On the other hand, many cucurbits are ideal foods for weight-conscious individuals. Watermelon is an excellent source of lycopene, the red pigment responsible for watermelon flesh colour, which is an anticancer agent (Table 4). **See also:** Plant mineral nutrition (general)



**Table 4**

**Table 3 World cucurbit production (2004)**

**Table 2 Cucurbit consumption of**



**Table 4**

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## **Cucumber (*Cucumis sativus*)**

Cucumber is thought to have originated in India, where it is found wild and is cultivated in many diverse forms. Accessions of *C. sativus* var. *hardwickii* may be more closely related to the original ancestors of cucumber, and have been collected in the foothills of the Himalaya Mountains. Secondary centres of diversity for cucumber exist in China and the Near East. Cucumber was probably domesticated in Asia, and then introduced into Europe, where the first cultivars were selected in the 1700s. Cucumbers were brought to the Americas by Christopher Columbus, and Native Americans were growing cucumbers from Florida to Canada by the early sixteenth century. Related species are *Cucumis hystrix* from China, and the African *Cucumis* species, such as melon (*Cucumis melo*), gherkin (*Cucumis anguria*), and their wild relatives. About 80% of the world production of cucumber is in Asia, with China being the leading producer ([Table 2](#)).

Most cultivars have long vines, and are grown flat on the ground for pickling and slicing type cultivars, or on trellis supports for Oriental and greenhouse types. Plants are normally monoecious (separate staminate and pistillate flowers), but most modern cultivars are gynoecious (female) hybrid blends (12 to 15% of the seeds are a monoecious pollenizer). Plants require various insects, especially bees, to effect pollination. Cucumber is grown for its fruit, which are eaten fresh or pickled, or fried (usually when fruit have been harvested at a more mature stage). The fruit have a high water content, and they provide some vitamin A and C, especially when pickled with dill and other spices ([Table 4](#)). Per capita annual consumption of fresh cucumber is 3.1 kg and of processed cucumber 2.2 kg in the United States ([Table 3](#)). **See also:** [Pollen: structure, development and function](#); [Pollination by animals](#)

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## West Indian Gherkin (*Cucumis anguria*)

The West Indian gherkin, also known as the bur gherkin, was thought to have originated in the Caribbean, but is now considered to be of African origin. The African progenitor is *Cucumis anguria* var. *longaculeatus*, formerly *Cucumis longipes*. It was probably brought to Brazil and the West Indies (where it got its name) by Africans in the slave trade. The term gherkin is also used for pickling type cucumber, especially the small sizes.

Fruit of the bur gherkin are smaller (5 cm) than those of the cucumber, but the defining characteristic of this species is the long peduncle or fruit stem (up to 20 cm in length). The fruit are light yellow to pale green, and are covered with short, fleshy spines. The fruit are eaten fresh or pickled.

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## Melon (*Cucumis melo*)

Melon originated in southern Africa, and has many wild relatives there. Closely related species include cucumber, the West Indian gherkin and horned cucumber. Melon was brought from Africa to Europe and Asia, and from Europe to the Americas. Asia produces about two-thirds of the world supply, with China being the largest producer ([Table 2](#)). Melon is now cultivated throughout the world, where specific types have been developed for local use as follows: the *Cantalupensis* group includes cantaloupe, muskmelon, and Persian melon; the *Inodorus* group includes winter melon, casaba, Crenshaw, honeydew, Juan Canary and Santa Claus; the *Flexuosus* group includes the snake or serpent melon and the Armenian cucumber; the *Conomon* group includes the oriental pickling melon. The fruit are smooth, cylindrical, and may be green, white or striped; the *Dudaim* group includes mango melon, pomegranate melon, and Queen Anne's melon; the *Momordica* group includes the phoot and snap melon.

Melons require a long growing season with warm, sunny days and

cool nights to achieve best fruit quality. Melons are harvested by hand from the vine. Maturity in the *Cantalupenis* group is by separation of the fruit from the peduncle (fruit stem) with minimal force. Maturity in the *Inodorus* group melons is not as easily determined, and they may be treated with ethylene after harvest to enhance the ripening process during transit to the market. Melon is served fresh as slices, chunks or juice. Chunks are often used in fruit salad, or made into melon balls and frozen. Total per capita melon consumption in the United States is about 7 kg ([Table 3](#)). The vitamin A and C content make melon a nutritious food ([Table 4](#)).

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## **Watermelon (*Citrullus lanatus*)**

Watermelon is originally from central and southern Africa. The citron (*Citrullus lanatus* var. *citroides*) grows wild there, and is thought to be related to the wild ancestor of watermelon. The related species known as Egusi melon (*Citrullus colocynthis*) is found wild in West Africa, and is also thought to be related to the wild ancestor of watermelon. Watermelon was distributed throughout the world as trade with central Africa developed. The crop was grown in India at least by ad 800, and in China by ad 1100. The Moors introduced watermelon into Europe, where it was noted in Spain in ad 961. Watermelons were introduced into the New World in the early seventeenth century with culture noted in the Massachusetts Bay colony in 1629.

Watermelon is grown commercially in areas with long frost-free, warm periods. Plants are widely spaced because of the long, trailing vines. They may be established in the field by planting seeds or by transplanting containerized plants. Management of plant pests (weeds, insects and diseases, including nematodes) is essential during the production period. Three-quarters of the world production is grown in Asia, with China the leading country ([Table 2](#)).

Watermelon is eaten as fresh fruit, but also as pickled rind, glacé candy and roasted seeds. The watermelon fruit contains 93% water, with small amounts of protein, fat, minerals and vitamins ([Table 4](#)). In some arid regions, watermelon provides a valuable source of



water like a living canteen. The major nutritional components of the fruit are carbohydrates (6.4 g/100 g), vitamin A (590 IU), and lycopene (4100 µg/100 g, range 2300–7200), an anticarcinogenic compound found in red flesh watermelon ([Figure 1](#)). Lycopene may help reduce the risk of certain cancers, such as prostate, pancreas and stomach. The lycopene content of the new dark red watermelon cultivars is higher than in tomato, pink grapefruit or guava. Orange flesh types do not contain lycopene, but have high carotene (vitamin A) content. **See also:** [Plant macro- and micronutrient minerals](#)



**Figure 3**  
Bitter melon fruit. ...

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## Squash and Pumpkin (*Cucurbita pepo*, *C. maxima*, *C. moschata*)

Alternative common names for *C. pepo* are pumpkin, gourd, acorn squash, marrow, summer squash and zucchini; *C. maxima* types are called winter squash; and *C. moschata* fruit are called squash or pumpkin ([Figure 2](#)). All are of New World origin from Mexico south to Peru. They are classed in the subtribe Cucurbitinae of the tribe Cucurbitinae.



**Figure 2**  
An assortment of *Cucurbita* spp. fruit. ...

Plants are mostly viny except for some compact plant types in *C. pepo* and *C. moschata*. They thrive in subtropical to temperate climates. Fruit size varies from minute in baby squash (*C. pepo*) to

immense in exhibition squash (*C. maxima*). Postharvest life varies from a few days in marrow and summer squash (*C. pepo*) to several months in pumpkin and winter squash (*C. moschata* and *C. maxima*).

China and India are the leading producers of squash and pumpkin (Table 2), which are grown in almost every country of the world because of the ease of cultivation and bountiful returns. Tender shoots are boiled for greens in some cultures, but the fruit is the principal edible part. The summer squashes are steamed or boiled, or occasionally eaten raw. The winter squashes generally provide more calories and nutrition as a main course vegetable. They are usually prepared as a baked or boiled dish, or for dessert as a pudding or pie filling. They are excellent vitamin A sources (Table 4). Roasted, salted seeds are an interesting, high calorie snack food. Gourds and pumpkins (*C. pepo*) are used widely for decorative purposes, especially during the autumn months.

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## **Bitter Melon (*Momordica charantia*)**

Also known as bitter gourd, bitter cucumber or balsam pear, bitter melon is native to the tropics of southeast Asia and India. It was probably introduced to the New World with the slave trade in the seventeenth or eighteenth century. It is the most common cultivated species in tribe Joliffieae of the Cucurbitaceae. Bitter melon is very popular in many Asian countries and with Asian people living elsewhere.

Bitter melon plants are perennials that may be cultured as annuals. Because of their very long vines they are trained on an inverted U-shaped trellis that is high enough so that workers can harvest fruit within the trellis. Bitter melon is harvested when immature. They exhibit various shades of green, have a warty, shiny surface, and measure about 15 cm in length (Figure 3).



### **Figure 1**

Watermelon fruit of various flesh colours. ...

The tender shoots and leaves of bitter melons can be prepared as cooked greens. The fruit may be boiled, curried, fried or pickled. It is often soaked in salt water to reduce bitterness before cooking.

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### **Luffa Sponge Gourd (Smooth Luffa) (*Luffa aegyptiaca*), Luffa Ridge Gourd (Angled Luffa) (*L. acutangula*)**

Luffa sponge gourd is also known as smooth loofah, vegetable sponge, dishcloth gourd or rag gourd. Luffa ridge gourd is also known as angled loofah, angled gourd or ridged loofahs. Both species are placed in the subtribe Luffinae of the tribe Benincaseae and probably originated in India. They are grown throughout tropical Asia, South America and the Caribbean, with the smooth type being the most common.

Loofah vines are very large, lending themselves to training on a stout vertical trellis that encourages the development of straight fruit. The principal food use is immature fruit prepared like summer squash. Young shoots and leaves are used as greens. When grown to maturity, fruit of smooth loofah produce phytosponges. After harvest, they are soaked in water to encourage decay of the outer fruit wall and inner pulp, then washed thoroughly to remove extraneous matter. The remaining fibre is dried in the sun and bleached white. Loofah is widely grown in Asia, especially China, and in the New World, especially Guatemala and Colombia.

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### **Wax Gourd (*Benincasa hispida*)**

Also known as Chinese winter melon, ash gourd, Chinese preserving melon and other local names, the wax gourd is named for the white



waxy bloom that covers the fruit surface. Japan and Indonesia are thought to be the centres of origin with India and Indochina being the present day areas of greatest diversity. Wax gourd thrives in areas with a long, warm growing season and will withstand rain during production. China and India are the greatest producers by far. However, wax gourds can be found throughout Asia as well as in places having a large Asian population.

Wax gourd is the only cultivated cucurbit within the genus *Benincasa*. Together with watermelon, bottle gourd, loofah and lesser cucurbits, it is in the tribe Benincaseae. Wax gourd shares many characteristics with *Cucurbita*, the squashes, but differs in certain critical flower characteristics, centres of origin, and chromosome number.

The mostly round, but often irregularly shaped fruit are produced at intervals along the trailing vines. The fruit may be harvested when the waxy bloom is fully developed and fruit have reached the desired weight, or they may be left in the field until needed or until market conditions favour harvest. It is aptly named winter melon because of its long storage life over an extended period.

As the plants grow, their young shoots and leaves may be used as greens. The immature fruit may be used in ways similar to summer squash. The mature fruit flesh can be eaten as a vegetable or its seed cavity can be hollowed out for use as a container for soup made with other vegetables, fish or meat. Because of its mild flavour, wax gourd is complemented by many foods. The wax gourd often serves as the centrepiece for festive occasions.

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## **Chayote (*Sechium edule*)**

Mirliton and vegetable pear are other common names for chayote. Its centre of origin is in Guatemala and Mexico. Today, large-scale production occurs in Costa Rica, Guatemala and Brazil, as well as in other tropical areas.

Chayote is the only cultivated vegetable in the subtribe Sicyinae,

tribe Sicyeae. Plants are perennial in frost-free areas. Because they require short days for induction of flowering, their production is restricted to subtropical and tropical areas of the world. Commercial fruit generally are pear-shaped, white to dark green coloured, and 10 cm long. They bear a single seed that may sprout within the fruit (known as vivipary). Propagation is by planting the entire fruit or the excised seed.

The very long vines are usually supported on an overhead trellis so workers can walk beneath the crop and easily identify and harvest fruit ready for market. Fruit are transported, sometimes via a miniature train system, to a packing house for sorting and placement in shipping containers. They are often wrapped in tissue paper to prevent bruising of the tender skin.

The fruit is used as a vegetable and is similar to scallop summer squash in texture and flavour. Young shoots and leaves as well as portions of the tubers are also used as food. It is also used in the food industry as an ingredient in sauces and fillings.

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## Further Reading

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