Cucurbit Crops—Cucumbers, Gourds, Melons, Pumpkins, Squash—Have Uniform Needs

by Thomas W. Whitaker

Cucurbit crops should be staples for home gardeners from Maine to California. Cucumbers, gourds, muskmelons, pumpkins, squash, and watermelons will perform satisfactorily over a wide range of climate and soil conditions. The vine, or more properly, the cucurbit crops are extremely uniform in their environmental and cultural requirements. Thus, a set of procedures designed for the culture of cucumbers can be used equally well for raising squash, with perhaps some slight modification.

The wide adaptation of the cucurbit crops to culture in temperate zone areas is surprising because they are basically tropical or semi-tropical plants, annuals, extremely frost tender, and mostly incapable of functioning normally at temperatures below 60° F. For best seed germination, temperatures of 60° to 75° are required, and for maximum seasonal growth, average mean temperatures of 65° to 85° are needed.

Considering their tropical origins, the cucurbits should thrive during the long, hot, humid days and warm nights of summer in the north temperate zone—and they do. Under such circumstances, and with adequate soil moisture from rainfall or irrigation, the vines grow rapidly and respond by quickly producing fruit. Summer squash and pickling cucumbers will produce an edible product within 48 to 56 days from planting. Muskmelons require 130 to 140 days from planting. Some baking squash, pumpkins and gourds have best quality if the harvest is delayed until after the vines are senescent or have been killed by frost.

The cucurbit crops are a homogenous group, easily identified by their prostrate, sprawling vines, usually with tendrils. Each runner bears many large, lobed more or less palmate leaves (having the shape of a palm leaf). Except for the bottle gourd, the flowers are usually bright yellow, large and conspicuous. The bottle gourd has white flowers which open at night. They are pollinated by nocturnal insects.

Each vine bears two kinds of flowers; the large or pistillate (no anthers, female), and the smaller or staminate (no pistils, male). Commercial varieties of muskmelons have a variation on the basic pattern. In this group, perfect flowers (with both pistillate and staminate parts) are on the same plant with staminate flowers.

The botanical name for the fruit of a cucurbit is a pepo. A pepo is a fleshy, indehiscent (closed at maturity), berry-like structure, the product of an inferior ovary. Some of the fruits of cucurbits are among the largest in the plant kingdom. Squashes weighing 350 pounds have been reliably reported, and fruits of the bottle gourd are nearly as large.

The most obvious disadvantages of cucurbit crops from the viewpoint of the home gardener are their light and space requirements. They need maximum sunshine for best development. A few vigorous plants of pumpkin, watermelon or gourd can overwhelm the small garden. These disadvantages can be successfully overcome by careful site selection within the garden, by planting bush or dwarf varieties of squash, and by judicious use of a trellis, or using structures adjacent to the garden—
Top, pumpkins and winter squashes — banana, ocorn, Hubbard, and butternut. Right, youngster displays cucumber grown in Children's Garden of Brooklyn Botanic Garden, New York. Above, easy does it! A little effort is worth the pies these pumpkins will make.
such as fences, garages, doghouses, etc.—as a substitute for a trellis.

Nutrients. Cucurbits are not consumed primarily for their nutritional value. They contain only a sprinkling of vitamins, minerals and protein, and except for baking squashes are low in calories. Since they are low in caloric content, they are frequently used in reducing diets.

The attraction of cucurbit fruits as food is mostly to the palate. Their aroma, flavor, texture, and juiciness are among the most attractive and delightful in the vegetable world. Muskmelons make a superb breakfast fruit or dessert; besides they are relatively high in vitamins A and C. The cool, crisp, juicy, refreshing taste of a watermelon on a warm summer day is an unforgettable experience. Cucumbers, fresh or pickled, are zesty ingredients of salads and sandwiches. Summer squash, boiled and seasoned, is an extremely tasty dish, and baked squash is comparable to sweet potatoes as a dietary staple. The dessert qualities of pumpkin pie are well-known.

Cucurbits are raised mostly for their fruits which are consumed in the immature stage (summer squash, pickles), or mature stage (muskmelons, watermelons, winter squash). Gourds are allowed to mature, and then can be used as ornamentals, planters, liquid containers, work baskets, rattles, drums, etc. As food, the cucurbits can be boiled, baked, stewed, dried, pickled, or eaten uncooked. In Latin America, the staminate flowers of squash are dipped in a batter, fried, and served as a fritter. Watermelon rinds are delicious pickled or candied.

There are reasons for thinking that squashes and pumpkins were originally domesticated for their tasty, nutritious seeds, rather than the fruit flesh. In Mexico, squash seeds, fried in oil and salted, are sold by street vendors, much like peanuts are sold at baseball games in this country. Also, in Mexico, squashes have been selected for the number and quality of their seeds as food, while the flesh is ignored.

Soils. The cucurbits are not exacting in their soil requirements. They accept almost any good garden soil, well-drained, aerated, and enriched with a generous supply of plant compost or animal manures. Sandy loams which warm up quickly in the spring are preferred for an early maturing crop, but crops can be grown on heavier soils if they are properly managed. Heavier soils have greater water-holding capacity, hence they withstand dry conditions much better than lighter soils.

One factor that places a definite limit on the culture of cucurbit crops is soil pH. They are uniformly sensitive to acidic soils, and they require a neutral (pH 7) or even better soil with a slightly alkaline reaction. For acidic soils, treatment with lime prior to planting is mandatory.

Nutrient Needs

While cucurbit crops do moderately well on most fertile soils, they benefit greatly from a generous supply of organic material in the form of green and animal manures. Well-composted animal manures worked into the soil and concentrated in the area where the seed is expected to be planted (hills) is the most efficient means of using these materials. In addition to manures, applying mineral fertilizers is usually needed for a satisfactory crop. Fertilizers act as a supplement to the manure and provide an added source of plant nutrients during the growing season.

It is difficult to be specific about fertilizer recommendations because of great variation in soil types, soil fertility, and other soil conditions. In general, cucurbit crops can be expected to respond to a complete fertilizer containing 4 to 6 pct nitrogen,
Spacing Distances, Planting Depths for Cucurbit Crops

Measurements are in Inches

<table>
<thead>
<tr>
<th>Crop</th>
<th>Spacing Between plants</th>
<th>Spacing Between rows</th>
<th>Planting Depth</th>
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<td>Cucumber</td>
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<td>24–36 2</td>
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<td>Muskmelon</td>
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<td>24–36 2</td>
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<td>Pumpkin</td>
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<td>Squash (bush)</td>
<td>24–30</td>
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<td>Squash (vining)</td>
<td>36–40</td>
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<td>Gourd</td>
<td>36–40</td>
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<td>Watermelon</td>
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1 Single plants.
2 Hills.

8 to 10 pct phosphoric acid, and 5 to 10 pct potash. This translates into 1 to 2 tablespoons for each hill prior to planting. In light, sandy soils, that leach readily, one or two side dressings of ammonium sulphate may be needed during the season; perhaps a tablespoon per hill will suffice.

In the garden, cucurbit crops are normally planted in hills, specific spacing depending upon the crop. In commercial practice, however, cucumbers, muskmelons, bush squash, and watermelons are drilled in continuous rows, and thinned to stand.

Cucurbit seeds are relatively large, and should be covered to a depth of 1 to 3 inches. After covering, the soil is lightly tamped, but not so firmly as to create a crust. In light, sandy soils that tend to dry out rapidly, seeds should be planted at greater depth than in heavier soils.

Assuming normal germination [80 to 90 pct], 4 to 5 seeds are planted in each hill. Thin the seedlings when they have 2 to 3 leaves. Remove all but 1 or 2 large, healthy, well-spaced plants per hill. More than 2 plants per hill causes undesirable crowding, and competition for nutrients, water and light. Under such conditions, the final result is unthrifty plants and declining yields.

Irrigation. In the West and Southwest, cucurbit crops are totally dependent upon irrigation as a source of moisture, and even in the Midwest and East some form of supplementary irrigation may be desirable during drought periods. The cucurbits are moderately deep-rooted crops, filling the soil mass to a depth of three feet or more. This means the soil must be supplied with enough moisture to maintain a thoroughly moist condition to this depth.

Furrow irrigation is probably the most practical for home gardens, especially after the young plants have a dozen or more true leaves. Moisture on the leaves from whatever source encourages several foliar diseases difficult to suppress with fungicides. Hence, sprinkler irrigation is not recommended if alternative methods are available.

Mulching and weed control are not critical for growing cucurbits in the home garden. If the soil directly above the seed (the hills) is kept from crust- ing, no mulch is needed. A thick, hard crust will prevent emergence of the young seedlings. Therefore, after planting and firming, it is important to scatter a thin layer of loose soil over seed in the hill.

There is really no safe, effective chemical weed control for cucurbit crops. If planting is done in a well-prepared seed bed, weeds will seldom be a problem and can easily be controlled by hand or by hoe. The cucurbits are leafy, rapidly growing, vigorous plants. Consequently, as they grow older they tend to shade out competition from weeds. Usually weeds are not much of a problem until late in the season, but by this time the crop is mature and little harm will be done.

The cucurbits are subject to infec-
tion by several diseases and attack by insects that can damage or even destroy a potentially promising crop without much warning, and within a relatively short time period. Nearly all the important pests are destructive to cucurbits you are likely to plant in the home garden. There are exceptions, however, such as scab, a fungus damaging only to cucumbers, and anthracnose, also a fungus, commonly attacking only watermelon. Squash bug and squash vine borer are more of a problem on squashes and pumpkins than with other cucurbits.

Cucumber Beetles

Bacteria responsible for bacterial wilt are spread by cucumber beetles. This fact is the key to control. If the beetles are eliminated or reduced to low levels in the garden, bacterial wilt will not be a problem. The bacteria multiply rapidly and plug the water transportation system of the plant. This results in characteristic wilting of the vegetative parts. Older plants at first may have only one shoot affected, but later the entire plant will wilt and die. Younger plants die quickly. It helps to promptly remove infected plants from the garden.

Anthracnose, a disease of watermelon, flourishes in warm, moist weather, and is particularly troublesome in the Southeast. Under favorable conditions it also attacks cucumbers and muskmelons, but is an acute hazard only to watermelon production. The symptoms are small, round, water-soaked spots on the fruits. These spots later become enlarged, sunken, with dark centers, which may turn pinkish in moist, humid weather. Infected leaves have a scorched appearance, and the stems may be girdled. Vines with the disease may die. The fruits are worthless, often decaying before they are mature.

A few simple preventive measures often give satisfactory control if you are in an area where anthracnose is a problem. (a) Plant seed of varieties known to have a high level of resistance to the disease. (b) Plant seed that has been treated with a fungicide to remove spores of the fungus. (c) Practice garden sanitation, removing all the debris of cucurbit vines because the spores overwinter in this trash. (d) Select areas for planting that have not been used for cucurbit crops within the past 3 to 4 years.

Downy mildew fungus is a destructive disease of cucurbits, especially when meteorological conditions favor its rapid growth. Warm, moist conditions that occur at times during the growing season in the Atlantic and Gulf States are ideal for growth of downy mildew. However, low humidity, high temperatures and lack of free moisture on the leaves and stems immediately check the fungus growth. Spores of the fungus are produced on the underside of the leaves, and are spread by wind or splashing of raindrops.

Initial symptoms are small, yellowish spots, with irregular edges which appear on the leaves at about the time the vines commence to set fruit. Tissue at the center of each spot soon turns brown and dies. Later the spots become more numerous, coalesce, and the leaf shrivels and dies. The brown or blackish withered leaves curl upward, a characteristic that makes downy mildew easy to identify with certainty. The fruits are not attacked, but fruits from denuded vines are apt to lack flavor, be tasteless, and are practically inedible.

Whenever possible use varieties with some tolerance or even resistance to the disease. Generally the home gardener will have to lean heavily on the use of a suitable fungicide.

Powdery mildew fungus can be a devastating pest of nearly all cucurbits, except watermelons. The first symptoms are small, white patches on undersides of the older leaves. As
the disease increases in intensity, leaves and stems become covered with the white, powdery spore masses. The foliage gradually dies, leaving the fruit exposed to the sun. In muskmelons, such fruits ripen prematurely, and are usually sunburned and of poor quality.

The fungus responsible for powdery mildew requires much sunshine and reasonably high temperatures for best growth. Rains and low light intensity tend to check its rampant increase.

Resistant Varieties

Resistant or tolerant varieties of most species are available, and should be used where powdery mildew is likely to be a problem. Several safe chemicals are effective against powdery mildew.

Scab is caused by a fungus which attacks the fruit, particularly cucumber, but it may occasionally damage young squash fruits. Sunken, dark brown, irregular spots appear on the fruits from which a gummy substance is extruded. The young fruits become malformed and cannot be used.

The disease spreads rapidly in cool, moist weather. It is most serious on cucumbers in the northern tier of States (Wisconsin, Michigan, Minnesota, New York and Maine). Good garden sanitation and use of resistant varieties should successfully solve this problem for the home gardener.

Mosaic caused by virus is one of the most widespread and serious diseases of cucurbits. Characteristic symptoms are light-green mottling of the leaves, and the younger leaves are malformed, dwarfed, and slightly curled. With late infection, the symptoms are mild and little harm is done to the crop. Vines infected in early stages of development normally are dwarfed, the leaves and flowers malformed, and they do not produce acceptable fruit.

There are roughly two classes of virus that attack cucurbits. (1) Watermelon mosaic viruses which are not seed-borne, and are spread by sucking insects—chiefly aphids. (2) Squash mosaic viruses, which are seed-borne and are spread by chewing insects—chiefly cucumber beetles.

The watermelon mosaic viruses are destructive pests of cucurbits because they are spread by aphids, and it is almost impossible to deny aphids access to home gardens. Apparently the virus is carried by several widely grown ornamentals, so sources of the virus are always present. Control is difficult, although there are resistant or tolerant varieties of cucumber, but resistance breeding programs in other species are not well-developed.

Control of the squash mosaic viruses can be established by planting virus-free seed. Also, controlling cucumber beetles and other chewing insects prevents dissemination of the virus.

Root knot disease is caused by minute eelworms or nematodes which enter the roots where they feed and breed. Feeding causes the root tissues to swell, producing nodules or galls on the roots. Some galls are small, others may be the size of a walnut. Plants become dwarfed, unthrifty, and often turn yellow and die. Soil heavily infested with nematodes should be fumigated, using one of the several nematocides that are effective when properly applied. Fumigation will reduce the population of nematodes to a point where good crops can be grown for at least 1 to 2 years. Some control can be obtained by crop rotation, that is, by not planting susceptible crops in the same soil for 3 to 5 years. Much research has been done, but resistant varieties are not yet available.

Cucumber beetles, both striped and 12-spotted, are common pests in most gardens. It is important to control them because the adults seriously damage or totally destroy the plants,
and their activities also spread certain diseases of cucurbits (bacterial wilt, squash mosaic). Additionally, the larvae bore into roots and stems below the soil line, often causing the plants to suddenly wilt and die. There are satisfactory chemicals that will control these insects, but they must be applied at the first appearance of the beetles for acceptable control.

Aphids—small, fragile, soft-bodied insects with sucking mouth parts—can be a problem on cucurbits during the course of the growing season. Aphids come in several colors, such as black, green, yellow, or pink. They feed on the undersides of leaves, causing a curling or cupping. With severe infection, the leaves become sticky, lose color, and the plant dies. Winged females fly from plant to plant, establishing new colonies. Aphids can be controlled by chemicals, but be sure to use those insecticides that are least harmful to aphid predators.

The squash bug is a troublesome pest of squash and pumpkins, and occasionally attacks gourds. Adults and the immature forms (nymphs) suck the sap from leaves and stems, causing the plant to wilt and die. The adult bug is about a half inch long, and dirty brownish, or black. The nymphs are much smaller and steel-grey. The female deposits the relatively large and brownish eggs in regularly arranged masses on the underside of the leaves.

Good plant sanitation helps control this pest. Promptly remove and destroy debris from cucurbit vines and fruit. You can trap the bugs by placing a shingle or board at the base of the plants. The bugs collect here during the night, and can be destroyed the following morning before they become active. Also, searching out the egg masses and destroying them can be helpful. Insecticides are effective against heavy infestations.

The squash vine borer can damage squash and pumpkin in areas east of the Rocky Mountains. The borer is the larval stage of a day-flying moth that deposits her eggs on the stem of the plant, slightly above the soil line. The young borers penetrate the stem and burrow toward the base. When mature, the borer crawls from the plant to the soil where it pupates.

Garden sanitation, and fall tillage deep enough to destroy the cocoons, are effective control measures. Also, where only a few plants are involved, locate the wound and slit the stem with a razor blade or sharp knife, thus puncturing the borer. Then place moist soil around the stem to a height a little beyond the wound. New roots will develop, thus compensating for the injury.

Harvesting. The proper time to harvest is crucial for obtaining maximum quality of cucurbit fruits. Cucumbers for pickling should be harvested when the young fruits attain a length of 2 to 4 inches, roughly 3 to 4 days after the flower has opened. For dill and larger pickles, harvest is delayed until fruits are 6 inches or more in length. The slicing type is harvested when the fruit is 8 to 10 inches long.
For muskmelons, nature has provided an unmistakeable sign. At maturity, an abscission layer forms between stem and fruit. This layer appears as a crack, completely encircling the stem, at the point of attachment to the fruit. If the stem has to be forcibly separated from the fruit, the fruit is immature. The abscission layer, or "slip" as it is known in the trade, is characteristic of most muskmelon varieties except the casabas and honeydews. Maturity in the latter is judged by softening of the blossom end of the fruit, and subtle changes in the fruit's color.

The expertise required to select a watermelon at prime maturity is only acquired by experience. For the amateur, some of the guesswork can be eliminated by rapping the melon sharply with the knuckles. A crisp, metallic sound indicates immaturity, while a dull, flat sound suggests maturity. Also, at maturity the ground spot usually changes from white to light yellow.

Summer squash, which is consumed in the immature state, is best harvested when 3 to 6 inches long, about 3 to 4 days after the pistillate flower opens. At this stage summer squash is tender, crisp, and has a good flavor. It should be harvested 2 to 3 times per week.

Winter squash, or baking squash, normally is harvested when mature. Maturity can be roughly estimated by pressure from the thumbnail on the fruit exterior. If the skin is hard and impervious to scratching, the fruit is mature.

Fruits of pumpkins and gourds are customarily allowed to remain in the garden until frost destroys the vines, or they deteriorate.

Storage. Most cucurbit fruits are consumed fresh. Honeydew and casaba muskmelons can be stored as long as a month in a cool, dry environ-
Pumpkins and the hard-shelled squashes can be stored for several months if properly cured. This means the fruit should be mature and carefully handled at harvest. After harvest, they should be placed in a room or other area with temperatures of 80° to 85° F for 10 days, then transferred to a cool, dry place, preferably with temperatures of 50° to 60°. In storage, the fruit must be well-ventilated, not piled on each other.

Since the cucurbits are large, vigorous plants, requiring relatively huge amounts of space for maximum development, the number of plants that can be accommodated in the average garden is minimal.

Plant population should be enough to cover the needs of an average family. Six cucumber plants, if harvested regularly, will produce sufficient fruit for a family. Muskmelons produce 2 to 3 fruits per plant and needs should be based on this estimate.

Watermelons are not heavy producers. Most varieties produce 1 to 2 melons per vine. Some of the varieties with small fruits are more prolific.

Two to three well-grown plants of bush summer squash will produce an abundance of squash for the average family and the neighbors, if harvested at regular intervals. For the average garden, 4 to 6 vine type squash or pumpkin should be sufficient.

Gourds are terrifically prolific. Two or three vines on a trellis will produce 12 to 24 fruits depending upon the variety.

Thump test tells this young feller his icebox watermelon is ripe. But the most definite proof (and the most fun) comes from taste-test.