

## QUALITY CHARACTERISTICS FOR CULTIVAR EVALUATION OF VEGETABLES CROPS

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**QUALITY CHARACTERISTICS FOR:** ASPARAGUS, BEANS, BROCCOLI,  
CABBAGE, CHINESE CABBAGE, CARROTS, CELERY, SWEET CORN, CUCUMBER,  
EGGPLANT, LETTUCE, MUSKMELONS, OKRA, ONIONS, BELL PEPPER, IRISH  
POTATOES, SWEET POTATOES, PUMPKIN, RADISHES, SQUASH (ZUCCHINI),  
STRAWBERRIES, TOMATOES, AND WATERMELONS.

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### ASPARAGUS

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Two federal grades apply: U.S. no. 1 and U.S. No. 2. Usually U.S. No. 1 requires stalks to be fresh, well-trimmed and fairly straight. They should be free from decay or damage. Unless otherwise specified, stalks should not be more than one-half-inch thick and color should be not less than two-thirds green (Packer, 1990).

Asparagus seldom is stored for more than 10 days; a temperature of 32F with relative humidity between 85-90 percent is recommended (Packer, 1990).

Good-quality asparagus will be fresh and firm with closed compact tips. The green portion, which is the edible part, should be tender. Amount of green and white on the stalk also is a factor of quality (Packer, 1990).

Angular or flat stalks tend to be tough and woody (Packer, 1990).

### BEANS SNAP

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Grades: U.S. Fancy; U.S. No. 1; U.S. Combination; U.S. No. 2 (Packer, 1990).

Snap beans maintain best quality if not stored for an extended time. Maximum storage usually is seven to 10 days. (Packer, 1990)

To retain moisture content, wash beans before refrigeration. Look for fresh, clean beans that are tender, crisp and reasonably well-shaped. Avoid those with scars (Packer, 1990).

Green pods should be entirely green and not yellowish (indicates senescence), or spotted with areas of darker green due to mechanical injury, diseases or insects. Pods should be firm, tender, crisp and never wilted. Striginess and fibrousness of pod walls are important factors associated with maturity and variety (Showalter, 1977).

## BROCCOLI

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Grades: U.S. Fancy; U.S. No. 1; U.S. No. 2 (Packer, 1990).

Good-quality product will have a firm, compact cluster of small flower buds; none should be open enough to reveal the yellow flowers inside. The clusters should be dark or sage green and may have a purple cast to them. Some florets may show a yellowish tone on the sides. This is because of insufficient sunlight in these areas during growth; quality is not affected (Packer, 1990).

Broccoli cultivars are generally classified by the length of time they take to mature. They mature in 50-85 d after transplanting, depending on the time of year planted and the cultivar. There are early-, medium-, and late-maturing cultivars (Splittstoesser, 90)

## CABBAGE CHINESE

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Chinese cabbage may be divided into two types. One type is characterized by its loose or nonheading growth while the other is compact with a blanched head. Both types produce short and long forms. Heading varieties invariably become nonheading when they are grown under unfavorable conditions (Chung and Ripperton 7).

Chinese cabbage of the Wong Bok (short head) type is more popular than the chihili (tall head) type. One of the most important problems in connection with production of Chinese cabbage is bacterial soft rot which is often an extremely destructive disease as the crop approaches maturity, particularly during periods of wet weather (Frazier, 1949).

## CABBAGE HEAD

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Grades: U.S. No. 1; U.S. Commercial (Packer, 1990).

Good-quality product will be solid, hard and fairly heavy in relation to size. Leaves should be firmly attached to stems. Yellow or discolored leaves usually indicate an unnecessary amount of loss through waste. Signs of worm damage on the exterior leaves generally indicate damage to the interior as well (Packer, 1990).

Overmaturity or poor storage conditions may be indicated by separation of leaves at the base. Heads with some outer leaves separated from the stem and held in place only by the natural folding over the head may have an undesirable flavor or coarse texture (Packer, 1990).

Cabbage should be harvested when heads become solid and heavy for their size. When harvested before the heads are mature they will be soft and loosely formed; whereas overmature heads become brittle and tend to burst. Head shape varies according to variety and number of outer or wrapper leaves that are removed. Head size (1-6 pounds) is not an important factor for eating quality, and a range in sizes is packed together for a net weight of 50-55 pounds. Principal defects encountered at harvest are mechanical damage, head softness, and wilting (Showalter, 1977).

Disease Resistance. Resistance or tolerance to Fusarium yellows, black rot, and black leaf speck is available in cultivars used in Florida. When all other factors are about equal, it would be prudent to select a cultivar with needed disease resistance (Hochmuth 88).

Horticultural quality. Some specific characteristics to consider for cabbage are earliness, uniformity, cold tolerance, ability to stand in the field, tipburn resistance, and head size, shape and color (Hochmuth-88).

## CARROTS

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Carrots are generally harvested before reaching full maturity because they are more tender, mild in flavor and have a brighter orange color. Carrots of good quality should be sweet, firm, fresh, smooth, well shaped with no forking and generally well colored. The deeper the orange color, the more vitamin A in the carrot. Undesirable characteristics include poor top trimming, regrowth of tops, growth cracks, sunburn and green color at the

stem end. Carrots that are limp, flabby, soft, shriveled, tough or decayed are highly undesirable.

#### CELERY

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Grades: U.S. Extra No. 1; U.S. No. 1; U.S. No. 2 (Packer, 1990). Celery should be fresh, crisp and clean with stalks that break easily. It also should be thick and solid and of standard length with good heart formation. Insides of stems should be smooth. If it feels rough or puffy, the celery is likely to be pithy. Leaflets should be fresh or only slightly wilted. Light green stalks with glossy surfaces offer the best taste (Packer, 1990). Factors considered in grading are growth cracks, seed stems, cleanness, discoloration and damage by insects and diseases. Stalks should be green and compact with a rigid feel and the petioles brittle enough to snap easily. Crispness is an essential quality and wilted, pithy, woody, or stringy celery is undesirable (Showalter, 1977).

#### CORN SWEET

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Grades: U.S. Fancy; U.S. No. 1; U.S. No. 2 (Packer, 1990). Fresh, well-colored green husks with silk ends free of decay or worm damage are indications of a good-quality ear. Stem ends should not be too discolored or dried. Ears that are well-covered with plump, not-too-mature kernels are best (Packer, 1990). Avoid underdeveloped kernels lacking in good color, old ears with large kernels and ears with dark yellow kernels and depressed areas on the outer surface. Ear with yellowed, wilted or dried husks, and discolored or dried-out stem ends signal poor quality (Packer, 1990).

When harvested at optimum maturity the silks are brown and dry, the kernels are plump, sweet, milky, tender and almost maximum size. Commercial growers ship US Fancy grade that requires a minimum cob length of 6 in and freedom from injury by worms and other means. Wide ranges in ear length and diameter result from differences in production area, season, variety and maturity. Retailers object to the wide range in the number of ears per crate because they purchase by the crate and sell by ear count. A uniform number of ears per crate is very desirable. Defects of most concern to the industry are worm and mechanical damage and poor cob fill (Showalter, 1977).

## CUCUMBER

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Grades: U.S. Fancy; U.S. Extra 1; U.S. 1; U.S. 1 small; U.S. large; U.S. 2 (Packer, 1990). The US Standards for No.1 cucumbers require diameters from 1.5 in for small size and not less than 2.25 in diameter and 6 in length for large size. The US Fancy grade requires a maximum of 2 3/8 in diameter and minimum of 6 in. Cucumbers grown in Florida are usually sized according to market demand rather than US Standards (Showalter, 77). Avoid yellow, puffy, withered or shriveled product. Large cucumbers are likely to have larger seeds (Packer, 1990). Shape is another grade characteristic that varies widely, and those which are nearly straight and not badly curved, constricted, or tapered are considered best. Good quality cucumbers can be elongated or short and thick but must be mostly dark green and harvested before they have reached full diameter with large seed size. Slicing cucumber texture should be firm and not soft or puffy. Defects encountered at harvest include overmaturity, shriveling, bitter flavor and decay (Showalter, 1977).

Cultivars selected for use in Florida should have resistance or tolerance to angular leaf spot, anthracnose, cucumber mosaic, watermelon mosaic, zucchini yellows mosaic, downy mildew, powdery mildew and scab. Available resistance to other diseases may be important in certain situations (Hochmuth 88).

## EGGPLANT

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Grades: U.S. Fancy, U.S. No. 1; U.S. No. 2 (Packer, 1990). Coloring should be uniform and characteristic of the particular variety. Scars and cuts signal poor quality. Wilted, shriveled or soft, flabby eggplant will result in product loss and a bitter or poor flavor. Worm injury usually is evident on the surface (Packer, 1990).

Eggplant cultivars are available in many shapes and sizes, with colors ranging from very dark purple or violet to pure white or green. Glossy, dark purple oval or elongated types are preferred by the commercial US market. Cultivars that are grown for the fresh market may be grouped by shape into three types- oval or globular, deep oval or teardrop, and long or cylindrical- or by color into a novelty type (Johnson-85).

Eggplant should be harvested while immature before the flesh becomes tough and the seeds begin to harden. Shape is a varietal characteristic and can not be used as an index of changes in eating quality. The fruit attain their purple color when very small and should have a glossy, deep purple color with a fresh green calyx and stem when harvested. When the color fades or becomes dull, quality has deteriorated. Eggplant of good quality should be firm, heavy in relation to size, and not soft, flabby or shriveled. An eggplant without firm texture will usually be bitter or otherwise poor in flavor (Showalter, 1977).

## LETTUCE

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Grades: U.S. Fancy, U.S. No. 1; U.S. No. 2 (Packer, 1990). The semi-heading and leaf types do not have the head firmness of crisphead and should be handled with great care because of susceptibility to bruising and breakage. Leaf color varies among varieties, but the outer leaves are generally darker green than the pale-green inner leaves. All lettuce should be crisp, tender and clean. Defects include various types of discoloration, fibrous stems, wilting, seedstalks and decay (Showalter, 1977).  
Rommanie Grades: U.S. No. 1 (Packer, 1990).

## MUSKMELON

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Desirable market qualities include smooth, oval to round, medium-sized, heavily netted fruit with tough rinds. Desirable interior qualities are a thick, deep-salmon flesh color, with a small seed cavity. Soluble solids or sugars should be at least 10%. Larger, sutured muskmelons may be quite acceptable for local markets (Hochmuth-88).

CANTALOUPE: Grades: U.S. Fancy; U.S. No. 1; U.S. Commercial; U.S. No. 2 (Packer, 1990).

Only a mature melon will provide the sweetness, texture, flavor and juiciness that characterized cantaloupe at its finest. The melon must mature on the vine before it is harvested. It does not increase in sugar content after picking, although it will soften and change type of sugar (Packer, 1990).

A mature cantaloupe will be well-netted or webbed with a smoothly rounded, depressed scar at the tip end. If the tip end is rough with portions of the stem remaining, the melon was harvested prematurely (Packer, 1990).

Fruit should be about 5 inches in diameter. Avoid those that are small or misshapen. Shriveled, flabby or badly bruised product

signals poor quality. Also avoid melons with growth cracks, mottling or decay (mold or soft sunken spots on the surface) (Packer, 1990).

## OKRA

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Grades: U.S. No. 1 (Packer, 1990).

Good-quality product may be either white or green. Pods may be short or chunky, long or slim. Although it will grow up to 8 inches long, look for product that is 1.5-3 inches long. Fresh okra will snap easily under light pressure. Avoid pods with a dry or dull appearance (Packer, 1990).

## ONION BULB

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There are a number of grades, which vary according to type. Onions other than Bermuda-Granex-Grano and Creole types are classified U.S. No. 1, U.S. Export No. 1, U.S. Commercial, U.S. No. 1 Boilers, U.S. No. 1 Pickles and U.S. No. 2. Grade standards for Bermuda-Granex-Grano types are U.S. No. 1, U.S. Combination and U.S. No. 2 (Packer, 1990).

Good-quality product will be hard or firm. Onions should be dry with small necks. Outer areas should be covered with pepery scales and be reasonable free of green sunburn spots or other blemishes (Packer, 1990).

In general, pungent onions have cured and stored better than milder ones. In trials at Fort Pierce, red onions stored and cured best, followed by yellow and then white cultivars. Yellow Texas Early Grano 502, however, stored about the same as mild red onions in tests at Hastings, Florida. Mild yellow onions have been tested more extensively in Florida than red or white types. The white varieties tested have been more susceptible than red and yellow varieties to postharvest decay including development of *Aspergillus* spp. beneath the outer bulb scales. White and red onions are more susceptible to sunburn than are yellow onions. Globe and top-shaped types may be less often infected by soil-borne bulb decay pathogens because a smaller portion of their underside is in contact with the soil compared to flat-shaped bulbs (Hayslip-87).

## PEPPER BELL

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Grades: U.S. Fancy, U.S. No. 1; U.S. No. 2 (Packer, 1990).  
Acceptable green bell cultivars produce large, blocky, thick-walled fruit with 3 to 4 lobes; continue to produce large fruit throughout the season; and set fruit under all conditions, especially during adverse growing conditions (Zandstra).  
Fruit size, shape and color are quite variable among varieties of sweet pepper. Florida's largest production consists of the "bell" or blocky shape with fruits having 3-5 lobes, 2.5-4 inches diameter, about 1:1 diameter/length ratio and a dark green color. Readiness for harvest is judged by fruit size, color and firmness. Peppers are commonly sold as green, red, or turning and small, medium or large. Common defects include mechanical injury, growth cracks, internal and external decay (Showalter, 1977).  
Non-green pepper: Grades: U.S. Fancy, U.S. No. 1; U.S. No. 2 (Packer, 1990).

## POTATO IRISH

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Grades: U.S. Fancy, U.S. No. 1; U.S. No. 2 (Packer, 1990).  
For baking and french fries, high solids are desirable, and for boiling and salads a higher moisture content is desired. Varietal characteristics also include skin color of white or red and shape of round or elongated. Potatoes of any variety or size should be firm, relatively smooth, well shaped and clean. They should not be sprouted, wilted, decayed, have blackheart or green skin color from light exposure.

## SWEETPOTATOES

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Grades: U.S. Extra No. 1; U.S. No. 1; U.S. Commercial; U.S. No. 2 (Packer, 1990).  
Pithy sweet potatoes will appear sound outside, but will have whitish streaks and spots inside (Packer, 1990).

## PUMPKIN

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Good-quality product is well-matured and not broken or cracked. A rich orange color usually is expected. They also should be clean. Avoid pumpkins that have soft rot or wet breakdown. Those with excessive scarring or indications of disease or freezing also should be avoided (Packer, 1990).



## RADISHES

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Grades: U.S. No. 1; U.S. Commercial (Packer, 1990).

High-quality radishes will be fresh and bright looking. They also will be smooth, firm, well-formed, tender and crisp. Coloring should be characteristic of the variety. If tops are attached, they also should be fresh (Packer, 1990).

Good quality red radishes should be bright red without black spots. They should be well formed, smooth, firm, tender, crisp and mild in flavor. Pithy or spongy radishes can be detected by slight pressure and light weight for their size. Internally, pithy tissue is dry and has many air spaces (Showalter, 1977).

## SQUASH

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For maximum edibility the product must have a very tender skin and partially developed seeds; squash with these characteristics will be small in size. There is a tendency to maximize yield by allowing squash to "size," but this practice will substantially reduce the quality. Optimum size and quality is a function of cultivar. Failure to select a suitable cultivar and size for harvest will lead to poor market acceptability.

Zucchini squash are cylindrical, straight, smooth, 5-12 in long and skin color is mostly dark green with some lighter green flecks. The crookneck and straightneck squashes are similar except in neck shape. Both are yellow, 4-6 in long, smooth or lightly warted and cylindrical or club-shaped. The scallops or pattypan are bowl shaped with prominent ribbing on the edge, 3-7 in in diameter, and change from pale green to white as they mature. Size is related to eating quality and these four types are completely edible including the skin and seeds. Tenderness is the principal quality factor and the smaller, immature squash have a more tender flesh and small, undeveloped seeds. The long varieties are usually harvested before they reach 8 in in length and 3 in in diameter, and the scallop varieties when they are 3-4 in in diameter. The skin of soft-skinned types is glossy, easily punctured with a fingernail, and so tender that skin breaks and bruises are one of the most serious harvesting problems. Other defects include dehydration, discoloration, overmaturity, and decay (Showalter, 77).

## STRAWBERRIES

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Grades: U.S. 1; U.S. Combination; U.S. No. 2

Quality characteristics are indicated by fresh, clean and bright berries. Coloring should be bright and solid red with very little green or white. Caps should be in place and there should be no mold, moisture or damage on the berries (Packer, 1990).

## TOMATOES

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Grades: U.S. No. 1; U.S. Combination, U.S. No. 2; U.S. 3 (Packer, 1990).

Tomatoes should be plump and well-formed, uniform in size and shape and free from bruises. Avoid tomatoes that appear overripe, soft or bruised (Packer, 1990).

Desirable tomatoes remain firm until they are ready for consumption. Eating quality improves in tomatoes as they ripen, but when they ripen, they also soften and a soft tomato is not suitable for slicing (Showalter, 1977).

Cultivars selected for use in Florida must have resistance to Fusarium wilt (Race 1 and 2), Verticillium wilt, gray leaf spot, and some tolerance to bacterial soft rot. Available resistance to other diseases may be important in certain situations (Hochmuth 88).

Plant habit, jointlessness, and fruit size, shape, color, firmness, smoothness, and resistance to defects should all be considered in cultivar selection. Market acceptability characteristics include pack out, fruit size and shape, ripening ability, firmness, and flavor (Hochmuth-88).

## WATERMELON

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Grades: U.S. Fancy, U.S. No. 1; U.S. No. 2 (Packer, 1990).

Size is important because larger melons will have more edible flesh proportionate to weight. Although the best way to determine flavor and maturity is by plugging, as a rule, good, ripe melons are firm, symmetrical and fresh-looking with an attractive waxy bloom. Color should be characteristic of the variety. Melon should have a yellowish underside where the fruit contacted the ground. If the melon is very hard, white or very pale green on the underside, it probably is immature. (Packer, 1990).

Cut melons should display good, crisp, red flesh. They should not be mealy or water-soaked. Seeds should be fully mature and hard (coloring varies from white to black) (Packer, 1990).

In revising the US watermelon grades, a minimum soluble solids of 10% was proposed for very good quality and 8% for good quality as measured from combined samples taken in all locations of melon. Varieties and cultural practices influence size, and watermelons range from 8-50 lbs. The size of a mature melon within a variety affects marketability but not eating quality. Watermelon varieties are mostly round or long in shape, and the long melons have thinner rinds at the blossom end which is more susceptible to bruising. Common defects include bruising, decay, and poor flavor and texture (Showalter, 77). Resistance to fusarium wilt should also be considered because it is an important disease. Melons grown for shipment should have a tough rind to minimize breakage during handling. Both solid green and striped varieties are grown for shipment. The preferred size for western markets is 16-20 lbs, and the varieties grown are all in that size range (Johnson 84).