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# Classifying Vegetables

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Some system of classification of vegetables and their cultivars is essential for the person interested in *olericulture*, the study of vegetable production. Vegetables number in the hundreds and comprise an extensive group of plants that vary in physiological complexity, morphological characteristics, growth habits, life cycles, and cultural and climatic requirements. Within this wide range of diversity, no two vegetable species are exactly alike. Some are very similar, and it is obvious that they are related, while others are very different. Each year, the information base for vegetable production is being continually increased by additional research. For convenience, as well as necessity, some orderly method with which to systemize or categorize the vast amount of material being accumulated on the numerous vegetable food plants is needed.

There are many ways to classify vegetable crops, but because of the wide diversity among species, a generally acceptable system is almost impossible to define. Any system of classification must depend on how the classification is to be used. The systems used in this chapter are intended to reflect similarities for general cultural needs and management practices, and include botanical relationships, edible plant parts, temperature requirements for optimum growth, and plant life cycles.

### CLASSIFICATION BY BOTANICAL FAMILY

The botanical classification is one of the most common systems for categorizing vegetables. Based largely on morphological characteristics, primarily flowers and fruits, it groups vegetables into classes, families, genera, and species.

All vegetables belong to the class of plants known as Angiospermae, having seeds produced in a carpel, or ovary. They may be further grouped into

subclasses Monocotyledoneae and Dicotyledoneae, having one or two cotyledons (seed leaves), respectively. Most vegetables belong to the Dicotyledoneae, with the primary exceptions being asparagus, sweet corn, yams, and onions and related crops.

The broadest grouping of plant classification at which more definitive similarities between different members become apparent is the family. Plants in the same botanical family are closely related morphologically, sharing certain characteristics of flower, fruit, and sometimes leaf. In many cases, morphological similarities carry over into common growth requirements, and vegetables in the same plant family have similar cultural practices, as well as many of the same insect and disease pests.

The genus is the classification below the family and consists of individuals that have even more characteristics in common than in the family. The basic unit of plant classification is the species, which is made up of plants that have many characteristics in common, including common ancestry and the ability of interbreeding freely.

Sometimes a group of plants within a species can be sufficiently different to warrant unique names to distinguish them from one another, so that a classification below that of species is given and is known as a variety. In horticulture, there are varieties that have persisted under cultivation and have retained their distinguishing features when reproduced (either sexually or asexually). These are known as cultivars, and in seed catalogs the specific name is usually set off by single quotation marks. The botanical classification for the tomato cultivar 'Better Boy' is shown as follows:

Division—Spermatophyta (plants bear seeds)  
 Class—Angiospermae (seeds enclosed)  
 Subclass—Dicotyledoneae (two cotyledons)  
 Family—Solanaceae (nightshade family)  
 Genus—*Lycopersicon*  
 Species—*lycopersicum*  
 Cultivar—'Better Boy'

Table 2.1 represents the botanical classification for the most commonly grown vegetables. The classification, which conforms closely to *Hortus Third* (Bailey and Bailey, 1976), groups the various vegetable crops alphabetically by family within Monocotyledoneae and Dicotyledoneae.

**Table 2.1. Botanical Classification of Vegetables<sup>a</sup>**

<b>I. Monocotyledoneae</b>	
Alliaceae—Allium Family <sup>b</sup>	
<i>Allium ampeloprasum</i> (Porrum group) . . . . .	Leek
<i>Allium cepa</i> (Aggregatum group) . . . . .	Shallot, multiplier onion
<i>Allium cepa</i> (Cepa group) . . . . .	Onion
<i>Allium cepa</i> (Proliferum group) . . . . .	Egyptian onion
<i>Allium fistulosum</i> . . . . .	Welsh onion, Japanese bunching onion
<i>Allium sativum</i> . . . . .	Garlic
<i>Allium schoenoprasum</i> . . . . .	Chive
Dioscoreaceae—Yam Family	
<i>Dioscorea alata</i> . . . . .	White yam
<i>Dioscorea batatas</i> . . . . .	Chinese yam
Gramineae—Grass Family	
<i>Zea mays</i> var. <i>indentata</i> . . . . .	Dent corn
<i>Zea mays</i> var. <i>indurata</i> . . . . .	Flint corn
<i>Zea mays</i> var. <i>everta</i> . . . . .	Popcorn
<i>Zea mays</i> var. <i>saccharata</i> . . . . .	Sweet corn
Liliaceae—Lily Family	
<i>Asparagus officinalis</i> . . . . .	Asparagus
<b>II. Dicotyledoneae</b>	
Chenopodiaceae—Goosefoot Family	
<i>Atriplex hortensis</i> . . . . .	Orach
<i>Beta vulgaris</i> (Cicla group) . . . . .	Chard
<i>Beta vulgaris</i> (Crassa group) . . . . .	Beet
<i>Spinacia oleracea</i> . . . . .	Spinach
Compositae (or Asteraceae)—Sunflower Family	
<i>Artemisia dracunculus</i> . . . . .	Tarragon
<i>Chichorium endivia</i> . . . . .	Endive, escarole
<i>Chichorium intybus</i> . . . . .	Chicory, radicchio
<i>Cynara cardunculus</i> . . . . .	Cardoon
<i>Cynara scolymus</i> . . . . .	Globe artichoke
<i>Helianthus tuberosus</i> . . . . .	Jerusalem artichoke
<i>Lactuca sativa</i> . . . . .	Lettuce
<i>Taraxacum officinale</i> . . . . .	Dandelion
<i>Tragopogon porrifolius</i> . . . . .	Salsify
Convolvulaceae—Morning-glory Family	
<i>Ipomoea aquatica</i> . . . . .	Water spinach
<i>Ipomoea batatas</i> . . . . .	Sweet potato
Cruciferae (or Brassicaceae)—Mustard Family	
<i>Armoracia rusticana</i> . . . . .	Horseradish
<i>Brassica hirta</i> . . . . .	White mustard
<i>Brassica juncea</i> . . . . .	Leaf mustard
<i>Brassica napus</i> (Napobrassica group) . . . . .	Rutabaga
<i>Brassica napus</i> (Pabularia group) . . . . .	Siberian kale
<i>Brassica nigra</i> . . . . .	Black mustard

(Continued)

Table 2.1 (Continued)

Cruciferae (or Brassicaceae)—Mustard Family (continued)	
<i>Brassica oleracea</i> (Acephala group) . . . . .	Kale, collard
<i>Brassica oleracea</i> (Alboglabra group) . . . . .	Chinese kale
<i>Brassica oleracea</i> (Botrytis group) . . . . .	Cauliflower, heading broccoli
<i>Brassica oleracea</i> (Capitata group) . . . . .	Cabbage
<i>Brassica oleracea</i> (Gemmifera group) . . . . .	Brussels sprouts
<i>Brassica oleracea</i> (Gongylodes group) . . . . .	Kohlrabi
<i>Brassica oleracea</i> (Italica group) . . . . .	Sprouting broccoli
<i>Brassica oleracea</i> (Tronchuda group) . . . . .	Tronchuda cabbage
<i>Brassica rapa</i> (Chinensis group) . . . . .	Chinese cabbage (leafy), pak-choi
<i>Brassica rapa</i> (Pekinensis group) . . . . .	Chinese cabbage (heading), pe-tsai
<i>Brassica rapa</i> (Perviridis group) . . . . .	Spinach mustard
<i>Brassica rapa</i> (Rapifera group) . . . . .	Turnip
<i>Brassica rapa</i> (Ruvo group) . . . . .	Broccoli raab
<i>Lepidium sativum</i> . . . . .	Garden cress
<i>Nasturtium officinale</i> . . . . .	Watercress
<i>Raphanus sativus</i> . . . . .	Radish
Cucurbitaceae—Gourd Family	
<i>Citrullus lanatus</i> . . . . .	Watermelon
<i>Cucumis melo</i> (Inodorus group) . . . . .	Honeydew melon, casaba
<i>Cucumis melo</i> (Reticulatus group) . . . . .	Muskmelon, Persian melon
<i>Cucumis melo</i> (Cantalupensis group) . . . . .	Cantaloupe
<i>Cucumis sativus</i> . . . . .	Cucumber
<i>Cucurbita maxima</i> . . . . .	Winter squash, pumpkin, turban squash
<i>Cucurbita mixta</i> . . . . .	Cushaw squash, pumpkin
<i>Cucurbita moschata</i> . . . . .	Winter butternut squash, pumpkin
<i>Cucurbita pepo</i> var. <i>pepo</i> . . . . .	Pumpkin, acorn squash, marrow
<i>Cucurbita pepo</i> var. <i>melopepo</i> . . . . .	Bush summer squash, pumpkin
<i>Luffa aegyptiaca</i> . . . . .	Sponge gourd
<i>Momordica charantia</i> . . . . .	Bitter melon
<i>Sechium edule</i> . . . . .	Chayote
Euphorbiaceae—Spurge Family	
<i>Manihot esculenta</i> . . . . .	Cassava, yuca
Leguminosae—Pea or Bean Family	
<i>Cicer arietinum</i> . . . . .	Garbanzo bean
<i>Glycine max</i> . . . . .	Soybean
<i>Phaseolus coccineus</i> . . . . .	Scarlet runner bean
<i>Phaseolus limensis</i> . . . . .	Lima bean (large-seeded)
<i>Phaseolus limensis</i> var. <i>limenanus</i> . . . . .	Bush lima bean
<i>Phaseolus lunatus</i> . . . . .	Sieva bean (butter bean)
<i>Phaseolus lunatus</i> var. <i>lunonanus</i> . . . . .	Bush sieva bean
<i>Phaseolus vulgaris</i> . . . . .	Snap bean (green, dry)
<i>Phaseolus vulgaris</i> var. <i>humilis</i> . . . . .	Bush snap bean (kidney bean)
<i>Pisum sativum</i> . . . . .	Garden pea
<i>Pisum sativum</i> var. <i>arvense</i> . . . . .	Field pea
<i>Pisum sativum</i> var. <i>macrocarpon</i> . . . . .	Edible-podded pea
<i>Vicia faba</i> . . . . .	Fava bean (broad bean)
<i>Vigna mungo</i> . . . . .	Black bean
<i>Vigna radiata</i> . . . . .	Mung bean
<i>Vigna unguiculata</i> . . . . .	Cowpea

(Continued)

Table 2.1 (Continued)

Leguminosae—Pea or Bean Family (continued)	
<i>Vigna unguiculata</i> subsp. <i>cylindrica</i> . . . . .	Catjang bean
<i>Vigna unguiculata</i> subsp. <i>sesquipedalis</i> . . . . .	Asparagus bean (yard-long bean)
<i>Vigna unguiculata</i> subsp. <i>unguiculata</i> . . . . .	Black-eyed pea
Malvaceae—Mallow or Cotton Family	
<i>Abelmoschus esculentus</i> . . . . .	Okra
Polygonaceae—Buckwheat Family	
<i>Rheum rhabarbarum</i> . . . . .	Rhubarb
<i>Rumex acetosa</i> . . . . .	Sorrel
<i>Rumex patientia</i> . . . . .	Dock
Solanaceae—Potato or Nightshade Family	
<i>Capsicum annuum</i> var. <i>annuum</i> . . . . .	Pepper (bell, cayenne chili, red)
<i>Capsicum frutescens</i> . . . . .	Pepper (tabasco)
<i>Lycopersicon lycopersicum</i> . . . . .	Tomato
<i>Lycopersicon lycopersicum</i> var. <i>cerasiforme</i> . . . . .	Cherry tomato
<i>Lycopersicon pimpinellifolium</i> . . . . .	Currant tomato
<i>Physalis pruinosa</i> . . . . .	Husk tomato
<i>Solanum melongena</i> var. <i>esculentum</i> . . . . .	Eggplant
<i>Solanum tuberosum</i> . . . . .	Potato
Tetragoniaceae—Carpetweed Family	
<i>Tetragonia tetragoniodes</i> . . . . .	New Zealand spinach
Umbelliferae (or Apiaceae)—Parsley Family	
<i>Anthriscus cerefolium</i> . . . . .	Chervil
<i>Apium graveolens</i> var. <i>dulce</i> . . . . .	Celery
<i>Apium graveolens</i> var. <i>rapaceum</i> . . . . .	Celeriac
<i>Daucus carota</i> var. <i>sativus</i> . . . . .	Carrot
<i>Foeniculum vulgare</i> . . . . .	Fennel
<i>Pastinaca sativa</i> . . . . .	Parsnip
<i>Petroselinum crispum</i> . . . . .	Parsley
<i>Petroselinum crispum</i> var. <i>tuberosum</i> . . . . .	Turnip-rooted parsley
Valerianaceae—Valerian Family	
<i>Valerianella locusta</i> . . . . .	Corn salad

<sup>a</sup>Classification conforms closely with *Hortus Third*.

<sup>b</sup>Classified as *Amaryllidaceae* in *Hortus Third*.

## CLASSIFICATION BY EDIBLE PART

A botanical classification alone is not sufficient in classifying vegetables. The members of the same botanical family may be grown for different plant parts. For example, some members of the Umbelliferae are grown for their foliage (celery, parsley), while others are grown for their fleshy roots (carrots, parsnips). In the Solanaceae, tomatoes and peppers are grown for their mature fruits, eggplants for their immature fruits, and potatoes for their underground tubers. Production and handling practices for vegetables grown

for different parts are likely to differ considerably, although within each group similar cultural requirements and handling procedures would generally apply. The classification in Table 2.2 is based on the edible plant part, including root, tuber, bulb, stem, leaf, flower part, immature fruit, mature fruit, and seed.

**Table 2.2 Classification of Vegetables by Edible Plant Part**

Underground Parts		
<b>Root</b>		
Beet	Parsnip	Salsify
Carrot	Radish	Sweet potato
Celeriac	Rutabaga	Turnip
Horseradish		
<b>Tuber</b>		
Potato	Jerusalem artichoke	Yam
<b>Bulb</b>		
Garlic	Leek	Onion
Above-Ground Parts		
<b>Stem</b>		
Asparagus	Kohlrabi	
<b>Leaf</b>		
Brussels sprout	Chive	Mustard
Cabbage	Collard	New Zealand spinach
Celery (petioles)	Dandelion	Parsley
Chard	Endive	Rhubarb (petioles)
Chicory	Kale	Spinach
Chinese cabbage	Lettuce	Watercress
<b>Flower Part</b>		
Broccoli	Cauliflower	Globe artichoke
<b>Immature Fruit</b>		
Cucumber	Podded pea	Summer squash
Eggplant	Snap bean	Sweet corn
Okra		
<b>Mature Fruit</b>		
Gourd	Pepper	Watermelon
Honeydew	Pumpkin	Winter squash
Muskmelon/cantaloupe	Tomato	
<b>Seed (green or dry stage)</b>		
Cowpea	Soybean	Lima bean
Garden pea		

## CLASSIFICATION BY TEMPERATURE REQUIREMENT AND HARDINESS

A classification based on the temperature requirement for optimum growth and development is valuable in determining which crops may be planted in a given region and at what time during the year. In this classification (Table 2.3), vegetables are grouped into the categories cool-season and warm-season. The subgrouping into hardy, half-hardy, tender, and very-tender is based on the ability of young plants to withstand frost, and to a lesser extent, on the ability of seed to germinate at low temperatures. Those classified as hardy will generally tolerate moderate frost without injury, while those classified as tender are susceptible to damage during cold weather. The very-tender crops are easily damaged by light frost.

**Table 2.3. General Classification by Temperature Requirement and Hardiness**

Cool-Season Crops		Warm-Season Crops	
Hardy	Half-Hardy	Tender	Very-Tender
Asparagus	Beet	Cowpea	Cucumber
Broccoli	Carrot	New Zealand spinach	Eggplant
Brussels sprouts	Cauliflower	Snap bean	Gourd
Cabbage	Celery	Soybean	Honeydew
Chives	Chard	Sweet corn	Lima bean
Collard	Chicory	Tomato	Muskmelon/cantaloupe
Dandelion	Chinese cabbage		Okra
Garlic	Globe artichoke		Pepper
Horseradish	Endive		Pumpkin
Kale	Jerusalem artichoke		Squash
Kohlrabi	Lettuce		Sweet potato
Leek	Parsnip		Watermelon
Mustard	Potato		
Onion	Salsify		
Parsley			
Pea			
Radish			
Rhubarb			
Rutabaga			
Spinach			
Turnip			

Cool-season vegetables make optimum growth under cool and moderate temperatures, and seeds germinate reasonably well in cool soils. These crops can withstand light to moderate frost; some of them, notably rhubarb and

asparagus, can even endure winter freezing. Vegetables in this group are the ones generally planted earliest in the spring, and again later in the season for fall and winter harvest. The cool-season crops include mostly vegetables grown for their edible stems, leaves, immature flower parts, and roots (garden peas are the exception, being grown for their seeds). In comparison to their warm-season counterparts, the cool-season vegetables are usually more shallow rooted, and plant size is generally smaller. Except for the potato, cool-season vegetables are usually stored near 32°F after harvest.

The warm-season vegetables make optimum growth under mean monthly temperatures of 65 to 86°F. Their growth is usually checked when the air is cool, and injury or death results if they are frosted. The warm-season crops are mostly grown for their fruits, the exceptions being sweet potato and New Zealand spinach, which are grown for their roots and leaves, respectively. Within the tender and very-tender groups, there is considerable variation in the soil temperature necessary for seed germination. Many warm-season vegetables are subject to postharvest chilling injury when stored at temperatures between 32 and 50°F. Among warm-season vegetables, sweet corn is the only one stored at 32°F after harvest.

## **CLASSIFICATION BY LIFE CYCLE**

Another classification of importance to vegetable growers is based on life span, and it groups vegetables into annuals, biennials, and perennials (Table 2.4). Although grown as annuals, many vegetables are actually biennial or perennial in habit. Asparagus, rhubarb, and globe artichokes are some of the few vegetables commercially grown as true perennials. Tomatoes, peppers, eggplants, potatoes, and sweet potatoes are perennials in their native tropical environments but are grown as annuals for vegetable production in temperate regions. The biennial crops are marketed for their vegetative parts (except for broccoli and cauliflower) and are grown as annuals. Especially sensitive to low temperatures, these vegetables can be induced to flower and produce seedstalks prematurely if exposed to periods of low temperatures during their early development (see Chapter 3).

Numerous other methods can be used for classifying vegetables. Some of these include minimum, maximum, and optimum temperatures for germination; method of propagation (seeds or asexual); depth of rooting; water requirements; fertilizer requirements; tolerance to salts and boron; optimum



**Table 2.4. Partial Classification of Vegetables by Life Cycle**

<b>A. Perennial</b>		
Asparagus	Garlic	Pepper
Chicory	Globe artichoke	Potato
Chive	Horseradish	Rhubarb
Dandelion	Jerusalem artichoke	Sweet potato
Eggplant	Lima bean (large-seeded)	Tomato
<b>B. Biennial</b>		
Beet	Chard	Parsley
Broccoli	Chinese cabbage	Parsnip
Brussels sprout	Collard	Rutabaga
Cabbage	Kale	Salsify
Carrot	Kohlrabi	Turnip
Cauliflower	Leek	
Celery	Onion	
<b>C. Annual</b>		
Broccoli	Lettuce	Pumpkin
Cauliflower	Lima bean (small-seeded)	Radish
Cowpea	Muskmelon/cantaloupe	Snap bean
Chinese cabbage	Mustard	Soybean
Cucumber	New Zealand spinach	Spinach
Endive	Okra	Squash
Gourd	Pea	Sweet corn
Honeydew	Potatoe	Watermelon

soil pH ranges; response to photoperiod in relation to flowering, bulbing, and tuberization; and length of season (short growing period or long growing period).

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