Cabbage, Cauliflower and Kale
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Cabbage

1 Scientific Classification and Etymology; Botanical Description

a) Scientific Classification and Etymology

The scientific classification of cabbage is the followings: Kingdom: Planate; Division: Magnoliophyta; Class: Magnoliopsida; Order: Brassicales; Family: Brassicaceae; Genus: Brassica; and Species: olearacea variety capitata. Thus, the scientific name of cabbage is *Brassica oleracea* var. *capitata*. It is an edible plant of the Family Brassicaceae (or Cruciferae). Its scientific name originates from *brassica, ae*, the Latin classical name for cabbage. (Quattrochi, 349) The English name cabbage derives from the French word "caboche" (head) (http://www.biodatabase.de/Cabbage). Other varieties of the same plant species are broccoli, cauliflower, collard greens, kohlrabi, Brussels sprout, Chinese kale, broccolini and broccoflower.

b) Botanical Description

Cabbage is herbaceous flowering plant with leaves forming a compact head chrematistics. Approximately 400 species of cabbage have been documented into five groups: The first group includes the familiar round, smooth-leafed cabbages with the colors of white, green or red, and wrinkled-leafed varieties, such as Savoy. The second group comprises the pointed cabbages like European spring and Chinese cabbages. The third group contains the cabbages with abnormally large, budding stems like Brussels

sprouts. The fourth group comprises the cabbages with green curly types, such as kale and collard greens. Cabbage species in this group are often used as animal food or decoration of dishes for presentation. Finally, the last group includes flowing cabbages, like cauliflower and broccoli (Kiple & Ornelas, 290).

In addition, Cabbages are outbreeding plants. Therefore, cabbages only produce viable seeds through insect and hand pollination. Most cabbages are self-incompatible, meaning that the pollen is viable, but is unable to grow in a flower on the same plant. Because the insects must carry pollen from one plant to another instead of just carrying from one flower to another in the same plant, the more in a group of plants the better the pollination and seed production (Ashworth, 50-51).

2 Nutritional Value

a) Nutritional Chart

The serving size on the top left corner tells you how much of the food you need to eat to obtain the amount of nutrients found in the chart. The Daily Value percentage (DV%) represents the amount of nutrients in the daily serving size (in grams). Nutrient density is a ratio of nutrient content (in grams) to the total energy content (in kilocalories or joules). The nutrient ratings adopted by the U.S. Food and Drug Administration's "Reference Values for Nutrition Labeling" standards.

Table 1: Cabbage Nutritional Value

Cabbage, shredded, boiled **1.00 cup** **150.00 grams** **33.00 calories**				
Nutrient	**Amount**	**DV (%)**	**Nutrient Density**	**World's Healthiest Foods Rating**
vitamin K	73.35 mcg	91.7	50.0	excellent
vitamin C	30.15 mg	50.3	27.4	excellent

dietary fiber	3.45 g	13.8	7.5	very good
manganese	0.18 mg	9.0	4.9	very good
vitamin B6 (pyridoxine)	0.17 mg	8.5	4.6	very good
folate	30.00 mcg	7.5	4.1	very good
omega 3 fatty acids	0.17 g	7.1	3.9	very good
vitamin B1 (thiamin)	0.09 mg	6.0	3.3	good
vitamin B2 (riboflavin)	0.08 mg	4.7	2.6	good
calcium	46.50 mg	4.7	2.5	good
potassium	145.50 mg	4.2	2.3	good
vitamin A	198.00 IU	4.0	2.2	good
tryptophan	0.01 g	3.1	1.7	good
protein	1.53 g	3.1	1.7	good
magnesium	12.00 mg	3.0	1.6	good

World's Healthiest Foods Rating	Rule				
excellent	DV>=75%	OR	Density>=7.6	AND	DV>=10%
very good	DV>=50%	OR	Density>=3.4	AND	DV>=5%
good	DV>=25%	OR	Density>=1.5	AND	DV>=2.5%

(http://whfoods.org/genpage.php?tname=foodspice&dbid=13#summary)

b) Health Benefit Highlight

When cabbage is cut, chewed or digested, a sulfur-containing compound called sinigrin is brought into contact wit the enzyme myrosinase, resulting in the release of glucose and the breakdown of products, including the highly reactive compound, isothiocyanates. Isothiocyanates includes sulforaphane and indole-3-carbinol which are potent inducers of the liver's Phase II enzymes and thus detoxify carcinogens. Additionally, recent research conducted by the Institute for Food Research in the U.K. found one of these compounds, allyl isothicyanate, also inhibits mitosis (cell division) and stimulates apoptosis (programmed cell death) in human tumor cells. Furthermore, sulforaphane may also provide special protection to those with colon cancer-susceptible genes (http://whfoods.org/genpage.php?tname=foodspice&dbid=19#foodspicename).

3 Cultivation and Cultivars Uses

a) Climatic and Soil Requirements

Cabbage is a biennial that grows best in mild summer climates ranging from around 80-90F. American farmers in the northeast direct seed their cabbage in early May. Late cabbage is seeded directly about a week later around May 10 to 15. The plant likes full sun and average water (Ashworth, 51). Cabbage thrives in deep fertile loamy soils well supplied with fertilizers lime and borax and having pH of between 5.5 and 6.5. Also, soil should be well drained and aerated for best results (http://www.bloomingarden.com/cabbrobrucau.html).

b) Cultivars Uses

Cabbage Types	Recommended Varieties
Green Cabbage  (http://www.flickr.com/photos/calliope/54833241/sizes/s/)	Golden Acre Yellows Resistant, Stonehead, Early Jersey Wakefied (early), Marion Market, Market Size, Round-Up (mid-season), Danish Ballhead, Wisconsin All Seasons (late)
Red Cabbage  (http://www.flickr.com/photos/jpockele/328467317/sizes/s/)	Ruby Ball and Red Acre

Savoy Cabbage  (http://www.flickr.com/photos/satrina0/855541259/sizes/s/)	Savoy King (mid-summer and late) and Vanguard

(http://www.bloomingarden.com/cabbrobrucau.html.)

c) Planting

The planting procedure includes three steps. First, seed treatment is needed before seeding. Soak seed for 25 minutes in 70F water. Maintain this uniform temperature with an accurate measurement of using a thermometer. Second, direct seeding uses 2 lb seeds/acre; therefore reduce it to the desired area. Direct seeded crops should be sown 0.5 to 0.75 inches deep. Third, spacing depends on different seasons. Early season (mid-February) cabbage rows 2.5 ft apart and plants 1 to 1.5 ft apart from each other. Late season (mid-May to early June) cabbage rows 2.5 to 3 ft apart and plants 1 to 1.5 ft apart from each other (www.gov.mb.ca/agriculture/crops/vegetablecrops/pdf/bmz00s04p.pdf). After seeding, use floating row covers to protect against several harmful insects, such as cabbage worm, cabbage looper, aphids and flea beetle (http://www.ces.ncsu.edu/depts/hort/hil/hil-7.html).

d) Overwintering

To successfully grow cabbage, vernalization is also required. Vernalizaiton is a period of cold temperatures for flowering. Therefore, dig the plan in early October and store heeled into sand or sawdust in a root cellar. Roots should be watered mid- to late-

winter and replanted in early may. The second year plant is extremely susceptible to flea beetles. Thus, a row cover is needed until flowers form (Ashworth, 50-51).

4 Origin and geographic distribution of crop; History of cultivation and distribution

Compared to all of the vegetables that originated in Europe, the cabbage family has one of the longest histories. Many botanists believe that the modern brassicas evolved from the wild sea kale (*B. oleraccea*), which is native along the western and southern sea coasts of Europe (Nieuwhof, 1969). Cabbage originated in the eastern Mediterranean or Asia Minor, and the hard-headed varieties produced today were grown in Europe by the ninth and tenth centuries. The Greeks and Romans consumed cabbage. Cabbages and kale were the first of the cole crops that were domesticated approximately 2,000 years ago "with a history stretching back into the most distant past include several members of the cabbage family…" mostly because of the important nutrients found in cabbage and its ability to thrive in various environmental conditions (Food in History, 1988). Numerous related varieties are described as being culinary and medicinal plants by Cato, Pliny, Columella, Dioscorides, Theophrastus and many others. Wild cabbage is a parent plant of many cultivated vegetables (e.g. Broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, and kohlrabi). Heading cabbage is one of the earliest forms of cabbage and was cultivated in Germany by the 1150s and in England by the 14th century. Early forms of cabbage were known as coleworts and were crucial greens for medieval potions. Charles Estienne writes, "First of all we are to speake of coleworts, both because they are most common, and also most aboundant of all other sorts of hearbs" (Food in History, 1988). French explorer Jacques Cartier, planted seed in Canada in 1541 and introduced cabbage to what would become the United

States. Thomas Jefferson's gardens had numerous types of cabbages such as French, Milan, Savoy, Ox-heart, Roman, Scotch, Sugarloaf, York, and Winter. (http://monticellostore.stores.yahoo.net).

History in North America

The first settlers at Jamestown introduced cabbages to Virginia. Whitaker in his treatise, titled "Good News from Virginia" (1612), writes, "Our English seeds thrive very well heare, as Peas, Onions, Turnips, cabbages, coleflowers" (Food in History, 1988). Cabbage, however lost popularity because of the sulfurous smell and many people in society considered it a lower class food. The ladies considered it more of a "fine meal" than the men. The women relied on cabbage cutters and planes, which are wooden planks with a hole cut into it for adjustable steel blades to prepare their meals (Oxford Encyclopedia of Food and Drink in America, 2004).

Medicinal Uses and Nutritional Value

In his article, "Hooked on a feeling", Max Dalrymple encourages the redefinition of medical paradigms for the prevention of diseases that we currently rely on medication to treat. He argues that one better way to treat cancer and lower one's chances of getting the disease "is to simply do what the Polish women mentioned …eat more sauerkraut, and Brussels sprouts. We don't need expensive drug trials to start saving lives" (Dalrymple, 339). Dalrymple reinforces the health benefits of cabbage in specific, and the overall health benefits of vegetables and healthy eating as well.

Cabbage is bursting with various health-giving properties such as an abundant supply of vitamin C, vitamin A, as well as other minerals, phosphorus, calcium and iron. Cabbage also has lactic acid which helps digestion and is low in calories (Turgeon, 1977). Cole crops were mainly suggested for medicinal purposes during the 19th century: "They were used against such ailments as gout, diarrhoea, coeliac trouble, stomach trouble, deafness, and headache. Cabbage juice was said to be a remedy against poisonous mushrooms, and was also used as a gargle against hoarseness" (Nieuwhof, 1969).

Literary Importance

Cabbage also had a deep literary significance and was often referenced in poetry suggesting the importance of the crop in cuisine culture. The cultural, medicinal, and communal benefits are only part of the reason cabbage was discussed frequently in literature. For example, "Penny Wise and Pound Foolish" is a poem that was written in 1819 by an anonymous writer:

Penny Wise and Pound Foolish

Poor John had bought him half a hog,
And thought it would be glorious prog,
To eat with cabbage, peas and beans,
Or with a dish of winter greens:
But Nelly thought it far too dear;
Indeed it cost her many a tear;
She used, (for shaving was her boast,)

But half a pound of salt at most.

But see how Nelly was mistaken-

She sav'd her salt—but lost her bacon

The presence of cabbage and other crops in the literature suggest that it had widespread popularity during that time period. Cabbage was mentioned in poetry and made its way into recipe books as well. Gardening in the 19th century was an opportunity for community development and the production of food to sustain the people. Cabbage was a popular choice because given adequate environmental conditions, it was relatively easy to grow, maintain and store for long period of time. Especially in places like Russia, with long winters, having stored vegetables and supply of nutrients led the people to believe that cabbage was important. Communities passed on their beliefs and strategies about preparing the food in cookbooks and recipes, or "receipts". Advice about how "cabbages need to boil an hour" and other traditions and tips were passed on especially during the family meals.

Cultivation

During this time period, the most effective way of growing a garden was sowing the seeds as soon as the weather and vegetation start developing. Each cabbage variety deserves a strong, rich soil, "preferably clay instead of sand; but would grow in any soil as long as it is properly cared for and maintained" (Rare Book Information, New York 1824, 74). Cabbage thrived if it was "well worked, and liberally manured with compost or well-rotten dung" (Rare Book Information, New York 1824, 77). The optimum temperature range for cabbage was 15-20 degrees Celsius

(http://discworld.imaginary.com) but has since adapted to the current environmental conditions such as global warming. When farmers were experimented with different farming techniques and planning conditions they learned that younger plants had more of an ability to grow in temperatures that fall on either end of the extreme, "if the environmental conditions are not good for the cabbage, then they might develop problems such as long stems in the heads" (Turgeon, 1977). It was also discovered that cabbage was a plant sensitive to soil acidity because it relies on plenty of nitrogen and potassium to thrive.

Varietals

Early cabbage varieties were Sugar Loaf, Battersea, Early York or Yorkshire, Early Dutch, and Russia (http://www.history.org/history/CWLand/resrch3.ctm) The "Drumhead" was one of the most common varietals in upstate New York. The Seed Savers Catalogue offers five varieties of cabbage. The first is 353- Copenhagen Market which was introduced around 1909 by the H. Hartman & Company. They offer medium and large size plants and growing to full size takes approximately 63-100 days from transplanting. The cabbages are approximately 6-8 inches in diameter and weigh around three to five pounds. Another variety is the 353- Early Jersey Wakefield which was originally grown in 1840. This variety has a shorter transplanting period of 60-75 days. It is the "earliest market variety" that this Seed Catalog offers. Also, "eight varieties of cabbage, which included the addition to the older varieties of the Russian cabbage, the flan-sided cabbage, and the early batter sea cabbage, in the eighteenth century rose to fifteen main types of garden cultivation a hundred years later" (Lyte, Charles, 1984). Another variety is the late flat Dutch. In the book titled *Descriptions of Types of*

Principal American Varieties of cabbage suggests that the Late Flat Dutch would be representative of the 1812 time period (Boswell, Victor, 1934).

5 Other issues that relate specifically to cabbage

Sauerkraut

Raw cabbage retains all of its vitamins and minerals, and sauerkraut also retains a majority of these even when it is stored. Cabbage is also "rather antisocial when stored because its odor becomes very pungent and pervasive and can affect other vegetables and fruits, so in general it is best to put cabbage in solitary confinement" (Turgeon, 1977). The laborers who built the Great Wall of China were given sauerkraut to prevent debilitating diseases such as scurvy, that were brought on from only eating rice (Turgeon, 1977).

In the nineteenth century, sauerkraut was typically a cold-weather food. It was, for instance often served with turkey on New Year's Day. The directions for preparing sauerkraut are, "Put good clean sauerkraut in water over the fire. Season it and let it simmer for two hours. In a sauce pan, heat some skimming grease, goose fat, drippings or pork lard. Sprinkle a little flour into it and let this turn straw color. (Onion lovers can also stir in a minced onion). Add strong meat broth to this and then the sauerkraut, together with some of the liquid in which it cooked, so long as it is not too sour. If such is the case, ignore this step, pour off the liquid, and use more meat broth. Stir in more drippings or goose fat, if you have them, and let this cook together well." (Colonial Williamsburg History, http://www.history.org/history/CWLand/resrch3.cfm#3g).

Use of Cabbage in Russian cuisine

Cabbage is an essential vegetable in Russian cuisine and borscht is one of most popular dishes. There are varieties of preparations of the Russian Beef Borscht, but the following is one that is most common.

Russian Beef Borscht (8 servings)_From the Of Cabbages and Kings Book:

Ingredients:

2-3 pounds meaty beef shin, 1 ½ teaspoons salt, 2 onions, 2 cloves, 1 cup tomato puree, 2 large potatoes, 1 small cabbage, 2 teaspoons red wine vinegar, 2 teaspoons chopped fresh dill or 1 teaspoon dried dill weed, freshly ground black pepper, 1 pint sour cream

Place the skin in a kettle containing 3 quarts of water and the salt.

Bring to a boil and simmer for 1 ¼ hours, removing any scum as it rises to the surface.

Add the onions stuck with the cloves and the tomato puree, and simmer 30 minutes.

Meanwhile peel the potatoes and cut into large dice.

Wash and quarter the cabbage, discarding the hard core.

Chop the cabbage rather coarsely.Remove the beef shin with a slotted spoon.

Add the potatoes, cabbage, and 1 teaspoon of the fresh dill (or ½ teaspoon of the dried variety).

Simmer 30 minutes, adding more water if necessary.

Cut the shin meat into small shreds.

Add the beets cut into strips, the juice and the caraway seeds and the meat.

Simmer 5 minutes. Taste for seasoning, adding salt and freshly ground black pepper.

Remove from the heat. Stir a little of the hot soup into the sour cream.

When well mixed pour the cream into the soup and serve sprinkled with a little dill.

CAULIFLOWER

1 Scientific Classification and Etymology; Botanical Description

a) Scientific Classification and Etymology

Cauliflower is a vegetable that belongs to the Cabbage family, which is also the Brassicaceae family or Cruciferae. Its scientific name is *Brassica oleracea var. botrytis* (http://www.biodatabase.de/Cauliflower). The plants in this family all share a common feature: their four-petaled flowers resemble to a Greek cross and are often refereed to as crucifers or cruciferous vegetables (http://www.dolesuperkids.com/html/kids/Nutrition%20Database/Encyclopedia/Encyclopedia_New/Cauliflower/index.html).

Its scientific name originates from the classical Latin word for Wild Cabbage (Quattrocchi, 349). The name cauliflower comes from the Latin words *caulis*, meaning "stalk," and *floris*, meaning "flower." As suggested by its name, cauliflower is actually a flower. The editable part of the plant is the head of underdeveloped, tender flower stems and buds. (http://www.dolesuperkids.com/html/kids/Nutrition%20Database/Encyclopedia/Encyclopedia_New/Cauliflower/index.html)

c) Botanical Description

Cauliflower is a biennial and frost tolerant vegetable with compact heads of immature or aborted flowers contracted into a single head. Its heads are usually white but can also be yellow or purple. Cauliflower is also an outbreeding plant. Cauliflower and

broccoli will cross with other varieties within the huge *B. oleracea* species, which include all cabbages (except Chinese cabbage), Brussels spouts, kale, collards, and kohlrabi, as well as with each other (Ashworth, 52).

In addition, cauliflower must undergo vernalization in order to flower. In some regions where winter temperature does not drop below 28F, brassicas can be planted in the fall, and seed is harvested the following summer. Most cauliflower is self-incompatible. For the purpose of providing a good seed set and of preserving much genetic diversity, a minimum of six plants are ought to be used for seed saving (Ashworth, 53).

2 Nutritional Value

a) Nutritional Chart

The serving size on the top left corner tells you how much of the food you need to eat to obtain the amount of nutrients found in the chart. The Daily Value percentage (DV%) represents the amount of nutrients in the daily serving size (in grams). Nutrient density is a ratio of nutrient content (in grams) to the total energy content (in kilocalories or joules). The nutrient ratings adopted by the U.S. Food and Drug Administration's "Reference Values for Nutrition Labeling" standards.

Table 2: Cauliflower Nutritional Value

Cauliflower, boiled
1.00 cup
124.00 grams
28.52 calories

Nutrient	Amount	DV (%)	Nutrient Density	World's Healthiest Foods Rating
vitamin C	54.93 mg	91.5	57.8	excellent
vitamin K	11.17 mcg	14.0	8.8	excellent
Folate	54.56 mcg	13.6	8.6	excellent
dietary fiber	3.35 g	13.4	8.5	excellent
vitamin B6 (pyridoxine)	0.21 mg	10.5	6.6	very good
Tryptophan	0.03 g	9.4	5.9	very good
omega 3 fatty acids	0.21 g	8.8	5.5	very good
Manganese	0.17 mg	8.5	5.4	very good
vitamin B5 (pantothenic acid)	0.63 mg	6.3	4.0	very good
Potassium	176.08 mg	5.0	3.2	good
Protein	2.28 g	4.6	2.9	good
Phosphorus	39.68 mg	4.0	2.5	good
vitamin B2 (riboflavin)	0.06 mg	3.5	2.2	good
vitamin B1 (thiamin)	0.05 mg	3.3	2.1	good
Magnesium	11.16 mg	2.8	1.8	good
vitamin B3 (niacin)	0.51 mg	2.5	1.6	good

World's Healthiest Foods Rating	Rule				
excellent	DV>=75%	OR	Density>=7.6	AND	DV>=10%
very good	DV>=50%	OR	Density>=3.4	AND	DV>=5%
good	DV>=25%	OR	Density>=1.5	AND	DV>=2.5%

(http://whfoods.org/genpage.php?tname=foodspice&dbid=13#summary)

b) Nutritional Profile and Health Benefits Highlight

One cup of boiled cauliflower is an excellent source of vitamin C (91.5% of the DV), folate (13.6% of the DV), and dietary fiber (13.4% of the DV). That same amount of cauliflower also serves as a very good source of vitamin B5, vitamin B6, manganese

and omega-3 fatty acids (http://whfoods.org/genpage.php?tname=foodspice&dbid=13#summary).

Consumption of cauliflower is known to reduce the risk of a number of cancers, such as lung, colon, breast, ovarian and bladder cancer. Recent research from University of Hawaii reveals that crucifers like cauliflower also provide important cardiovascular benefits. Researchers have shown that a phytonutrient called indole-3-carbinol found in cruciferous vegetables, even in the tiny concentration of 100 micromoles per liter, can lower liver cell's secretion of the cholesterol transporter ApolipoproteinB-100 (ApoB-100) by 56%. ApoB-100 is the main carrier of LDL cholesterol to tissues, and high levels have been linked to plaque formation in the blood vessels. When liver cells were treated with I-3-C, researchers found not only apoB-100 secretion was cut by more than half, but also the synthesis of lipids (fats) was decreased significantly. (http://whfoods.org/genpage.php?tname=foodspice&dbid=13#summary)

3 Cultivation and Cultivars Uses

a) Climate and Soil Requirements

Cauliflower can be abundantly produced from April to December in the maritime Northeast. This plant likes mild summer climates (around 80-90F). Soil with rich humus is crucial because cauliflower tends to have weak root systems. Because cauliflower will produce the best quality heads only with continuous rapid growth, ideal soil conditions should be fertilized. Thus, one-quarter to half cup of complete organic fertilizer is needed to put into the soil and immediately below the plant if the soil is light enough to permit good root development. A soil with pH between 6.5 and 7.5 is important for best development (http://discworld.imaginary.com/lpc/links/cabbage/info/cauliflower.html).

b) Cultivars Uses

Cauliflower Types	Recommended Varieties
Early Cauliflower	a) Snow Crown  (http://flickr.com/photos/ennor/431302761/sizes/s/) About 50-60 days from planting to harvest. It may show some pinking when maturing in the hotter parts of summer. Its hybrid vigor and rapid growth produce large, fully-domed curds with a mild and sweet flavor. b) Snow Peak About 50 days from planting to harvest. Snow Peak's dense white curds have a crisp, mild taste that attracts people back for more. It is best grown when planted in the Spring for an early Summer harvest.
Autumn Cauliflower	a) Ravella  (http://flickr.com/photos/mmewuji/3598981/sizes/s/) About 65-85 days from planting to harvest. The heavy snow white hears are easily grown. It wraps its head almost perfectly under good growing condition and performs well during cold weather. Best sowing dates from March to June.

b) Alverda

(http://flickr.com/photos/monkeyone/271662746/sizes/s/)

About 80-100 days from planting to harvest. The medium-sized plants product a wonderful bright lime-green curd, particularly when planted to mature in cool weather. Pick before the head loosens up for the best eating quality.

c) Fremont

(http://flickr.com/photos/calliope/54833239/sizes/s/)

About 75-85 days from planting to harvest. Fremont is the most popular choice for commercial growers in Northern areas. The 2-2.5 pound heads can endure well both Summer and Fall harvest periods.

	d) White Rock  (http://flickr.com/photos/moniquehofland/398887101/sizes/s/) About 80-100 days from planting to harvest. It is a very popular, smaller headed variety. It has extremely well-wrapped curds, which offer good frost and rain protection for late harvest e) Arbon About 120-140 days from planning to harvest. It produces heavy yields of large, tender, sweet curds late October or November from a June sowing. It is also well-wrapped as White Rock.

((http://discworld.imaginary.com/lpc/links/cabbage/info/cauliflower.html)

c) Planting

Start transplants of the early types from March to June or direct seed them if desired from mid-April to June. Seeds are sown 0.5 inch deep in clumps of 4, 24 inches apart, and 30 inches between rows. Thin gradually to the best single plant. Start late types by direct seeding during June. Start overwintering cauliflower during early July to early August. Remember that one teaspoonful of bloodmeal every 3 weeks sprinkled about the base of the plant will produce maximum growth (http://discworld.imaginary.com/lpc/links/cabbage/info/cauliflower.html). After cultivation, floating row covers are needed to guard against flea beetles.

4 Origin and geographic distribution of crop; History of cultivation and distribution

Cauliflower is one of the cultivated varietals of cabbage. It is picked during the bud stage before it blossoms. The flowers are the parts that are most frequently eaten because they are the most nutritious (http://www.whfoods.com/genpage.php). It is commonly believed that cauliflower originated in the Middle East, and in Italy, since the 15th century (http://www.urbanext.uiuc.edu/veggies/cauliflower1.html, Nieuworf, 1969). Cauliflower may have migrated to Europe from Cyprus, and during the 16th century, it spread in popularity from Italy to France (http://www.cauliflowerfestival.com). It was found in North America around the end of the 1600s" (Nieuworf, 1969).

Recipe books from the 18th century suggest that individuals from that time period enjoyed boiling, frying, and stewing cauliflower (Nieuworf, 1969). Interestingly enough, in the 19th century people even boiled cauliflower in milk to make the flavor a bit gentler "it is not without some difficulty, that this plant is brought to perfection in any country, where the frost is severe in winter, and especially where the summers are as hot as they are in every part of the United States. Still it may be brought to perfection.—It is a cabbage, and the French call it the flower-cabbage" (Cobbett, 2003). Often it was used in butter or white sauces and served as a side dish with meat dishes. Serving meat was a sign of success and often people aimed to have it three times a day if possible (http://growingtaste.com/vegetables/cauliflower.shtml). The first cauliflower cookbook was published by Arthur A Crozier in 1891 and since that point remained a popular ingredient for a variety of dishes (Nieuworf, 1969)

5 History of the crop in early 19th-century America

Early gardening authors mentioned the only varieties were early (spring-sowed and fall harvested) and late cauliflower (Cobbett, 2003). Mark Twain said that "cauliflower is nothing but cabbage with a college education". Cauliflower is known for its nutritious values of high vitamin C and fair source of iron. It thrives in cool and moist conditions (approximately 50 to 68 degrees Farenheit) and tolerates light frost as well which means that overall the crop can adapt to various weather conditions in different countries **(**http://www.gardening.cornell.edu/homegardening/scene595b.html**)** and thus explaining its international popularity.

Some of the recommended open-pollinated varietals are self-blanche which takes 71 days to harvest and produces 7 inch heads with excellent leaf protection. Some common hybrids are Andes, candid charm, Serrano, snow crown, snow grace and snow king (http://www.urbanext.uiuc.edu/veggies/cauliflower1.html). Also Arapaho and arctic are recommended as well (http://cuke.hort.nesu.edu). The Seed Savers exchange has two varieties of cauliflower. Peter Henderson & Company introduced the Early Snowball variety in 1888. This variety in particular can adapt to harsher environmental conditions and produces "white curds [that] are solid, crisp and tender, excellent quality" (Seed Savers Catalogue). The other variety that this company offers is the 613- Purple Cape. It originated in South Africa in 1808.

6 Other issues that relate specifically to cauliflower

Poetry from the time period:

I cook whatever I can
What my hog won't touch,

I feed to my old man!

Old Folk Saying
(Sauerkraut Yankees, 50).

Sauerkraut and pork
Drive all cares away.

A Folk Saying
(Sauerkraut Yankees, 151).

On September. 29, 2007 there was a Cauliflower Festival
Cauliflower Pot Pie was one of the winning recipes:
(http://www.cauliflowerfestival.com/recipies.html)

Cauliflower Pot Pie
1st place – Jean-Paul Iasutto-Summerfield's restaurant

Ingredients
2 large cauliflower – use floret's only
3 tsp. salt
1 qt. milk
8oz butter
8 oz flour
10 oz shredded Swiss cheese
3 oz grated parmesan cheese
½ tsp. grated nutmeg
1 tsp. white pepper
10 oz. baked Virginia ham or prosciutto (optional)

Instructions:
Cook the cauliflower in oiling water 7-15 minutes until tender. Drain and place in ice water.

In a saucepan, melt butter and flour until blended. Add milk gradually, cook slowly until thickened. Add the cheeses, nutmeg, salt, pepper, ham and the cooked, dry patted cauliflower florettes.

Pour the mixture into a baking dish. Preheat your oven at 350 degrees. Cover the baking dish with a sheet of puff pastry dough and brush it with an egg wash. In the center, cut a ½ inch hold. Bake the Cauliflower Pot Pie at 350 degrees for 20-25 minutes or until the dough is golden brown. Let stand for 5-10 minutes before serving.

Kale

1 Scientific Classification and Etymology; Botanical Description

a) Scientific Classification and Etymology

Kale is a leafy green vegetable that belongs to the *Brassica* family. In contrast to other highly developed forms in the same family, such as cauliflower, broccoli, and cabbage, kale has retained its primitive form through thousands of years because of its merit as a garden vegetable. Although kale comes in various colors like yellow, deep green, deep steely blue, purplish red and almost black, it is usually classified by its leaf form and texture. For example, Scotch types have very curly and wrinkled leaves, Siberian types are almost flat with finely divided edges, and Lacinato types have embossed texture leaves (http://www.ngb.org).

The scientific name of kale is *borecole*, which means leafy nonheading cabbage. The Latin name *Brassica oleracea variety acephala*, the last term meaning "without a head." This term was used by the Greeks and Romans in referring to the whole cabbage-like group of plants. The English name kale derives from the Scottish word "*coles*" or "*caulis*". (http://plantanswers.tamu.edu/publications/vegetabletravelers/kale.html).

b) Botanical Description

In the summer, the flavor of spring planted kale becomes more intense- almost bitter-as the weather warms up. Kale actually tastes sweeter and tastier after being exposed to a light frost. Its blue-green color is associated with greater cold tolerance. Kales are also noted as "baby" and "mature", which can be used raw when young and

cooked when they mature.

(http://www.ngb.org/gardening/fact_sheets/fact_details.cfm?factID=21).

2 Nutritional Value

a) Nutritional Chart

The serving size on the top left corner tells you how much of the food you need to eat to obtain the amount of nutrients found in the chart. The Daily Value percentage (DV%) represents the amount of nutrients in the daily serving size (in grams). Nutrient density is a ratio of nutrient content (in grams) to the total energy content (in kilocalories or joules). The nutrient ratings adopted by the U.S. Food and Drug Administration's "Reference Values for Nutrition Labeling" standards.

Table 3: Kale Nutritional Value

Kale, boiled **1.00 cup** **130.00 grams** **36.40 calories**				
Nutrient	**Amount**	**DV (%)**	**Nutrient Density**	**World's Healthiest Foods Rating**
vitamin K	1062.10 mcg	1327.6	656.5	excellent
vitamin A	9620.00 IU	192.4	95.1	excellent
vitamin C	53.30 mg	88.8	43.9	excellent
Manganese	0.54 mg	27.0	13.4	excellent
dietary fiber	2.60 g	10.4	5.1	very good
Copper	0.20 mg	10.0	4.9	very good
Tryptophan	0.03 g	9.4	4.6	very good
Calcium	93.60 mg	9.4	4.6	very good
vitamin B6 (pyridoxine)	0.18 mg	9.0	4.5	very good
Potassium	296.40 mg	8.5	4.2	very good

Iron	1.17 mg	6.5	3.2	good
Magnesium	23.40 mg	5.8	2.9	good
vitamin E	1.11 mg	5.6	2.7	good
omega 3 fatty acids	0.13 g	5.4	2.7	good
vitamin B2 (riboflavin)	0.09 mg	5.3	2.6	good
Protein	2.47 g	4.9	2.4	good
vitamin B1 (thiamin)	0.07 mg	4.7	2.3	good
Folate	17.29 mcg	4.3	2.1	good
Phosphorus	36.40 mg	3.6	1.8	good
vitamin B3 (niacin)	0.65 mg	3.3	1.6	good

World's Healthiest Foods Rating	**Rule**				
excellent	DV>=75%	OR	Density>=7.6	AND	DV>=10%
very good	DV>=50%	OR	Density>=3.4	AND	DV>=5%
good	DV>=25%	OR	Density>=1.5	AND	DV>=2.5%

(http://whfoods.org/genpage.php?tname=foodspice&dbid=38#summary)

b) Nutritional Profile and Health Benefits Highlight

Kale is a low calorie, leafy green vegetable, high nutrition whether it is raw or cooked. A cup of raw kale has 60 calories whereas cooked kale has 48 calories. Although kale can lose one-third of its nutritive value when it cooked, a cup of kale satisfies the minimum daily requirement of Vitamin A and C and 13 percent of the calcium requirement. In addition, kale is a good source of glucosinolates, Vitamin E, and manganese (http://www.ngb.org/gardening/fact_sheets/fact_details.cfm?factID=21).

The rich chemical substances of *glucosinolates* and the methyl *cysteine sulfoxides* in kale have the ability to activate detoxifying enzymes in the liver that help neutralize potentially carcinogenic substances. Moreover, there are 10-15 *glucosinolates* present in kale and other *Brassicas* that appear able to decrease the occurrence of a wide variety of cancers, including breast, bladder and ovarian cancers. Another unique compound,

organosulfur is well known for its carotenoids, especially *lutein* and *zeaxanthin*. These carotenoids function like sunglass filters and prevent the eyes from overexposure to ultraviolet light. Thus, studies have shown the protective effect of these nutrients against the risk of cataracts, where increased eye cloudiness leads to blurred vision. Eating *lutein*-rich foods like kale could lower the risk for new cataracts by 50%. (http://whfoods.org/genpage.php?tname=foodspice&dbid=38#summary).

3 Cultivation and Cultivars Uses

a) Climate and Soil Requirements

Kales prefer cool weather and can bear light frosts. They grow best in full sun in rich (good mix of organic matter, such as compost, humus, well-rotted manure, or leaf mold into the soil before planting), moist, slightly alkaline (pH 7.0) well-drained soil. To avoid any soil borne diseases, crop rotation is crucial. Thus, do not plant any members of the cabbage family like cauliflower, broccoli, kohlrabi, Brussels sprouts and mustard greens, in the same place for four years. (http://www.ngb.org/gardening/fact_sheets/fact_details.cfm?factID=21).

b) Cultivars

Kale Types	Recommended Varieties
1) Curly kale	It has ruffled leaves and a fibrous stalk and is usually deep green. It has a lively pungent flavor yet delicious bitter peppery qualities (The World Healthiest Foods).

 (http://flickr.com/photos/etcher/1744478280/sizes/s/)	Varieties include: a) Dwarf Blue Curled Scotch b) Redbor c) Winterbor (National Garden Bureau)
2) Ornamental kale  (http://flickr.com/photos/brewbooks/318568954/sizes/s/)	It is a more recently cultivated species that is considered as salad savoy. Its leaves can be green, white or purple. Its stalks coalesce to form a loosely knit head. It has a more mellow flavor and tender texture (The World Healthiest Foods). Varieties include: a) Red Russian b) Blue-Curled Vates c) White Russian (National Garden Bureau)
3) Heirloom kale  (http://flickr.com/photos/visualarts/413226936/sizes/s/)	It is also know as *Lacinato*. It has dark blue-green leaves that have an embossed texture. It has a slightly sweeter and more delicate taste than curly kale (The World Healthiest Foods). Varieties include: Tuscan Black or Dinosaur ((National Garden Bureau)

c) Planting

Kale is best directly seeded into the garden. For fall harvest, sow seeds in July. Conserve seeds by grouping 3 or 4 seeds at the desired plant hole instead of the traditional continuous row and then thinning and throwing away a lot of seeds. Sow the seeds 1/4 inch deep. Water them well and keep the soil surface moist especially for drier mid-summer planting. Once the seedlings are several inches high with at least two sets of leaves, leave the strongest and pinch out the rest in each group. During its growth period, cover the plants with floating row cover to prevent aphids and cabbage loopers. (http://www.ngb.org/gardening/fact_sheets/fact_details.cfm?factID=21)

4 Origin and geographic distribution of crop; History of cultivation and distribution; Culinary, medicinal, and ritual significance of crop

Kale is a descendent of the wild cabbage, which was thought of as originating in Asia Minor and was brought to Europe around 600 BC by groups of Celtic wanderers. It is the most robust cabbage type because it is very hard and firm and was one of the most common crops in Europe (Quattrochi, 347). Kale was a significant crop during ancient Roman times and Middle Ages. English settlers brought kale to the United States around the 17th century. The typical kale known in the 18th century may have been somewhat larger than modern kales, which include Black Tuscan Kale, Siberian Kale, Sprout Kale, Red Russian (Ragged Jack) and Scotch Kale. (http://www.history.org/history/C). During the 19th century, dinosaur kale was discovered in Italy.

Cultivation

During World War II, kale was cultivated to support the "Dig for Victory" campaign. Kale was chosen because it has a tremendous nutritional value and is relatively easy to grow. Ornamental kale was first cultivated commercially in the 1980s in California. The most valuable growing places currently are in central and northern North America and Europe. Kale tolerates almost all soils given proper drainage: "the cale does not head, or loave, but sends forth a loose, open top, which in England, is used after the frost has pinched it, and then it sends out side-shoots from its tall stem, which it continues to do, if kept cropped, till May. In mild winter climates it is very useful and pleasant. It does not get rotted by the successive freezing and thawing, as cabbages do" (Cobbett, 2003). Also, kale infrequently suffers from pests and other problems that other cabbages do.

Kale is known as one of the Old World cabbages. It was the green vegetable for most of the poor people until the Middle Ages, when head cabbages were originally cultivated. Kale got its name from "kail" which is the Scottish name for the plant (Cambridge World History of Food). There are three heirloom varieties of kale that the Seed Savers Catalogue offers. The one we are selecting for our garden is the Red Russian (625OG). The plants have purple-veined blue-green leaves that have a mildly sweet flavor. They have been documented since 1885 (Seed Savers Catalogue). There are three varieties of kale that the Seed Savers Catalogue offers for sale. The one we are selecting for our garden is the Red Russian (625OG). The plants have purple-veined blue-green leaves that have a mildly sweet flavor. They have been documented since 1885 (Seed Savers Catalogue).

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