

## GLORIOUS GARLIC, HERB OF THE YEAR 2004

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*Editors note: The following article was written by Mr. Charles Voigt, Vegetable Crops Specialist at U of I. He is a leading authority in garlic and herb production. With his permission I have modified the original document submitted to the IHA for length. If you are interested in obtaining the original, please contact Mr. Voigt by email at: [cevoigt@uiuc.edu](mailto:cevoigt@uiuc.edu).*

### Introduction:

Garlic ranks behind only onion as the second most important *Allium* crop in the world (1), and has finally begun to assume the same importance in this country as it has always enjoyed in the rest of the world.

This is due to the rise of ethnic cuisines in the United States, based on the continuing tide of immigration into the US, and increased reliance on eating out over the last 20 years. Trendy spots now lace dishes from seafood to mashed potatoes with copious amounts of this herb. Roasted garlic seems to be the flavor du jour of the country. Garlic festivals in places like Gilroy, California, and Saugerties, New York, annually attract thousands of devotees to celebrations of the "stinking rose". Medicinal, culinary, and mystical significance is attached to this bulb. A plant that can fight disease, thin the blood, reduce cholesterol, season a variety of foods, and repel vampires seems to offer some diverse marketing possibilities.

### History, Mythology, and Lore:

Garlic is believed to have originated in the mountains of central Asia, in the present day republics of Kazakhstan, Uzbekistan, and Turkmenistan. Today it is found wild in Siberia and on the slopes of the Ural Mountains (14). From this origin, garlic has been cultivated for many thousands of years, perhaps being one of the earliest wild plants tended by humans (1). Despite the fact that cultivated garlic has lost the capacity to produce viable seeds, there are a wealth of subspecies and varietal types grown in, and available from, the four corners of the world. Each ethnic group, geographic area, and cultural stratum seems to have its own preferred garlic varieties. When possible, selection of a strain well suited to local growing conditions will help ensure success.

Many ancient cultures were familiar with the culinary and medicinal uses of garlic. It is mentioned in the Sanskrit writings and in the book of Numbers in the Bible. Herodotus writes that the Egyptians ate it and that it was a part of the diet of the pyramid builders. Among many peoples, though, the plant was considered unclean and evil food of barbarians. Ancient Greek priests permitted no one who had eaten garlic to enter the Temple of Cybele. Romans detested the strong odor, but fed the bulbs to soldiers and laborers (16). The Chinese have known and used garlic for centuries, as have the Jews and the Arabs. Garlic was mentioned in the Calendar of the Hsai, a Chinese book dating back 2000 years before Christ; was used by the Babylonians around 3000 BC; and is a part of ancient Hebrew Talmudic law, which stipulates that it be used in certain dishes on certain occasions (12). Detailed models of garlic bulbs were unearthed in the tomb of El Mahasna, in Egypt, 3750 BC. Archeologists discovered four dried, but perfectly preserved garlic bulbs in the tomb with King Tutankhamen, which dates from about 2,000 B.C. (7). The Spanish, French, and Portuguese brought garlic to the Americas (15).

**Plant Description, Botany:**

The genus name of garlic, *Allium*, was the original Latin name for garlic. Carolus Linnaeus simply adopted it when he coined the botanical name. The common name, garlic, comes from the Anglo-Saxon *gar*, a lance, and *leac*, a pot herb, and refers to the spear-shaped leaves (15).

Garlic's straplike leaves are 1-2 feet long, surrounding a central flower stalk or scape, which develops a globular cluster of tiny white blossoms (12). The leaves are flat, linear, gray-green, and longitudinally folded, with a keel on the lower surface. Six to twelve of them grow, widely spaced, along the central stalk of the plant. The bases of non-topsetting types form a semi-stiff pseudostem, which remains upright until bulb maturity, when it bends over near ground level (15). The scape of topsetting types remains rigid and fully upright, even after full senescence. The "true stem" is below ground and almost flat as a pancake, a small disc upon which the cloves rest within the bulb (1).

The scape or flower stem usually emerges coiled, then later straightens to vertical as it grows and develops. A papery spathe covers the umbel at the top of this scape (also called a capsule). This spathe splits along one side to reveal the umbel, which consists of many bulbils that vary greatly in size between cultivars. The small, greenish-white, purple, or pink flowers vary in number, or may be absent. In many cultivars, these flowers wither as buds, without opening. Even those that open and occasionally produce black withered seeds are sterile, however (15).

Unlike onion, garlic produces a compound bulb, made up of 4-15 cloves (16). They are called cloves from the word *cleave*, which means both "to cling together" and "to divide along natural lines". Individual cloves are made up of two modified leaves, one which forms the protective papery outer skin, and the other which thickens to form a storage structure (15). Each clove is inside a protective sheath, and the whole compound group is covered with a thin, papery skin, which is tan colored to pinkish. Flowers are very small, white to pinkish, with six segments and six stamens. These are sterile, borne in a terminal globe-shaped umbel (13).

**Varieties, Cultivars:**

M.R. Pooler and P.W. Simon, of the University of Wisconsin, Madison, have made an effort to classify a confusing array of garlic varieties into a botanically organized and logical order. Filaree Farm in Okanogan, Washington, offers organic planting stock of an exhaustive collection of garlic varieties, using the taxonomic system of Pooler and Simon to organize a catalog of amazing diversity. More than just a sales brochure, this publication can be a valuable reference tool for the would-be garlic grower.

All garlics are divided into two common subspecies, based on whether or not they form a hard flower stalk (scape) or not. *Allium sativum ophioscorodon*, or the hardneck garlic, is considered the more primitive type, producing a tall stalk with a cluster of bulbils and undeveloped flowers at the top. These bulbil stalks emerge curled and looped in a variety of ways. How the stalk is produced and emerges is one of the classification descriptors of the different varieties within the general "hardneck" type. All hardneck varieties are sometimes lumped under the designation "rocambole," though this system uses that name for a specific sub-group of the *ophioscorodon* subspecies. These "ophio" varieties are generally considered the "gourmet" types, with better, more complex flavor than their softneck kin. In general, though, they do not store as well as softneck types.

Over millennia of selection, softneck garlics, *A. sativum sativum*, were developed. These produce no hard central stalk or aboveground clusters of bulbils. All energy storage is in clove form within the bulbs produced underground. These bulbs typically have many more cloves than the hardneck types, some of them small central ones, thought to be converted remnants from what once would have been a bulbil stalk. The leaves form a pseudostem above the ground, which softens and falls over as the garlic matures, very much like the tops of an onion. These are the garlics of the mainstream marketplace, because they yield more, store better, and require less maintenance in the field than the hardnecks. The soft, pliable stems also make them the garlics of choice for braiding. Softneck cultivars may be less hardy than hardnecks in cold winter areas (14).

Botanical purists, such as Rexford Talbert, insist on a third subspecies, *A. sativum pekinense*, although popular literature seldom if ever mentions this type, or describes how it is set apart from the hardneck, *Allium sativum ophioscorodon*, variety.

Table 1. Examples of Garlic Cultivar Classifications

Cultivar	Species/Subspecies	Variety/Group Name
Spanish Roja	<i>A. sativum ophioscorodon</i>	Rocambole
Persian Star	<i>A. sativum ophioscorodon</i>	Purple Stripe
Red Rezan	<i>A. sativum ophioscorodon</i>	Purple Stripe/Glazed
Metechi	<i>A. sativum ophioscorodon</i>	Purple Stripe/Marbled
Music	<i>A. sativum ophioscorodon</i>	Porcelain
Inchelium Red	<i>A. sativum sativum</i>	Artichoke
Asian Tempest	<i>A. sativum sativum</i>	Artichoke/Asiatic
Chinese Purple	<i>A. sativum sativum</i>	Artichoke/Turban
Nootka Rose	<i>A. sativum sativum</i>	Silverskin
Ajo Rojo	<i>A. sativum sativum</i>	Silverskin/Creole

### Elephant Garlic:

Elephant garlic is not a true garlic at all. It is a leek, *Allium ampeloprasum*, though it's sometimes erroneously listed in catalogues as *Allium sativum* 'Giganteum' (1). Elephant garlic has become a popular and expensive item, due to the huge size of well-grown bulbs, and its milder flavor. Single cloves can grow to the size of pullet eggs or small tulip bulbs.

Elephant garlic should be planted in the fall for large size bulbs, although it is not as dependably winter hardy as true garlic, and generally performs better below 40° latitude, except along coastal areas of the US. Spring planted elephant garlic may not form separate cloves, but will often produce "rounds," which are large single, undifferentiated cloves which can sometimes grow to the size of a baseball (11).

Growing in cold climates may sometimes sharpen the flavor of elephant garlic, making it come closer to that of true garlic. Garlic aficionados usually scoff at the quality of this garlic "pretender," although large quantities are still sold at high prices to the uninitiated, keeping the market good for elephant garlic.

**Planting:**

Although the bulbils produced at the top of the hardneck stalk can be used to produce bulbs, the process usually takes two years. In general, the size and weight of the clove planted will affect the ultimate size of the bulb formed. In a given planting of a single cultivar, bigger cloves almost always make bigger bulbs. Bulbils can be used in cooking, though they are difficult and tedious to peel. Unless these tiny bulblets are desired for faster reproduction of a garlic strain, it is usually recommended that the topsets be removed as the stalk is fully emerged and begins to uncoil. The development of the bulbils saps strength that will be transferred to the developing underground bulb if the topset is removed.

Tender topsets and stems can be used in cooking, if desired. Wholesale removal of topsets is a tedious and smelly job, but will result in the production of much larger bulbs.

Green garlic can be produced in much the same way that scallions are produced from onion sets. This can be a way to turn bulblets and undersized cloves left over from planting stock into a deliciously different crop. To grow garlic this way, small cloves or bulbils are planted thickly in rows, in mid to late fall, whenever garlic for mature bulbs is sown. These germinate and root well in late fall, go into dormancy through the coldest part of the winter, and start growing and are usable very early in the spring. Plants are dug, washed, and bunched much like scallions. The whole plant, leaves and all, is then chopped for use in recipes calling for garlic. The flavor is usually more subtle and less pungent than from mature bulbs, which can be a definite plus in some dishes. When these plants start to bulb, the tops begin to toughen, so harvest should be completed before the daylength reaches the critical level, which cues the bulbing response.

Garlic strains can be as unique and different as fine wines. Cooks using garlic in recipes need to become familiar with some of the more obvious differences in texture, taste, and aftertaste among all the various varieties. Just as Riesling is not an acceptable substitute for Merlot, neither is California White always a workable alternative to Spanish Roja for the garlic purist. As with chili peppers, some recipes work best when specific varieties are used. Some are hotter, some are nuttier, some are crunchier, and some hit the diner on different parts of the palate. Part of the wonder of the Filaree catalog is the detailed flavor information included in the variety descriptions. Where possible, try to match specific garlic strains to specific tastes. Like other fine edibles, certain garlics may be "in season" for only part of each year.

Throughout much of North America, garlic is best planted in fall, like many other hardy bulbs, such as tulips and daffodils. If planted about 6-8 weeks before the ground can be expected to freeze (where the ground freezes), the cloves have a chance to root and grow a shoot to the soil surface in the fall. Then, in the spring, growth commences immediately, when the frost goes out of the soil, allowing lush growth before conditions would allow spring planting of garlic.

In frost-free areas, plant garlic when hardy bulbs normally go into the ground (except in the extreme south where flowering bulbs are planted after a winter in the refrigerator for chilling). Garlic needs no chilling to begin growing. Except in rare early springs, garlic from spring plantings never comes close to making up the difference with fall plantings, and has to mature in the hotter, dryer conditions of mid-summer, as well.

Just prior to planting, bulbs are broken apart into individual, unpeeled cloves which should be planted 3-4 inches deep, in 36 inch rows, about 4 inches apart in the row. Care may be taken to align the cloves within the row to keep foliage uniformly arranged in the rows to facilitate cultivation.

If cloves are planted with the flattened sides perpendicular to the axis of the row, the leaves will all develop in the plane of the row. This makes mechanical cultivation much easier. In situations where hand cultivation is to be used in dense plantings, the angled sides of the clove should be planted parallel to the plane of the row so that the leaves will emerge perpendicular (crosswise) in the row, allowing plants to be spaced closer without leaf interference.

### **Culture:**

Like all Alliums, garlic is a fairly heavy feeder that appreciates fairly high levels of fertility. Planting beds should be well amended with compost or other well-rotted organic matter, fertilized, and thoroughly worked before planting. A high phosphorus and potassium fertilizer should be incorporated before or at planting. Nitrogen will probably not be stable in the soil over the winter, so application should be delayed until the soil warms in the spring. Abundant organic matter in the soil enhances garlic's performance.

Raised beds might be advisable to prevent waterlogged soil over the winter. After the ground crusts over with frost in early winter, a mulch of some sort will help prevent winter damage from frost heaving, and growth starting and stopping. During early season growth, plants should be watered whenever necessary to prevent the soil from drying out. In much of temperate North America, garlic grows in the part of the year with the most dependable rainfall, so irrigation is not always required. As maturity nears, water should be withheld in areas where this is possible.

In spring, two side-dress applications of nitrogen fertilizer should be made, the first about the time the soil warms enough to begin planting field corn (about 50-55° F at a 4 inch depth), and the second about three to four weeks later. This will help the garlic plants to grow large and robust before they receive the daylength cue to begin bulbing in late spring. The bigger the plants when this signal is received, the bigger the resulting bulbs will be. About 40-50 pounds of actual N per acre, applied alongside the rows, is recommended for each of these side-dress applications. In smaller plantings, this works out to about 1 pound of N per 1,000 square feet of garlic.

If conditions become dry in the spring while the garlic is actively growing, irrigation is recommended. The plants need to make as much growth at this stage as possible. All this energy will later be transferred into the bulbs. As the plants begin to bulb and mature, added water should be avoided, to allow better rot control. Varieties that produce topsets should have these scapes removed after they emerge.

This forces all the energy of the plant into the bulbs, making them significantly larger. Bulbs will usually begin to be ready to harvest from late June through much of July, depending on garlic variety and where you are, geographically.

### **Harvest:**

Garlic should be dug while there are still at least 4 live, green leaves on the plants, since these leaves are attached to the papery wrappers on the bulbs, which quickly deteriorate in moist soil once the leaves die. Under humid summer conditions, bulbs left too long in the soil rapidly lose quality and storability. Wrapperless bulbs do not keep well. Bulbs with 4 or 5 layers of intact wrappings can be rubbed clean of dirt when they have cured and dried, leaving the cloves well covered and protected by the remaining wrappers. Garlic must be undercut or dug since it will not readily pull up out of the ground, even at full maturity.

**Curing and Storing:**

Whole plants should be moved from the field into a dark, dry, well-ventilated area for drying and curing of the bulbs. Bulbs should be moved out of the sunshine as quickly as possible after digging. Do not dry by laying the plants in the sunshine. Tops and roots are allowed to remain on the drying bulbs. After several weeks, drying and curing should be complete, and the unique flavors fully developed within the bulbs. (Most garlicks will taste fairly similar, fresh from the ground.) Tops and roots can be removed once drying and curing are complete. Depending on variety, the bulbs should store for 4-12 months, once they are properly cured. Best flavor also develops during curing.

In central Illinois, early varieties begin to mature about the last week of June or the first week of July, and the range of maturities may stretch through about 3-4 weeks. Harvest will normally be completed for all varieties by late in July here. Throughout the digging and storage operations, it should be remembered that the bulbs are living things that must be handled with care for best storage and quality. Any small bruise may cause the whole bulb to spoil in storage.

If garlic is planted fairly early in the fall, a cover crop of oats can be sown at planting time to try to provide some winter cover for the young garlic plants. In cold-season, low snow cover areas, a layer of organic mulch, applied after the ground freezes, is usually recommended for fall-planted garlic. Materials such as shredded leaves or straw can be used as mulching materials. This should stabilize the young plants, preventing frost heaving, cold injury, or premature growth in the late winter.