



UNIVERSITY OF GEORGIA
EXTENSION

Production and Management of Garlic, Elephant Garlic, and Leek

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Introduction

Georgia is well known for its sweet onions. These short-day, dry bulb onions are marketed throughout the United States and Canada as Vidalia® onions. Although garlic (*Allium sativum*), elephant garlic (*A. ampeloprasum*), leek (*A. ampeloprasum*), and other Alliums also can be grown successfully in South Georgia, acreage of these related Alliums has remained low.

Garlic can be placed into one of two broad classes—hard neck and soft neck—based on growth habit. Hard neck varieties are grown in colder northern climates. These varieties tend to bolt or form a seed stalk at maturity. This seed stalk is stiff; thus the name hard neck. Soft neck varieties are adapted to the Mediterranean-like climate of central California. They also can be grown in the Southeast, including Georgia. These varieties don't form a seed stalk at maturity; thus the necks remain soft and are easy to cut or weave into strings of garlic.

Elephant garlic, also called great-headed or Oriental garlic, is probably the most widely grown Allium in Georgia, excluding sweet onions. Although elephant garlic is more closely related to leek than to garlic, it has the same growth habit and bulbing process as regular garlic. It will, however, bolt or form a seedstem at maturity unlike soft neck garlic varieties. As the name indicates, elephant garlic is much larger at maturity than regular garlic. A single clove of elephant garlic may be as large as an entire bulb of standard garlic.

Leek is a non-bulbing Allium. Instead of forming a bulb, the leaves adhere to one another at the base, forming a pseudostem. Although leek are popular in the produce section of food stores, they are a minor crop in Georgia.

Land Preparation

Soil should be deep turned, to bury any residual litter on the site, 2 to 4 weeks before final land preparation and planting. This will insure sufficient time for breakdown of previous crop residue.

Although garlic and related Alliums have no specific recommendations based on soil testing, taking a soil sample to assess the residual fertility and pH is still a good idea. The soil pH should be between 6.0 and 6.5; if soil tests below this, an application of lime is recommended. Dolomitic lime is generally recommended for South Georgia soils because it effectively raises pH and supplies both magnesium and calcium. Raising soil pH is a relatively slow process. Therefore, if you suspect that your soil is acidic, you may wish to test and apply lime several months ahead of the crop to insure that the pH will be adequately adjusted at planting.

A slightly raised bed is ideal for producing leek and garlic. Follow the standard bedding practices for sweet onions: Form beds approximately 4 ft wide with a 1-ft wheel row on either side. In onion production, a drum the width of the bed is used to mark the holes where the onion transplants will be placed. This drum (pegger) has pegs that form the holes based on the required in-row and between-row spacing (Figure 1). Four to five rows can be pegged on each bed with this pegger. For garlic, the between-row spacing should be 12 to 18 in. The in-row spacing should be 2 to 3 in. for regular garlic and 3 to 4 in. for elephant garlic. Between 800 and 2,000 lb of garlic cloves will be required to plant an acre. The exact amount required will vary based on type (soft neck or hard neck), variety, clove size, and plant spacing. Because of its large size, elephant garlic would require considerably more pounds of cloves to plant an acre than would regular garlic, depending on plant spacing.

Leek can be direct seeded with an in-row spacing of 3 to 4 in. and a between-row spacing of 14 to 18 in. About 3 to 4 lb



Figure 1. An onion pegger could be used to set garlic. The in-row spacing should be closer for garlic.

of seed will be required per acre. For accurate seeding, a precision seeder with coated seed is recommended for planting leek. Leek can also be produced from transplants.

Fertilization

Garlic, leek, and related Alliums are heavy feeders and will require considerable amounts of fertilizer over a relatively long growing season. In addition, because the Coastal Plain soils of Georgia are generally low in sulfur, this nutrient must also be applied to the crop.

Garlic and elephant garlic require approximately 150 to 175 lb of nitrogen (N) per acre. Phosphorus (P₂O₅) and potassium (K₂O) would be required in the range of 100 to 150 lb per acre depending on the residual levels of these nutrients in the soil.

Leek requires about 125 to 150 lb of nitrogen per acre with phosphorus and potassium requirements ranging from 100 to 120 lb per acre, depending on the residual levels of these nutrients in the soil.

As mentioned earlier, Georgia does not have specific recommendations for garlic and related Alliums based on soil test results. Because garlic is a relatively long season crop, it will require applications of fertilizer throughout the production cycle. A good starting point would be to incorporate 1,000 lb of 5-10-15 or similar analysis fertilizer with 5% sulfur (S) per acre prior to setting the crop. A sidedress application of CaNO₃ is recommended every 4 to 6 weeks at a rate of 200 lb per acre. One additional application of 5-10-15 with 5% sulfur should be substituted for one of the CaNO₃ applications in January.

In the absence of Georgia soil test recommendations, periodic foliar analysis is recommended to monitor the status of the crop, particularly as it relates to N-P-K and S. See Table 1 for sufficiency ranges for garlic.

Table 1. Plant tissue nutrient analysis sufficiency ranges for garlic and related alliums.

Status	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Fe (ppm)	Mn (ppm)	Zn (ppm)	B (ppm)	Cu (ppm)
Deficient	< 2.0	0.2	1.5	0.6	0.15	0.2	50	10	15	10	5
Adequate Range	2.0–3.0	0.2–0.5	1.5–3.0	0.6–0.8	0.15–0.3	0.2–0.6	50–100	10–20	15–20	10–25	5–10
High	> 3.0	0.5	3.0	0.8	0.3	0.6	100	20	20	25	10
Toxic (>)										100	
<i>Reproduced with permission from Maynard, D.N., G.J. Hochmuth, C.S. Vavrina, W.M. Stall, T.A. Kucharek, P.A. Stansley and A.Ga. Smajstrla. 1999. Onion, leek, and chive production in Florida. University of Florida Cooperative Extension Service.</i>											

Crop Management

Garlic, elephant garlic, and leek should be planted in the fall from September to November. Earlier maturing varieties of garlic can be planted later (November) with satisfactory results. Late maturing varieties planted at this time may not have sufficient time to size adequately before growth is slowed by the high temperatures of summer.

Garlic and elephant garlic produce bulbs consisting of clearly defined sections called cloves. It is from these cloves that garlic and elephant garlic reproduce asexually. The bulbs are broken apart or shattered and the basal plate removed to get cloves for the new crop's "seed." In fact, most fields are clones of the same variety. Garlic does not normally set viable seed because it is self-incompatible. Asexual propagation has advantages and disadvantages. Advantages include ease of handling and a large food reserve to get the plant started. Disadvantages include the bulk of the material and the possibility of propagating diseases in the cloves.

Commercial growers should periodically renew their seed stocks of cloves by heat treating the cloves and micro-propagating them in tissue culture. This removes any latent diseases and can dramatically increase yields. Growers in Georgia should, when possible, purchase cloves from a reputable source that attempts to minimize latent disease problems through these techniques.

Several different varieties of soft neck garlic are available. California Early is a common type of soft neck garlic that has done well in trials in Georgia. No named varieties of elephant garlic exist at this time. Most growers handle their own seed stocks.

Cloves should be planted with the growing point just below the soil surface. This means the base will be from 1 to 2 in. below the surface. Leek seed should be planted approximately 0.25 to 0.5 in. deep, and transplants should be planted at the same depth they were growing in the greenhouse.

Garlic, elephant garlic, and leek should be grown with soil moisture at or near field capacity, particularly during periods of rapid growth (bulbing).

Pest Management

Although winter crops generally have reduced insect pressure compared with crops produced during the spring, summer, or fall, garlic and leek should be scouted regularly for potential insect problems. Early spring is the most likely time to encounter insect pests in winter vegetables. If an insect pest problem arises, consult your local county Extension agent for the best method of control.

Diseases can be a particular problem with winter crops because of rainy, humid weather conditions. Regular applications of protective sprays are recommended to protect garlic and leek from bacterial and fungal diseases that can occur throughout the production season. Check with your local county Extension agent for recommended chemical application programs to control diseases in these crops. Generally, under conditions favorable to disease development, broad-spectrum fungicide sprays will have to be applied every seven days. During drier conditions these sprays may be required only every 10 to 14 days.

Weed management is particularly important with these Alliums. They are poor competitors with weeds. Weed control should begin early when weeds are small and easier to control. Hand weeding as well as herbicides can be used to control weeds. Consult your local county Extension office for the latest information on available herbicides for weed control in these crops.

Harvesting and Handling

Unlike onions, garlic and elephant garlic don't exhibit a breakdown of the neck tissue to signal maturity. Tops will become lighter green and exhibit some necrosis of the tissue, which is usually a good indicator of harvest maturity. This appearance should, of course, correspond with the harvest time. Such an appearance early in the crop should be a point of concern and probably represents a disease or nutritional problem. In addition, counting the number of wrapper leaves will indicate the maturity of the crop. The number of wrapper leaves around the bulb will decrease as the bulbs mature.

Bulbs are ready for harvest when they have three to five wrapper leaves (Figure 2). Prior to harvest, several plants should be pulled from different locations in the field and the



Figure 2. Counting the number of outer wrapper leaves is a good method to determine garlic maturity.

bulbs assessed as to size and number of wrapper leaves. The garlic or elephant garlic should have reached sufficient size for the crop and variety grown. Garlic and elephant garlic will require 180 to 210 days to harvest maturity. Leek should have sufficient size and several leaves forming a solid pseudostem before harvest. Leek requires approximately 150 days to harvest maturity.

Undercutting garlic and elephant garlic before harvest can facilitate the harvesting process. After drying, small quantities of garlic can have their tops woven together into groups for storage and sale. Most garlic and elephant garlic, however, will have the tops and roots removed after harvest. The bulbs should be cured by drying. Fans and heaters can help this process.

Leek will often have the leaf tops cut, leaving the white pseudostem and part of the green leaves attached.

Regular garlic is graded into several different size classes as a standard practice by the industry. However, elephant garlic is not; it will typically be twice the size of regular garlic at harvest. Garlic and elephant garlic can be stored for long periods (up to eight months or longer) if kept dry and cool. Leek, by contrast, is sold as a fresh market item much like scallions. They can be stored for two to three months at 32 °F and 95% to 100% relative humidity.

The USDA recognizes only one standard for regular garlic, U.S. No. 1. The only size classification is a minimum of 1.5 in. in diameter. For more detailed information on USDA grades for garlic, contact the USDA Agricultural Marketing Service or visit it online at www.ams.usda.gov/grades-standards.

The permalink for this UGA Extension expert resource is fieldreport.caes.uga.edu/publications/C852/.