

BULB VEGETABLES

(ONIONS, LEEKS, AND GARLIC)



Soil pH and Fertility

For all bulb vegetables, maintain soil pH between 6.2 and 6.8. Soil testing is strongly recommended for determining soil pH and nutrient status. You can purchase kits from your local county extension office or garden supply center.

Before applying chemical fertilizer, incorporate a ¼-inch layer of compost into the soil. For onions, shallots, and leeks, in the absence of a soil test, apply to each 100 square feet either 4½ pounds of 5-10-10 fertilizer where potash is deficient or 4½ pounds of 5-10-5 or equivalent where potash levels are higher. For garlic, use 3½ pounds per 100 square feet of the above fertilizers. Broadcast all fertilizers, and work them into the soil before planting.

Side-dress fall-planted garlic in March and onions and leeks about 6 weeks after planting. For garlic and pungent onions (or those for long-term storage), band ¼ pound (4 ounces) of ammonium sulfate per 100 linear feet of row. Place the fertilizer about 3 inches to either side of the plants and lightly work into the soil. For leeks and mild salad onions, use 1 pound of 5-10-10 (or equivalent that contains no sulfur) per 200 linear feet of row, again banding to the sides of the plants and working into the soil. To maintain the mild flavor of leeks and mild (short-storage) onions, be sure the fertilizer used contains no sulfur. For best bulb development of shallots, a light soil high in potassium and phosphorus but not too rich in nitrogen is recommended.

Selecting Cultivars

Garlic

Secure a strain of garlic from a local garlic grower, gardener, or seed house or garden center operator who has success with fall-planted garlic. Farmers' markets are also a good source of locally grown garlic—start looking in mid- to late August. Unlike most strains now sold commercially, such a strain will be acclimated to Pennsylvania and will produce and overwinter very well. Do not purchase garlic for planting from a grocery store because it is often treated with a sprout inhibitor. Plant garlic in the fall for greatest clove size and yields.

Two types of garlic exist: softneck and stiffneck. Softneck types are used for braiding and are commonly found in stores but are not generally hardy enough for Pennsylvania. Stiffneck types send up a hard, flowering stem and are more cold hardy than softnecks. Elephant garlic is not a true garlic but instead is best described as a bulbing leek. It is the least cold hardy of the garlics and is cultivated in the same manner as stiffneck garlic. Elephant garlic has a milder flavor than true garlic.

Onions

Onions can be classified as short-day, intermediate, long-day, or day-neutral. Any of these types of onions can be found as yellow, white, or red skin or flesh. The best sweet onions for Pennsylvania are the day-neutrals. The best storage onions are intermediate types.

Day-neutral hybrids, such as 'Super Star' and 'Candy', do extremely well in Pennsylvania, either direct-seeded or from transplants.

Sweet Spanish and Bermuda types are mild-flavored, large bulbs (3–5 inches diameter) that generally do not keep as long as other onion types. They are usually started from young transplants.

Red onions have deep red to purplish red skin, which makes them highly attractive in salads or wherever raw onion rings are used. Most cultivars adapted to Pennsylvania conditions are fairly pungent and generally keep better than Sweet Spanish types but not as well as the yellow storage types.

Regular yellow storage onion cultivars, when well cured with no defects, store well. Generally, the stronger the flavor of the onion, the longer it keeps.

Shallots

The Welsh type of shallot is milder and more leek flavored, has a light brown to tan skin, and keeps very well. The French-Italian type has a brownish red skin, a stronger flavor, and an aroma that resembles garlic. Traditionally planted as sets only, many new shallot hybrids are even better when direct-seeded in spring.



Sets, Transplants, or Direct-Seeding

Start older, nonhybrid, long-storage onions by sets in spring. For overwintering, plant shallot sets in late fall. In all but the warmest regions of Pennsylvania, grow leeks and certain onion types such as the very large Sweet Spanish types from transplants rather than seeds. Direct-seeding is very effective with ‘Super Star’ and ‘Candy’ and is sometimes possible for other types in the regions of southwestern and southeastern Pennsylvania with the longest growing seasons. Obtain transplants from nurseries, garden centers, hardware stores, or garden catalogs or by starting seed indoors or in a hotbed 10–12 weeks before planting.

Leeks

Since leek seedlings grow very slowly, sow them 14–16 weeks before planting them outdoors. Transplant when the plants are 8 inches tall and about pencil thickness. Cut off half of the green, leafy portion and be careful not to bend the roots when planting (trim them if you must).

Onions

Generally, plant sets for the best cooking and long-storage types. Sparsely sow seed indoors or in a hotbed 10–12 weeks before transplanting outdoors; set the young plants after all danger of severe frost has passed.

Shallots

Plant French types as sets in the spring or fall, and other types as sets only in the fall. To produce sets for later planting, start seeds indoors and transplant them outdoors in the spring. Start seeds 10–12 weeks before the last expected hard frost date; transplant seedlings outdoors after all danger of hard frost has passed.

Planting Dates

Transplant, direct-seed, or set onions and shallots about April 1–15 in central Pennsylvania. (Plant spring plantings about 3 weeks earlier in the warmest regions of the state and about 10 days later in the coldest regions.) Seed hardy, bunching onions in the fall; leeks around April 1–15 for late June to early July garden transplanting; and garlic cloves by October 15 (10 days earlier in colder, short-season areas and up to 3 weeks later in warm, long-season areas).

Depth of Seeding

Sow onion and leek seeds ½ inch deep. Plant garlic cloves and onion sets about 1–2 inches deep to eliminate bird scavenging or frost heaving. Be sure to plant onion sets and garlic cloves upright (point of the onion or clove up, flat part where roots form down). Set leek transplants in a trench about 6 inches deep and gradually fill the trench as the plants grow. Plant shallot seeds 1 inch deep. Plant shallot sets upright and at half their depth, making sure the tops remain uncovered.

Spacing

Between rows:

- Garlic: 1 foot for stiffneck types, 1½ feet for elephant garlic
- Leeks: 1½–2 feet
- Onions: transplants and direct-seeded, 1½–2 feet; bunching and sets, 1–2 feet
- Shallots: 9 inches

Within rows:

- Garlic: 6 inches
- Leeks: 5–6 inches
- Onions: set transplants 3–4 inches apart; thin direct-seeded plants to 3–4 inches; thin bunching types as you pull them; plant sets 1½–2 inches apart and pull every other plant for early harvest
- Shallots: 4–6 inches

Special Considerations

Garlic

Expose dormant cloves, divisions of the large bulb, or young garlic plants to temperatures of 40°F for 40 days to induce bulb formation. Planting cloves in the fall ensures proper cold exposure. Garlic yields tend to increase as the size of the mother clove increases. Therefore, use the smallest cloves (those less than 1 gram in weight) for cooking rather than planting. Make sure not to plant them so deep that the soil hampers their expansion, or so shallow that birds pull them out or frost heaves them out of the soil. Mulching in early December with weed-free straw or other organic material protects the cloves from frost heaving and provides weed control the following spring.

Stiffneck garlic strains produce flower stems (scapes) that form heads with bulbils in late May or early June. Remove these scapes as soon as you first notice them to produce larger bulbs. The Rocambole type of stiffneck garlic has scapes that are distinctly twisted or coiled, sometimes even double coiled. This coiling is perfectly normal and is not the result of any poor cultural practice or herbicide contamination. If scapes are not removed, they tend to straighten by the time of harvest and can be 5–6 feet tall. Also remove scapes from both stiffneck and elephant garlic to improve clove size. Use these scapes as cut flowers or eat them.



Leeks

As leeks begin to reach harvestable size, hill 3–4 inches of soil or organic mulch around the stems for maximum blanching. Hardy strains such as ‘Bandit’ will overwinter well if covered with marsh hay or straw mulch or with nearly continuous snow cover. A general rule is that leeks with short, thick stalks and bluish leaves overwinter well, but leeks with tall, thinner stalks and green leaves cannot survive Pennsylvania’s worst winters unless grown in high tunnels or cold frames.

Onions

Optimum growth for onions requires at least 1½ inches of water per week either through irrigation or rainfall. Inadequate watering will reduce bulb size and increase pungency. Medium-sized onion sets, ½–¾ inch in diameter, are best for producing mature onions. If large sets (over ¾ inch) are planted, many will send up seed stalks. Pinch off seed stalks as soon as they develop, or else thick, double-neck onions will likely be produced. Use thick, double-neck onions as immature green onions since they do not keep well and are undesirable for storage. Thick, double-necked bulbs are slow to cure and frequently succumb to neck rot.

Shallots

After five or six shoots have developed, mulch with straw, peat moss, or leaves. Mulching too heavily encourages onion maggots and root rot, but using no mulch necessitates frequent watering and cultivation.

Harvesting

Garlic

Fall-planted garlic in central Pennsylvania is ready to harvest about the second week in July. When the leaves start to brown, pull a sample. There is only a 10- to 14-day window for optimum garlic harvest. Before then, the garlic is unsegmented like an onion; after that period, the cloves will have grown and expanded to the point that the outer sheath will be split, exposing part of the naked clove. Bulbs with split sheaths are difficult to harvest and have a shorter storage life. Picked at the proper time, each bulb should be fully segmented and yet fully covered by a tight outer skin. Pull the garlic and allow it to dry in a well-ventilated, shaded area at 70–80°F; hotter areas and/or direct sun can caramelize garlic. After drying, remove the loose outer portions of the sheath and trim the roots and tops 1 inch from the bulb.

Leeks

Harvest leeks when they reach an edible size. Those transplanted in early July are ready for harvest by October. If overwintered, harvest in early spring before flower stalk formation (bolting) occurs.

Onions

When about half or more of the onion tops have fallen and started to turn brown, bend all of the tops over to promote maturation. When the tops are completely brown, pull the bulbs out of the ground and spread them to dry and cure in a well-ventilated area protected from direct sunlight. Either braid (bunch) the tops or trim to about 1 inch from the bulb and store in a slatted container. Breakdown in storage may result if the tops are cut too close to the bulb and the neck is not thoroughly dried. Close cutting allows decay organisms to have easy access to the bulb. Neck rot fungus only attacks onions that have been injured, wounded, or not properly cured.

Onions can also be stored in a mesh bag or by tying them into pantyhose. Place one onion in the pantyhose and knot it, then place the next one in and knot; do this until filled. To use throughout the winter, cut the desired number of onions from the chain.

Shallots

Like onions, shallots are mature when their tops have fallen over. You can accelerate maturity by bending all the tops over as soon as the first few bend. Before storing, cut the necks to within 2 inches of the bulb and dry thoroughly. Store shallots in a cool location with good air circulation.

Weed Management

All members of the *Allium* (onion) genus discussed here do not compete well with weeds. Alliums are shallow rooted and do not have large amounts of leaf area to capture sunlight. Large weeds drastically reduce yields in these vegetables. Therefore, it is very important to keep your plantings weed free. To reduce the amount of time needed to cultivate and pull weeds throughout the season, use some type of organic mulch or very reflective plastic mulch that cools soils. The mulch will conserve moisture, reduce or eliminate weed growth, and help keep the soil cooler.

Insect Identification and Management

Onion Thrips

Onion thrips occur in all areas. Adults are small ($\frac{1}{25}$ inch long), slender, and light yellow to brown in color. They overwinter on plants or debris in gardens, fence rows, and weedy areas. Thrips puncture the outer layer of the leaves with their rasplike mouthparts and feed on sap and bits of leaf tissue. They produce several generations each summer. Hot, dry weather is favorable for increased insect activity and plant injury. Small, whitish blotches on the leaves are characteristic symptoms of thrips injury. Thrips are hard to manage since they feed between the leaves.

Management: Maintain plant vigor. Limited control can be achieved by hosing down the plants (early in the day) on a regular basis when injury is first noticed. Some control will also result from using insecticidal soap (more effective on larvae than adults). The most effective control measure is to use an insecticide labeled for thrips management in vegetables (be careful to observe the days-to-harvest interval). Insecticide resistance has been a problem with onion thrips. Since the insects feed between leaves near the base of the plant, they are hard to reach with insecticides. Apply insecticides with sufficient water to ensure thorough coverage.

Red onions tend to be more susceptible to thrips than white onions, with yellow onions intermediate. Resistance to thrips infestation occurs in some cultivars of Sweet Spanish onions. All cultivars can tolerate populations of 25 thrips per plant. For well-managed, irrigated onions, plants can tolerate high populations of thrips without reducing yields. Bulb size can be reduced if populations greater than 50 thrips per plant are allowed to develop and persist. In onions, waiting until you see damage is not recommended. Sprays need to be based on high populations, but before feeding damage is readily apparent. Early plantings can sometimes be harvested before damaging populations develop.



Onion thrips (nymphs)



Onion thrips damage

Onion Maggots

Onion maggot problems vary from year to year. Maggots are more of a problem during and after a series of wet springs. They rarely attack any plants except onions (other related species attack other plants). As maggots infest young onions, the plants wilt and often die.

Larger onions may survive an attack, but the injured bulbs often rot in the garden or in storage.

The adult is a long-legged fly that is a little smaller than a house fly. The maggots are whitish in color and $\frac{1}{3}$ inch long when fully grown. Onion maggots overwinter in a resting stage known as pupae. Adult flies emerge in early spring and begin to lay their eggs in the soil near onions. Eggs hatch in 3–4 days and the maggots immediately bore into the plants. They feed and grow for about 3 weeks before changing to pupae. Adult flies emerge about 2 weeks later. Three to four generations occur each year, depending on the weather. The first brood is always more injurious to plants.

Management: Do not plant onion bulbs in the same location as the previous year. Remove and destroy infested plants. Protect plants from the first generation of adults by using a floating row cover held at least 6 inches from the plant stems.

Disease Identification and Management

Leaf Spots and Blights

Spots appear on leaves, which die prematurely. If spots are purplish in color with concentric rings, then the disease is called purple blotch. Spots that initially appear as white specks and are surrounded by a light green halo are diagnostic for Botrytis leaf blight. The spots eventually expand and can cover the entire leaf, causing it to turn brown and eventually die. For downy mildew, white specks similar to Botrytis leaf blight develop; but, under moist conditions, a white to purplish mold will develop on the surface of the lesions.

Management: Grow bulbs in a sunny, well-drained area. Allow at least 2 years without onion-related plants within the rotation. If needed for onions, spray with fungicides as directed on labels; fungicide materials should contain chlorothalonil, mancozeb, or a fixed copper. To be effective, start fungicide applications before disease is well established. Leaf spots and blights can be a problem where heavy dew or rainfall occurs frequently during the growing season. Use drip or trickle irrigation when possible to minimize leaf wetness. When possible, grow a cultivar that has resistance to the disease of concern.

Root Rots, Wilts, and Bulb Rots

Rots can develop on the roots and the base of bulbs. When rots are severe, plants can wilt in the garden, and many bulbs may rot during storage. Soft rots can be caused by several different types of bacteria.

Management: Grow bulbs in a sunny, well-drained area. Where root rots and wilts have been a problem, allow at least 4 years between onion-related plants. For storage onions, plant early enough to permit bulb maturation and drying before long, cold, wet periods in the fall. When necessary, dry onions inside before storage. When possible, grow a cultivar that has resistance to the disease of concern. Minimize any kind of injury to the plant to prevent openings through which bacteria and other pathogens can enter. Use drip or trickle irrigation when possible to minimize leaf wetness.



Purple blotch on onion



Onion bulb rot

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