

# Onions 101.

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Interest in growing onions at home appears to be increasing, as the number of onion-related questions received by master gardeners is definitely on the rise. People are also growing a great deal of garlic and shallots, which are relatives of the onion. Successfully growing salad onions (onions without a bulb), garlic and shallots is no more difficult than growing other types of vegetables, in fact they are easier than most. However, growing onions for their bulbs turns out to be rather complicated, and understanding their biology helps us make the right decisions about variety selection, cultural practices, and planting time.

## **Structure of the onion body**

The structure of the onion body is quite different than other garden plants. The stem, which is a short, squat structure is at the base of the plant and is buried deep within the leaves, but can be seen at the plant base as a corky nub from which the roots arise. On the top center of the stem is the growing point where new leaves arise, which are surrounded by older leaves to the outside. The leaves of the onion consist of a sheath at the bottom, which attaches around the stem at a node, and the blade, which comes off the top of the sheath. Each new leaf forms in the center of the stem, which is inside the sheath of the previously formed leaf, making for a series of round sheaths concentrically arranged (think of concentric onion rings). All of the leaf sheaths taken collectively form a stem-like neck, called a false stem or pseudostem, coming off the top of the true stem.

## **Culture**

### ***Soils:***

Onions can be grown on a wide variety of soils, however heavy clays can impede root growth and present a clod problem during germination and harvest. The soil should be free of clods and friable, because the seeds need close contact with the soil in order to germinate. Draining should be excellent, so raised beds should be used on very heavy soils.

### ***Seed germination:***

In the home garden, onions can be grown by direct seeding, transplants, or sets. Be certain to store seed in a cool, dry environment. The optimal temperature range for

germination is 52 - 77°F (which is high for a cool-season crop). Seed should be sowed ½ inch deep and kept continuously moist until germination. Between sowing and emergence, sprinkler irrigation is best for preventing the soil from drying out and crusting. For production of bulbs, seedlings should be thinned to a spacing of 2 – 5 inches in rows 12 – 24 inches apart. For green (salad) onions, sow much thicker at 2 inch spacing. Onion seedlings are very slow to emerge (usually 10 – 20 days) compared to other vegetables.

### ***Transplants:***

Onions can be grown from transplants to get an earlier harvest and to produce higher yields. In a warm indoor area, sow the seed densely in a pot of sterilized soil at a depth of 1/8 inch, keeping the soil continuously moist. When the pseudostems reach a thickness of about 1/8 inch, separate the grass-like seedlings and transplant into a trench, spaced 4 – 5 inches apart, and firm the soil around the roots. Transplanting depth should be about 1 inch; increasing the depth will alter the shape of the bulb.

### ***Sets:***

Onion sets are small bulbs, usually less than 1 inch in diameter, which are “sowed” like seeds, and will very quickly establish a stand of plants. They are widely available in home garden centers. For the production of a bulb crop, sets are not recommended for use in California because the varieties used to grow sets are poorly adapted to our climate, and the plants tend to bolt (flower) very early, before a bulb crop is formed. Sets are appropriate to produce a quick crop of green (salad) onions, however. In such a case, plant the bulbs just below the soil level.

### ***Weeds:***

Because onions are slow growing, have very shallow roots, and the leaves are slow to form a canopy, weeds can quickly out-compete the crop. Careless weeding can severely damage the shallow roots, so weeding should be done very carefully. In a commercial setting, pre-emergent herbicides are the rule. In the home garden, prior to planting the onions prepare the bed and water thoroughly, and after weeds germinate, remove them. It is very important to reduce the weed population before planting the onions.

### ***Irrigation and water stress:***

In onion, drought and salt stress negatively affect the rate of growth more than in other crops. Onions roots are generally shallow and unbranched, with a depth of about 2 feet, but they extract most water from only the upper 10 inches of soil (90% of the root mass is

in the top 7 inches), and when salts are high they quickly shut down their stomata (pores in the leaf epidermis), which greatly reduces photosynthesis and therefore growth. Onion is three times more sensitive to salt stress than the bean. When the soil gets dry, salinity will slightly increase, but that is enough to cause onion plants to wilt and shut down. Furthermore, as new onion roots form, they form above the older roots, therefore the upper soil layer must be kept moist to allow these new roots to form. As a result of these factors, onions need regular irrigation during growth. Commercial growers use drip, furrow, or sprinkler irrigation. In the home garden, drip irrigation is likely the most effective means of irrigation.

### ***Fertilization:***

Onion is one of the most responsive of all crop species to fertilizer treatment, with phosphorus and nitrogen application significantly increasing bulb yield. Phosphorus is normally applied at planting. Nitrogen should be applied at planting, again at the 3 – 4 leaf stage, and again at mid-season. Don't apply nitrogen late in the season just prior to bulbing, which can cause bulbing and postharvest problems. Onions are sensitive to ammonia, so limit the use of high-ammonia fertilizers.

### ***Life cycle:***

The onion is a cool-season, biennial plant normally grown as an annual. When day lengths are short and temperatures cool, onions continuously make normal leaves and roots, and when harvested in this stage are termed green or salad onions. When day lengths become longer and temperatures increase, bulbing starts, which is how the plant prepares itself for dormancy (see "Bulbing" below). Given the proper environmental conditions, the plant will begin making "bulb scales" instead of normal leaves.

Flowering is also controlled by environmental conditions. When bulbs are grown under cool temperatures (vernalization), plants will bolt (form an inflorescence). Flowering does not destroy the bulb, but it does make it smaller and it creates a woody hollow inflorescence stalk base in the center of the bulb, which is not edible and reduces the keeping quality. To avoid flowering, be careful not to plant too early.

### ***Bulbing:***

What factors control the initiation of bulbing? There are at least eight known factors that affect bulbing in onions, but the best understood are photoperiod (day-length) and temperature, with photoperiod being the most important factor. Different varieties differ in the photoperiod "threshold" needed to induce bulbing. The terms "short-day", "intermediate day", and "long-day" (often called "early", "mid", and "late" varieties) are widely used to describe the different photoperiod requirements for different onion varieties. Generally, onions grown south of Bakersfield are short-day varieties (threshold:

10 – 12 hours daylight), whereas those grown to the north are long-day varieties (threshold: 14 – 16 hours daylight) or short-day varieties. Intermediate-day varieties (threshold: 12 – 14 hours daylight) are best adapted for the interior valleys of central California. Increasing temperature will increase bulb development rate once the photoperiod threshold is reached.

### ***Planting & Maturity:***

In Alameda County, choosing a planting time will depend on the variety of onion, the proximity to the coast, and the desired harvest time. More inland sites will experience more chilling, which can induce bolting. More coastal sites have moderate temperatures which could influence the rate of bulbing. West of the east bay hills, bulbing onions can be planted out anytime between September and March, whereas salad onions can be planted year-round. In the more inland sites, short-day varieties can be planted out as seed or transplants between November and January for a late spring – summer harvest, and long-day varieties can be sown or transplanted between January and March for a late summer – fall harvest. Since there are dozens of varieties available, and each location differs slightly in its climatic conditions, some experimentation will be required to find the best varieties for a particular garden. Remember that for long-day varieties, bulbing will start quite late in the season. Typical time from seed to harvest is about 6 months. How do you know when the plant is making the bulb? In general, when the onion “tops” start falling over you know that bulbs are forming.

### ***Harvest & Storage:***

Once most of the tops have fallen over, dig out the bulbs, lay on the soil surface, cover with the tops to prevent sunburn, and allow drying for several days. Once the pseudostems are dry, pull them off and store the bulbs in a cool, dark location with good air circulation. If the bulbs have bolted, they will not keep well and should be consumed immediately.