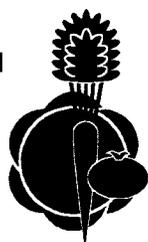


**VEGETABLE RESEARCH  
AND  
INFORMATION CENTER**

**Vegetable Production  
Series**



## **GREEN ONION PRODUCTION IN CALIFORNIA**

*RONALD E. VOSS, Cooperative Extension Vegetable Specialist,  
University of California, Davis; KEITH S. MAYBERRY, University  
of California Cooperative Extension Farm Advisor, Imperial County*

### **PRODUCTION AREAS AND SEASONS**

Green onions (*Allium cepa* L.) are produced mainly in Monterey and Riverside Counties. At one time, several thousand acres (including acreage in Fresno, Orange, Los Angeles, and Sacramento Counties) were planted annually for year-round production. Much of that production has moved into Baja California, Mexico, where harvest labor is less expensive. Green onions are planted during the fall, spring, and summer for harvest 60 to 120 days later.

### **GREEN ONION ACREAGE AND VALUE**

Year	Acreage	Average yield (tons/acre)	Gross value/acre
1997	2,205	12.7	\$10,775
1996	2,045	9.9	\$8,890
1995	1,495	12.9	\$9,770

SOURCE: *County Agriculture Commissioner's Annual Report Data* (Sacramento: California Department of Food and Agriculture, 1995-1997).

### **CLIMATIC REQUIREMENTS**

Onions are cool-season, biennial plants (requiring two seasons to complete the cycle from seed to seed) that are commercially grown as an annual crop. Bulbing and growth are highly sensitive to day length. Each variety has a critical day length at which bulbing is initiated regardless of size. As days lengthen in the spring and summer, these critical day lengths are reached.

Growth is also dependent on temperature. The minimum for emergence is higher than for most other cool-season vegetables, at 55°F (12.8°C) for 70 percent emergence in up to two weeks. In addition, early growth rate is slow compared to other cool-season crops. Optimal leaf growth rate occurs at 68° to 77°F (20° to 25°C). However, total plant growth rate is dependent on the amount of light intercepted. Maximum light interception occurs with a leaf area index of approximately 8 or higher. A combination of factors, including variety, stem size, temperature, and duration of temperature, determine bolting susceptibility. Onions can bolt at temperatures of 45° to 50°F (7.2° to 10°C).

### **VARIETIES**

Few public onion breeding programs exist in the United States (none in California), but many private seed companies are involved in onion variety development. Because of this, a large number of varieties are available for any given area, and the emphasis of development is on hybrid varieties, not open-pollinated types.

Onion varieties are generally classified according to day length (short, intermediate, and long), market use (green, fresh bulb, dehydrator bulb), and bulb color (within the fresh market class: yellow, brown, red, and white).

Long-day, white varieties of Sweet Spanish or Southport White Globe are grown as green onions in areas with short days. Short-day varieties bulb too easily to be used for green onion production. Many hybrids have been developed by crossing *Allium cepa* with *Allium fistulosum*, the non-bulbing Japanese bunching onion. These hybrids are most commonly grown in spring and summer in the Salinas Valley, and occasionally during winter in the southern desert regions and in Baja California, Mexico. Green onion production in areas with long days or during the summer months is most successful with the use of varieties with Japanese bunching onion parentage. White Sweet Spanish and Southport White Globe types are also sometimes grown in intermediate- and long-day growing regions.

### **PLANTING**

Onion seed should be planted approximately ½ inch deep (12.5 mm). This shallow planting requires a soil surface that is well prepared and must be kept moist until germination. The number of rows varies with bed spacing. Normally, 60 to 70 seed per foot are planted on a 30-inch (76-cm) bed.

Onion seed is susceptible to loss of vigor from high temperature and humidity; germination tests are critical. Storage life of opened seed containers can be shortened very rapidly if not immediately placed in an environment low in temperature and humidity. Seeding rates should be adjusted for lower germination. The

minimum level of germination is 85 percent for onion seed accepted and packaged by seed companies in California. Seed size may range from 100,000 to 130,000 seed per pound (220,000–286,000 seeds/kg). Green onions require 12 to 18 pounds of seed per acre (13–20 kg/ha).

## **SOILS**

Onions will grow in a wide range of soil types: sand, loam, clay, and organic/peat. Onions are shallow-rooted and need a friable soil that retains moisture well. Excessively dense clay soils interfere with root growth and frequently result in a serious clod problem at harvest. Sandy soils require very frequent irrigation. Seed germination and seedling establishment require a seedbed that is uniform, clod-free, firm, and several inches deep. Compared to planting on the flat or small ridges, raised beds provide better drainage and an area for salt accumulation away from the root zone.

Onions are sensitive or moderately sensitive to salinity, primarily at the stages of germination and emergence. Once plants are established, higher levels of salinity are tolerated. Yield reductions of 50 percent may occur at electrical conductivity levels of 4 to 5 mmho/cm (dS/m). Onions are more sensitive to salinity, sodium, and boron than are lettuce, cauliflower, broccoli, and cabbage.

## **IRRIGATION**

During the postplanting, pre-emergent state (which can last 10 to 20 days after initial irrigation), onion seed must not dry out, and the soil surface must not be allowed to crust. Sprinkler irrigation is the best management practice for stand establishment.

Onions require frequent irrigation throughout the season for several reasons. The root system is shallow, so very little water is extracted from soil depth of more than 24 inches (61 cm), and most is from the top 12 inches (30 cm). Onion roots are mostly non-branching, and all roots originate at the stem, or basal plate, of the plant. This means that upper soil areas must be kept moist to stimulate root growth. Rates of transpiration, photosynthesis, and growth are lowered by even mild water stress. Onions show little capacity for reducing leaf water potential by osmotic adjustment to compensate for reduced water availability at the root, whether caused by salinity or dry soil. Stressed plants will be stunted, may result in doubles and splitting, and are usually higher in pungency.

The amount and frequency of irrigation depend on the method, soil type and conditions, and temperature. For optimal plant growth, irrigate when 25 percent of the available moisture in the top 24 inches (61 cm) of soil is depleted. A green onion crop typically uses 12 to 18 inches (30–46 cm) of water. With 70 to 80 percent water use efficiency, applications of 15 to 25 inches

(38–64 cm) of water should be sufficient. If more water is used, the frequency and length of irrigation should be examined or a different method of irrigation should be considered (drip, surge, sprinkler). Since green onions are harvested immature, preharvest irrigation management is the same as that used for maximum production.

## **FERTILIZATION**

Because onions are shallow rooted and usually planted in cool soils, they are responsive to fertilization. Soil analyses are the best indicators for phosphorus (P), potassium (K), and micronutrient needs. Tissue analyses, combined with soil and cropping history, are the best indicators for nitrogen (N) needs. Typically, no more than  $\frac{1}{3}$  of the nitrogen should be available at planting,  $\frac{1}{2}$  at early season (3–4 leaf stage), and  $\frac{1}{3}$  at mid-season. Too much late season nitrogen availability can delay maturity, decrease storability, and contribute to bulb splitting. Onions are sensitive to ammonia, so fertilizers that contain high amounts of it should be avoided. Total supplemental nitrogen needs may vary from 100 to 400 pounds per acre (112–448 kg/ha) of nitrogen, depending on soil and cropping history and irrigation efficiency. High rates of phosphorus (200 lb/acre; 224 kg/ha) may be needed if soils are low or deficient. Onions are not responsive to potassium in most California soils. Zinc and other micronutrients may be needed in many soils. To meet planting and early season N and other nutrient needs, 5 to 10 tons per acre (11–22 metric tons/ha) of composted manure is sometimes used. Soil tests, tissue analyses, and preliminary quick tests on tissues (for nitrogen) are available. Marketability requires that leaves are dark green and without tip burn. High levels of nitrogen are maintained throughout production to promote those requirements.

## **INTEGRATED PEST MANAGEMENT**

*UC IPM Pest Management Guidelines* for onions have been updated (including photographs) and are available for weed, insect, disease, and nematode pests. Sanitation, crop rotation, resistant varieties, and frequent monitoring are essential for prevention and control of the numerous pests afflicting onions. Visit the UC IPM Website at <http://www.ipm.ucdavis.edu> or see *UC IPM Pest Management Guidelines*, ANR Communication Services Publication 3339.

**Weed management.** Onions are poor competitors against weeds because it takes a long time for them to achieve ground cover. Hand weeding can be very destructive to the root system of onions. Therefore, proper field selection and early cultivation are essential. Currently, a selection of effective pre-emergent and postemergent herbicides is available.

**Insect identification and management.** Thrips and onion maggots are most frequently the serious insect problems for onions, but mites, seed corn maggot, leafminers, and armyworms can also be serious pests.

**Disease identification and management.** Pink root (*Phoma terrestris*), white rot (*Sclerotium cepivorum* Berk.) and Fusarium basal rot (*F. oxysporum* f.sp. *cepae*) are the most common important diseases in green onions. Bacterial rots (*Pseudomonas* and *Erwinia* spp.), Downy mildew (*Peronospora destructor*), Purple blotch (*Stemphylium vesicarium*, *Alternaria porri*), Black mold (*Aspergillus niger*), neck rot (*Botrytis allii*), and blue mold (*Penicillium hirsutum*) are occasionally observed.

**Nematode identification and management.** Stem and bulb nematode (*Ditylenchus dipsaci*) and root-knot nematodes (*Meloidogyne* spp.) can be a problem in California onion production, but this does not occur frequently.

### HARVESTING AND HANDLING

Fresh green onions require hand harvesting. The most common system used involves undercutting the onions, pulling them immediately, gathering them by

hand into bunches of 5 to 7 plants secured by rubber bands, and placing them into 20-pound cartons. Other containers used include 11-, 13-, and 28-pound cartons. These containers are usually for export or are used with imported green onions.

### POSTHARVEST HANDLING AND STORAGE

Green onions are highly perishable. Shelf life is only 7 to 10 days. To minimize loss, green onions are stored at 32°F (0°C) and 95 to 100 percent relative humidity. If green onions are improperly stored, the leaves will yellow and decay. To keep the moisture content high, top ice can be used or the onions can be covered with plastic film.

### MARKETING

California is the leading state in US green onion production. Shipments are made from California year-round, but supplies peak from July to October. The winter and spring supply of green onions is dominated by imports from Mexico, whose production schedule is very similar to that in the southern California desert regions. Illinois, New Jersey, and Ohio produce a small portion of domestically grown green onions..