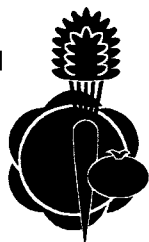


**VEGETABLE RESEARCH
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**Vegetable Production
Series**



EGGPLANT PRODUCTION IN CALIFORNIA

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PRODUCTION AREAS AND SEASONS

There are three main eggplant (*Solanum melongena*) production regions in California: the southern desert valleys (Riverside and San Bernardino Counties), the San Joaquin Valley (Stanislaus and Fresno Counties), and the southern coast (Orange County).

In the desert, planting takes place in February with a harvest from April through June. Summer plantings are in July and August with harvests that last from October until the first frost. In the northern San Joaquin Valley, planting is in late February (under hot caps or plastic tunnels) to begin harvest in late June. Other plantings are made during the spring. Harvest continues until the first frost, usually in the late fall.

EGGPLANT ACREAGE AND VALUE

Year	Acreage	Average yield (tons/acre)	Gross value/acre
1995	840	16.5	\$10,752
1994	1,009	16.7	\$8,851
1993	1,214	12.7	\$6,615

Source: California Agricultural Commissioner's Report Data (Sacramento: California Department of Food and Agriculture, 1994-1996).

CLIMATIC REQUIREMENTS

Eggplant is a warm-season crop and does not tolerate frost. A long growing season of 80 days is required for the transplanted crop. Optimal temperatures for eggplant production are 78°F (26°C) days and 68°F (20°C) nights. Plant growth slows, and pollination problems occur at temperatures below 62°F (17°C) or above 95°F (35°C). Flowering is not affected by day length.

VARIETIES AND PLANTING TECHNIQUES

Varieties. Eggplant is a member of the nightshade family, related to tomatoes, peppers, and potatoes (Solanaceae). Eggplant is more sensitive to cold temperatures than peppers and tomatoes. It is a perennial but is grown as an annual, and growth is determinate. Several types of eggplant are grown in California. American varieties are oblong or globular in shape and

have dark purple skin with a green calyx. Japanese varieties are slender and elongated or teardrop-shaped and have a darker skin than the American eggplant. Chinese varieties are long, slender, cylindrical, and slightly less purple with a greenish-purple calyx. Italian varieties have a green calyx like the Japanese types but are shorter and wider with a thicker skin. The most common eggplant varieties grown in California are the American Black Bell and Black Beauty, the Japanese Millionaire, and the Italian Little Finger. Other varieties are grown on a more limited scale for their color or shape.

Planting. Eggplant crops are normally grown from transplants; however, a few growers use direct seeding. Desert growers plant spring transplants on southern-sloping beds that run east to west. They use brush paper and wood stakes to protect the crop from spring frosts. The butcher-type brown paper is held in place with wood stakes placed every 2 feet (60 cm) along each row. The paper-stake structure is placed at an 80-degree angle to reflect sunlight downwards, warming the soil and young plants. The stakes must hold the paper securely or wind can cause it to vibrate and tear.

Clear, polyethylene mulch is also used on the spring crop. Some small-scale growers use mulch in combination with brush paper and stakes. Black-plastic mulch increases yields by controlling weeds, conserving moisture, and warming the soil.

In-row spacing of eggplant is 12 to 24 inches (30-60 cm). The crop can be grown using row widths of from 36 to 40 inches (90-100 cm). Row width depends on the space needed by harvest workers. In the central San Joaquin Valley, it is common for growers to plant 8 rows and skip 2 rows to make roadways for harvest operations. In the northern San Joaquin Valley, growers are experimenting with a bed spacing of 60 inches (1.5 m) and in-row plant spacing of 18 to 28 inches (45-70 cm) in an effort to maximize sunlight penetration onto the fruit, improving fruit color. Some growers remove the lower leaves and flowers, and stake the plants in an effort to reduce fruit rot that occurs when fruit touches the soil.

SOILS

Eggplant does well in a variety of soil textures. Previous crop residues must be stubble-disked to improve soil aeration and to adequately bury organic matter for decomposition. Eggplant grows best with a soil pH of 5.5 to 6.5. In the northern San Joaquin Valley and the Coachella Valley, eggplant is usually grown in light or sandy loam soils that provide good drainage and favorable soil temperatures. Eggplant will root to a depth of 36 to 48 inches (90–120 cm); therefore, sandy loam or silt loam soils free of physical barriers are better for proper plant growth and development.

IRRIGATION

Eggplant can be grown with furrow or drip irrigation. A crop of furrow-irrigated eggplant uses approximately 1.5 acre-feet (1,850 cu. m) of water. Some growers use black plastic mulch and drip tape to control weeds, moisture, and soil temperature in spring plantings. Critical watering periods are at flowering, fruit set, and enlargement. The amount of water applied depends on the time of year and stage of plant growth. Most of the water- and nutrient-absorbing roots are in the top 18 inches (45 cm) of soil. Irrigation should be managed to maintain good soil moisture in this root zone.

FERTILIZATION

The nitrogen (N) requirement for eggplant is approximately 150 to 200 pounds per acre (168–224 kg/ha). Preplant fertilizers are usually broadcast applied. A typical blend is 80 to 120 pounds per acre (90–134 kg/ha) each of phosphorous (P) and potassium (K) and 20 to 40 pounds per acre (22–45 kg/ha) of N. During the growing season, 5 to 10 pounds (2.3–4.5 kg) of N is applied each week for the period of vegetative growth. At early flowering, 15 to 25 pounds (7–11 kg) of N is applied each week. During fruit enlargement, 10 to 15 pounds (5–7 kg) of N is applied each week. The N is water run by most small growers.

POLLINATION

Eggplant is self-fertile as its flower contains both male and female parts. Flowers are usually formed on opposite leaves. Flowering is considered day neutral. Eggplant is not well suited for greenhouse production because it will not set fruit in extreme high or low temperatures. Fruit abortion can result if day temperatures reach above 95°F (35°C). If night temperatures drop below 61°F (16°C), pollen deformity increases, and less fruit is produced. Flowering and fruit setting begin 6 to 8 weeks after transplanting. Market-size fruit are ready approximately 3 weeks after flowering.

INTEGRATED PEST MANAGEMENT

Herbicides, insecticides, and fungicides should always be used in compliance with label instructions.

Insect identification and control. Many insect pests are attracted to eggplant. Spider mites (*Tetranychus* spp.), green peach aphids (*Myzus persicae*), lygus (*Lygus* spp.), flea beetles (Chrysomelidae), and wireworms (Elateridae) can be destructive to eggplant. Spider mites are especially harmful and should be treated as temperatures become warmer. Flea beetles are usually a problem only when plants are young. Fields should be closely monitored during the blooming period as lygus will feed on flowers and cause flower drop. Root knot nematodes (*Meloidogyne* spp.) can cause plants to wilt and leaves to yellow.

Disease identification and management. Leaf spot and fruit rots caused by *Phomopsis vexans* are characterized by circular brownish spots on fruit and leaves. Fruit rot may appear during postharvest transport even when symptoms are not evident at the time of harvest.

Early blight caused by *Alternaria solani* can result in dieback known as collar rot in seedlings. Foliage can be affected at all growth stages, and fruit can drop due to infection. This fungus is favored in temperatures between 60° and 90°F (16° and 32°C). Stressed plants are more susceptible than healthy plants.

Anthrax fruit rot from *Colletotrichum melongenae* causes sunken spots and lesions on the fruit surface. This fungus is favored in temperatures between 55° and 95°F (13° and 35°C) with optimum growth at 80°F (27°C) and humidity at 93 percent or higher.

Wilt caused by *Verticillium albo-atrum* affects the vascular system of a plant and results in stunted plant growth, yellow discoloration and eventually defoliation of lower foliage, and plant death. This fungus is favored in temperatures between 55° and 86°F (13° and 30°C). Currently, there are no eggplant varieties available that are resistant to this soilborne fungus. Growers should consult their Cooperative Extension office about the potential for soil solarization.

Tobacco ring spot virus (TRSV) is characterized by yellowing foliage and plant death. Crop rotation can help to lessen the effects of this disease. The dagger nematode (*Xiphinema* spp.) is a known vector of TRSV.

Postharvest losses of fruit can be caused by *Alternaria* spp. (black mold rot), *Botrytis* spp. (gray mold rot), *Rhizopus* spp. (hairy rot), and *Phomopsis* rots.

HARVESTING AND HANDLING

Harvest of eggplant usually starts 75 to 90 days after transplanting or 15 to 35 days after flower expansion (anthesis). Fruit are harvested when they reach market size and skin is glossy, but before seeds begin to enlarge

significantly and mature. Varieties with elongated fruit take more time to ripen. Over-mature eggplant become pithy and bitter. Fruit should be removed often to encourage continued fruit set. At market maturity, the fruit stem hardens and a sharp knife is needed to cut fruit from plants. The amount of stem left on the plant can vary from 1 to 2 inches (2.5–5.0 cm) for American varieties and 1 to 3 inches (2.5–7.5 cm) for Asian varieties. Harvesting is done by cutting the stem rather than by pulling the fruit.

Fruit are dumped in a water bath to wash and cool prior to packing. Fruit should be handled and packed carefully to avoid skin abrasions and puncturing. Some types of eggplant have skin that can be damaged easily. Careful harvesting and handling practices should be followed to avoid bruising and compression injuries. Fruit are packed by 18s and 24s into fiberboard containers.

Some growers cut plants to 18 inches (45 cm), allowing them to grow out again for a fall harvest. This practice depends on current market prices and plant vigor.

POSTHARVEST HANDLING

It is important to cool eggplant rapidly after harvest to reduce water loss. While hydrocooling is the most common practice, forced-air cooling is the most effective. Moistened paper or waxed cartons are often used to reduce water loss. Symptoms of water loss include skin wrinkling, spongy flesh, browning of the calyx, and reduction in surface sheen.

Eggplant fruit do not have a long shelf life, usually fewer than 14 days. Chilling injury can occur at 50°F (10°C) or below. The American varieties are the most sensitive to chilling injury, with symptoms appearing 2 to 4 days sooner than in the other varieties. Chinese varieties are the most resistant to chilling injury. Optimum storage temperature is between 50° and 54°F (10° and 12°C) with a relative humidity of 90 to 95 percent. Decay increases when fruit are stored more than two weeks. Chilling symptoms include fruit and calyx discoloration, surface pitting, internal discoloration of the pulp and seeds, off-odor, and fruit decay. Eggplant deteriorate quickly when placed in warm temperatures after exposure to chilling. The presence of *Alternaria* spp. usually accelerates decay. Freezing injury starts at 30.6°F (-0.8°C). Freezing symptoms include water-soaked pulp that turns brown and becomes desiccated. Eggplant have a moderate to high sensitivity to exogenous ethylene. Exposure to ethylene greater than 1 part per million can cause calyx browning and abscission.

MARKETING

Florida is the largest U.S. producer of eggplant, providing more than 30 percent of the U.S. crop. Florida has year-round production except in August and September. New Jersey is the second largest U.S. producer with harvests from July through October. California produces 19 percent of U.S. eggplant with harvests from April through December. Mexico exports eggplant to the United States from January through March.