VEGETABLE RESEARCH AND INFORMATION CENTER

Vegetable Production Series

EDIBLE-POD PEA PRODUCTION IN CALIFORNIA

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PRODUCTION AREAS AND SEASONS

Edible-pod peas (*Pisum sativum* L.) include the types of peas variously referred to as snow peas, sugar peas, and China peas (*P. sativum* var. *saccharatum*), and the sugar snap type (*P. sativum* var. *macrocarpum*). All of these peas are eaten as whole tender pods without shelling. Sugar snap peas have fuller, fatter pods with individual peas that are allowed to develop more than the other three types, which have flatter pea pods. All are tender and relatively sweet when eaten fresh.

EDIBLE-POD PEA ACREAGE AND VALUE

Many areas of California produce small acreages of edible-pod peas, but only San Luis Obispo and Santa Barbara Counties reported 1995 production figures to the California Agricultural Statistics Service.

Year	Acreage	Average yield (*tons/acre*)	Gross value
1995	4,447	2.62	$20,996,600
1994	3,886	2.67	$16,336,900
1993	4,445	2.61	$24,888,400

Source: Annual County Agricultural Commissioner Report Data for San Luis Obispo and Santa Barbara Counties (Sacramento: California Department of Food and Agriculture, 1993–1995).

CLIMATIC REQUIREMENTS

Edible-pod peas are grown every month of the year in some mild areas of California. The peas are grown from spring to fall in northern growing areas and in the Sierra foothills, and during cooler spring and fall periods in the inland valleys of California. Edible-pod peas are grown year-round in central and southern coastal areas.

Edible-pod peas require consistently cool growing conditions and do not produce well in hotter areas. Peas are cool-season vegetables with optimum growing temperatures between 55° and 65°F (13° and 18°C). In milder growing areas where peas are grown year-round, growth and development are considerably slower during winter months. Flowering and pod set are sometimes interrupted by frosts, but plants recover and produce normally if frosts are brief.

Plants may tolerate some high temperatures during vegetative growth, but flowering is initiated when plants are smaller. Pod and seed development is so rapid that quality and yield are reduced by high temperatures. High temperatures in desert and inland growing areas severely restrict the growing season. In milder areas, yields and quality may be adversely affected for short periods by unusual warm weather.

Edible-pod peas are also affected by humidity. Frequent rains, early morning dew, extended periods of cloudy weather, and high humidity increase fungal disease pressure. In California, the more frequent rainfall and higher humidity appear during the winter months when lower temperatures slow fungal disease development. Disease pressure is generally higher during the rainy winter months.

VARIETIES AND PLANTING TECHNIQUES

Management is similar for both main types of edible-pod peas. Snow pea and sugar snap types are harvested at a fresh, green, tender stage and eaten as whole pods. The snow pea has traditionally been used cooked in various Asian dishes, and increasingly the peas are used fresh and cooked in a wide array of dishes. Sugar snap peas are also used fresh and cooked in diverse dishes.

The most frequently planted snow pea cultivar in California is Mammoth Melting Sugar, but smaller acreages of Oregon Sugar Pod II are also found. The Sugar Snap cultivar is the most widely planted sugar snap type, although other varieties such as Sugar Daddy and Cascadia are occasionally grown. Commercial production of both types of edible-pod pea is dominated by tall, vigorous cultivars that require trellising. Several other sugar snap pea cultivars—Sugar Bon, Sugar Mel, and

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Sugar Ann—have been grown in trials, but they do not consistently produce quality equal to that of Sugar Snap.

Most snow peas and sugar snap peas are grown on trellises because yields and quality tend to be higher than for peas grown on the ground. Shorter-statured cultivars are occasionally planted without trellises, but quality is less consistent and production is markedly lower.

CULTURE

Commercial plantings of edible-pod peas are generally small because of high hand labor requirements for trellising and picking. Individual fields typically range from 1 to 10 acres (2.5 to 25 ha), but some growers may stage multiple plantings for continuous production.

For the most part, peas are planted on flat ground in coastal areas and on raised beds in inland areas. Snow peas and sugar snaps typically are planted in widely spaced rows and trained on trellises. The trellises permit plant foliage to dry out, reducing the threat of mildew and other fungal disease.

Single trellis rows are usually spaced 6 feet (2 m) apart, since this is the smallest spacing that will still accommodate a tractor for spraying and cultivation. Within the row, seeds are spaced every 3 to 4 inches (7.5 to 10 cm) for an estimated population of 20,000 to 30,000 plants per acre (49,000 to 75,000 plants per hectare). Some smaller-scale growers plant their rows closer together and use hand-operated spray equipment.

Peas typically require 45 to 55 days from emergence to first harvest during the summer and 60 days or more during the winter months.

SOILS

Edible-pod peas are grown on a wide range of soil types throughout the state. Plantings on soils having a higher percentage of clay may have more problems with root and stem rots as well as higher humidity in the lower leaf canopy. Such plantings often do better when planted on raised beds. The difficulty of managing the crop on a heavier soil is often aggravated by excessive moisture or poor irrigation management. Fusarium root and stem rot diseases may also be aggravated by poor aeration and excessive soil moisture. Sandy soils tend to warm more quickly in the spring and may yield earlier harvests than clay soils. Sandy soils also require close attention to water management and more frequent irrigation to prevent moisture stress and interruption in foliage or fruit growth.

IRRIGATION

Most edible-pod peas are grown using drip irrigation. Sprinkler and furrow irrigation are less-used alternatives. Frequent irrigation aggravates root and stem rot problems on heavy soils and generally increases costs. Peas need a consistent supply of water for optimum production and quality. Once stressed by a lack of water, plants will not recover and produce normally. Edible-pod peas are best adapted to cooler growing areas where evapotranspiration (ET) requirements seldom exceed 1.5 inches per week. Consult rainfall and ET data from a nearby CIMIS field station.

FERTILIZATION

Common practice is to apply 200 to 400 lb per acre (224 to 448 kg/ha) of granular, complete fertilizer (e.g., 15–15–15) as a preplant band-incorporated application, followed by one or two banded applications of nitrogen (N) or periodic applications of soluble N through the drip system as CAN 17 or UN 32. Typical total N amounts range from 75 to 130 lb per acre (84 to 146 kg/ha). It is best to use soil analysis to guide fertilization for phosphorus, potassium, and other secondary and minor elements.

Peas are high-value fresh market legumes and although they fix atmospheric N, the fixation process is slow to reach an optimum rate so adequate N for high yields may not be available through fixation alone. Best yields will come with additional early N fertilization, and the use of fertilizer as the primary N source is cost effective. No available research data give a clear indication of the optimum N fertilization rates for edible-pod peas in California.

INTEGRATED PEST MANAGEMENT

Insect Management. Leafminers (*Liriomyza huidobrensis*) cause damage to leaves, stems, and fruit. They may constitute a serious problem in coastal areas in midsummer months when leafminers migrate from surrounding vegetable crops. Pea aphids (*Microsiphum pisi*) cause problems by weakening the plant through feeding, but aphids also are vectors of virus diseases (see below). Pea leaf weevils (*Sitona lineata*) feed on foliage, especially seedling peas, severely scalloping edges of leaves. More-mature plants may tolerate weevils when feeding is confined to lower leaves. Twelve-spotted cucumber beetles (*Diabrotica undecimpunctata*) are common in California. In mild areas, they overwinter and can be found every month of the year. Beetles feed on leaves and are especially damaging to young plantings.

Western flower thrips (*Franklinella occidentalis*) and onion thrips (*Thrips tabaci*) are minute insects that attack flowers and young pods. Thrips feeding weakens plants and scars developing pods. The damaged pods may not be readily apparent at harvest, but scars become more visible during postharvest transport to market. Damage from thrips lowers the market value of the pea pods. Their feeding punctures may also be a point of entry for fungal disease organisms such as *Ascochyta.* Thrips often migrate into peas from surrounding vegetable crops and weeds. Thus, some measure of control depends on the location of the planting and thrips pressure in surrounding fields. Control measures for thrips most often include timely application of a registered insecticide.

Beet Armyworm (*Spodoptera exigua*) larvae attack stems and leaves of developing pea plants. In warm weather, populations may increase rapidly, causing severe damage to affected plantings. Spider mites frequently move in from surrounding grape plantings in fall as grape plants mature. Centipedes and wireworms are the most important soil pests of peas. In some areas, plant damage and even loss of stand may be high.

Disease Management. Peas are affected by both soilborne and foliar disease organisms. The soilborne organisms cause seed rot, seedling damping off, and root and stem rot. Seed pretreatment and soil fungicide treatment are the most effective practices for control of seed rot and damping off. Consult a licensed pest control advisor for currently registered fungicides for seed or soil treatment.

Fusarium root and stem rots are soil borne diseases caused by the fungus *Fusarium oxysporum* f. sp. *pisi.* The disease may affect the root or lower stem, plugging translocation tissue and causing plants to yellow from the ground up and eventually to wilt and die prematurely. When the lower part of the stem is cut, the vascular system is yellow-brown. It is not uncommon to see entire fields affected by Fusarium when edible-pod peas are grown a third or fourth time in the same location. Yellowing may start early when the plants are young, and progressively extend to most or all of the plant. Fusarium-affected fields fail to produce commercially acceptable yields. There is no control for Fusarium other than rotation of the field out of peas for six or more years. Fusarium symptoms are more severe during the warmer months. On the central coast, fields that are unproductive during July and August due to Fusarium pressure, sometimes will nevertheless produce normally during the winter months. All pea fields eventually succumb to Fusarium, and land availability on the central coast may limit rotation possibilities.

Ascochyta leaf spot, caused by *Ascochyta* sp., is the most common foliar disease of edible-pod peas. Symptoms include small black spots that enlarge into concentric dark rings surrounding lighter-colored centers. Stems may exhibit brownish purple elliptical lesions, often with concentric rings. The disease is aggravated by extended periods of cloudy or rainy weather. Fixed copper is the only registered fungicide that may have some effect on the *Ascochyta* organism. There also are reports of Ascochyta developing as distinct black stippling, and of black spots that occasionally develop as a physiological disorder with no apparent causal disease organism.

Powdery mildew (*Erysiphe polygoni*) is common in pea fields during warmer months when fog or humidity is present. This disease can be a problem at any time in coastal growing areas, and in spring in the inland valleys. Growers recognize it as a gray-white powdery growth on upper and lower leaf or stem surfaces. If not controlled, the disease completely destroys the foliage, and any fruit that survives will be sunburned and discolored. The loss of productive vines also severely restricts fruit yield and size. Fungicides are the only control for powdery mildew at present, although seed companies are developing mildew-resistant varieties. Fields should be scouted frequently and carefully, and registered fungicides applied at the first sign of the disease.

Downy Mildew (*Peronospora pisi*), is caused by a fungus that survives on diseased plant refuse in the soil and is carried on the seed. Symptoms include pale yellow lesions on the upper leaf surface, which eventually turn brown. A white or violet mycelium growth is often visible on the underside of the leaf. Downy mildew may also become systemic in terminal growth. New growth is distorted and stunted, and is covered with a gray-purple fuzz of sporulating fungus. When pods are affected, brown or black spotting is apparent. Infected leaves turn yellow and die. Stems may be distorted and stunted. Brown blotches appear on the pods, which may be distorted. Use seed from clean fields. Rotating to non-legume crops for 2 or 3 years reduces disease pressure. Burn or rake off diseased pea straw after harvest. A fungicidal seed treatment may help prevent early infection.

A number of viruses affect edible-pod peas and all have similar symptoms, including mottled color, crinkled leaves, twisted pods, and stunted plants. Pea Enation Mosaic Virus (PEMV) is transmitted by the pea aphid (*Acyrthosiphon pisum*). Alternate hosts of PEMV include sweet peas and a number of legume forage species. Sweet peas grown for flowers and legume-based green manure may harbor the virus, and aphids may be blown some distance by the wind after feeding

on an infected host. Pea Streak Virus (PeSV) may appear in fall plantings as brown-purple streaking near the tip of the plant. Leaves and pods are shriveled, wrinkled, or discolored.

A number of different viruses are reported to induce streak symptoms in peas. Cucumber Mosaic Virus (CmV) is increasingly common in cucurbits and peppers in coastal growing areas, and has also been observed in edible-pod peas. There is no known control, but viruses can be avoided by planting peas in fields isolated from aphid or virus pressure, particularly during the warmer months when aphid pressure is highest. There is no known control for virus disease once plants are infected. Virus transmission is specific however, and a given virus—CmV, for example—is only transmitted by aphids. Resistant cultivars such as Oregon Sugar Pod do not consistently outperform Mammoth Melting Sugar.

Many of these viruses are present in native plant species, rangeland, or other crop plants and are readily transmitted to developing peas as the insect vectors move into pea fields. If possible, avoid growing other virus hosts in the same area prior to pea planting in order to preclude movement of virus from one crop to another. It is always desirable to plant crops of peas upwind of previously planted cucurbit crops. Other crops (peppers, for example) may harbor a number of viruses that also affect neighboring pea crops.

Contact the University of California Statewide Integrated Pest Management Project (worldwide web: http://www.ipm.ucdavis.edu) for the most recent information on integrated pest management of edible-pod peas. Check pesticide labels for restrictions or updated registration information on appropriate pesticides.

HARVESTING AND HANDLING

Sugar pea production history across a broad range of environments has shown that the trellised varieties typically yield 500 to 700 10 lb cartons of marketable pods per acre (5600 to 7800 kg/ha). More successful growers will often harvest 1000 cartons per acre, and yields of 1400 cartons per acre are possible. Average trellised sugar snap pea yields are typically 400 to 600 cartons per acre, generally running 100 to 200 cartons per acre behind snow pea yields.

Variations in edible-pod pea yields are often related to time of the year or number of plantings on the same piece of land. Yields are best in spring and fall plantings, and yields tend to fall due to root rot diseases when peas are repeatedly planted on the same plot of land. Yield is related to how long the field continues to produce; the best fields may be picked 15 to 20 times with 3 to 5 days between pickings and as many as 7 to 10 days between pickings in winter. Preventive spraying for mildew or Ascochyta may also improve yields, but the market price may affect the grower's willingness to apply preventive sprays.

Peas are first harvested when sufficient pods have reached the critical 3½- to 4-inch size. The market often prefers a smaller pea than is typically shipped in California, and may pay price premiums of as much as $4 per carton for smaller sizes. Some price premium is often paid for offshore peas from Guatemala or Mexico, where inexpensive labor permits the harvest of smaller pods and more careful hand grading of the harvested product to separate culls. Specialty packs of de-calyxed peas are increasing in popularity. Peas may be packed in 10 lb cartons or in 4 to 6 oz clamshell packs, which typically are sold at a premium price.

Other desirable grading attributes include uniform size of pods, thin pods that are free of puffiness (which indicates overdeveloped pods), the absence of black spots, and the presence of fresh green calyxes. Harvested peas should be rapidly precooled to 32° to 34°F (0° to 1°C) with forced air or by hydro-cooling. Optimum storage conditions for edible-pod peas are 32° to 36°F (0° to 2°C) and 90 to 98 percent relative humidity.

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