Globe artichoke

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CONTENT

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ORIGIN AND DISTRIBUTION

The globe artichoke is thought to have originated in the Mediterranean—there are references to it being grown in Italy and Sicily from around 300 BC. The ancient Greeks and Romans are said to have considered artichokes to be both a delicacy and an aphrodisiac. In the ninth century the globe artichoke was being cultivated by the Moors in southern Spain. It is thought to have been introduced to England in the sixteenth century.

SOIL AND CLIMATIC REQUIREMENTS

Artichokes are a cool-season crop that grows best in 24 °C days and 13 °C nights. The temperature range for a good crop is from 7 °C to 29 °C. In areas with cool day and night temperatures (i.e. cool coastal climates), the period of flower bud induction is extended, thereby lengthening the production period. Plants are tolerant of temperatures above 30 °C, but the quality of the edible flower bud is reduced. Freezing damages the bud bracts, causing blistering of the outer bud tissue and a whitish appearance. Freezing injury is superficial and does not affect eating quality, but it does make discoloured buds more difficult to market. Mature plants usually survive heavy frosts, but their yield may be reduced.

Artichokes can develop root systems down to 90 to 120 cm deep. They can be grown on a wide range of soils but produce best on deep, fertile, well-drained soils. Lighter soils that have excessive drainage and poor moisture-holding potential should be avoided. Artichokes are moderately salt tolerant. Research has shown bud yield reductions starting at soil salinity levels of 6 dS/m (Ece in mmho/cm at 25 °C) and a reduction in vegetal growth at 7 dS/m. Yield losses are approximately 11% for each increase of 1 dS/m of soil salinity above these thresholds. Artichokes can tolerate boron levels in water from 2 to 4 ppm.

USES

The globe artichoke is a member of the botanical family that includes milk thistle, daisies and sunflowers. The globe artichoke is an impressive-looking globe-shaped vegetable which is covered in layers of leaves. The flower petals and fleshy flower bottoms are eaten as a vegetable throughout the world. The plant should not be confused with the Jerusalem artichoke which is an edible root vegetable.

HUMAN HEALTH BENEFITS AND CONCERNS

The globe artichoke has been used in traditional medicine for centuries. Cynarin, the main constituent in globe artichokes, has a powerful effect on the production of bile and fat-digesting enzymes, stimulating liver function and lowering cholesterol levels. The lowering of cholesterol levels is the result of increased bile production and reduced absorption of cholesterol in the intestine with less cholesterol being synthesised in the liver and more being eliminated. As a result of this positive effect on managing cholesterol, the plant may be used to help prevent fatty deposits building up inside the wall of the artery, reducing blood flow and pushing up blood pressure—thereby protecting against heart disease. The plant contains significant levels of vitamin C, folic acid, potassium and fibre.

CULTURAL PRACTICES

Soil preparation

Artichokes are bred for richer soils, so amending the soil with 5 to 8 cm of good garden compost or composted manure gives these large plants plenty of space to achieve a good yield.

Manure or compost should be worked into the top 25 cm of soil before planting, along with some dolomite lime, dried, ground eggshells, or ground oyster shells for supplemental calcium.

Artichokes can handle alkaline soil conditions better than most garden vegetables. Optimal pH for growing artichokes is 6,5 to 7,0.

Planting

Perennial planting

Perennial artichokes are propagated by division of the crown. Rooted sections of crowns (stumps) selected from commercial fields are planted by hand in trenches of 10 to 15 cm deep with 1,0 to 1,1 m in-row spacing and 2,7 to 3,0 m between rows. The plants are usually laid out in a grid system to make weeding and other operations easier. Growers generally replant a field every 5 to 10 years, because after years of regrowth, the rooting area becomes crowded and the plants tend to lose vigour. The cropping cycle for perennial artichokes begins when plants are cut back. For autumn, winter and spring harvests, the plants are cut back from mid-April to mid-June; for harvest in summer, they are cut back in late August or

September. The plants are cut at ground level to stimulate new shoot development. During the harvest season, old, bearing stalks are often removed after the artichokes have been harvested to encourage the development of new shoots. This process, called “stumping” consists of harvesters chopping out the stalk just below the ground using a hand axe or stalk knife. Stalks are removed at 3 to 4-week intervals throughout the year, depending on the growth of new bud-bearing stalks. Stumping is generally thought to increase total yield and extend the productive life of the field.

Annual planting

Artichokes grown as annuals are established by seed in greenhouses and then transplanted into the field. Bed widths vary from 1,8 to 2,0 m; a single row of plants is used with in-row spacing of 76 cm. Annual plantings can fill market niches, as they can be timed to mature at different times of the year. The time from transplanting to maturity can vary from 4 to 6 months, depending on when transplanting takes place. Seeded artichokes can be grown in many parts of the country. In some parts of the state, annual artichokes are direct seeded, but in general, the majority of production is transplanted to avoid problems with weeds and diseases.

Fertilisation

Phosphorus fertilisation should be based on the soil test level of bicarbonate-extractable phosphorus. Levels above 60 ppm are adequate for growth; for soils below this level or plantings during the winter, preplant applications of 45 to 90 kg/ha of phosphorus pentoxide are recommended. The need for potassium can also be determined from soil tests; soils with greater than 150 ppm of ammonium acetate-exchangeable potassium have sufficient quantities of potassium for the crop. Potassium fertilisation presents no environmental risk, and many growers routinely apply potassium even in fields with high levels of exchangeable soil potassium. Fertilising to replace potassium removal by the harvested crop is appropriate to maintain soil fertility.

Perennial artichokes require moderate quantities of nitrogen. For maximum yields in most circumstances, growers apply 112 to 224 kg/ha of nitrogen. For annual artichokes, autumn application of nitrogen is not recommended owing to the risk of NO_3 N leaching beyond the root zone in the winter rains. Small quantities of nitrogen, 22 to 34 kg/ha, applied preplant are sufficient to provide young transplants sufficient nitrogen for the first month of growth. The need for nitrogen by the crop increases as the crop matures. For instance, early in the season, 6 kg/ha of nitrogen a week may be needed. In most field conditions, a seasonal fertigation total of 144 to 180 kg/ha should be adequate, assuming efficient drip irrigation management. Annual artichokes planted later in the season, after other vegetables such

as lettuce and cole crops, may benefit from substantial quantities of nitrogen left behind by the earlier crops. This nitrogen can be measured by the pre-sidedress soil nitrate test (PSNT). Soil nitrate levels greater than 20 ppm in the top 30 cm are adequate for crop growth. The test can be repeated later in the season to ensure continuing nitrogen sufficiency.

The plant growth regulator gibberellic acid (GA3 or GA4+7), when applied properly, can increase the earliness and uniformity of artichoke bud development. It is mostly applied to perennial artichokes to stimulate earliness to meet market demand. One or two applications are applied in July or August. For perennial production, gibberellic acid treatments are sprayed on the field 6 weeks before the expected first harvest at a rate of 10 grams of active ingredient per 936 ℓha of water.

Irrigation

Artichokes require adequate soil moisture during the vegetal and reproductive growth phases. Too little soil moisture, particularly when buds are forming, results in loose buds and poor quality. Moisture stress may also contribute to black tip, a physiological disorder that causes bracts to become dark brown, rendering them unmarketable. Artichokes are susceptible to root rot, and irrigation must be carefully managed to avoid saturating the soil. Ditches are dug in fields of perennial artichokes during the winter to drain excessive rainwater.

Irrigation begins 1 month after plants are cut back at the beginning of a new production cycle for perennial artichokes. Early irrigations are typically provided by overhead sprinklers. Subsurface drip, buried 30 to 35 cm below the soil surface, often provides irrigations during the remainder of the production period; some growers use a single buried drip line in the plant row or two buried drip lines, one on either side of the plant row. On hilly terrain, pressure-compensating drip tape is used to attain high distribution uniformity. Annual plantings are usually established with overhead sprinklers. Growers often switch to surface-placed drip after the crop is established. The tape is retrieved after harvest and reused for subsequent crops.

During the summer, sprinkler-irrigated plants are watered at 2 to 3-week intervals, depending on the soil type. Drip-irrigated crops are irrigated at closer to 1-week intervals, depending on the weather. Approximately 206 to 310 m^3 of water is applied by sprinklers with each irrigation to perennial crops; approximately 1 860 to 2 480 m^3 of water is applied for the entire crop a year, depending on winter rainfall, which averages 40 cm per year. Although grown for a shorter time than perennial plantings, annual crops receive from 2 060 to 2 480 m^3 owing to their denser canopy. Drip irrigation may reduce water use by as much as 25% on clay loam soils, and it has increased yields on sandy soils by maintaining higher soil moisture levels through more frequent irrigations than could be achieved with sprinklers. Water used for

irrigation should be suitable for artichoke production and be appropriate for the irrigation system. High bicarbonate levels (> 4 meq/ℓ) and high iron and manganese levels (> 0,5 ppm) in groundwater can form precipitates that plug drip emitters and reduce the system uniformity.

The combination of soil moisture monitoring and weather-based irrigation scheduling can be used to determine the water needs of artichokes. Water use is highest during the summer months and when the canopy cover has reached maximum size. Because of their deep root system, perennial crops can tolerate some water stress in the early vegetative phase, but crops should be adequately watered during flowering and bud formation. Water extraction by artichokes can be estimated, using reference evapotranspiration data adjusted by a crop coefficient that is closely related to the percentage of ground covered by the canopy. At maximum canopy cover (> 90% canopy cover for annual plantings), the crop coefficient is nearly 1,0 for annual artichokes.

Weed control

Growers use a combination of cultural practices, herbicides and hand weeding to control weeds. Perennial artichokes are often planted on a grid system that allows mechanical cultivation in two directions following planting, reducing hand weeding to the area around the individual artichoke plants when the plants are small. However, owing to the increased plant populations used in perennial artichokes, cross-cultivation cannot be used when the plants get larger. Pre-emergent herbicides are used on both annual and perennial artichokes. Winter weeds in perennial artichokes are controlled by directed applications of post-emergent herbicides. Seeded artichokes can be cultivated two or three times before the canopy closes over the beds; hand weeding removes weeds in the seedline. Key weeds include buttercup oxalis (*Oxalis pes-caprae*), mustards (*Brassica spp.*), swinecress (*Coronopus spp.*), chickweed (*Stellaria media*) and sowthistle (*Sonchus spp.*). Buttercup oxalis attracts rodents, as the nutlets are a desirable food.

Pest control and disease control

Insects

The artichoke plume moth (*Platyptilia carduidactyla*) is the most devastating pest of artichokes. The insect lays eggs on the underside of the fuzzy leaves or on the stem below the buds. The larvae tunnel into the buds, stem and foliage, damaging the bracts and receptacle and distorting and stunting young buds. The insects reproduce throughout the year, particularly where there is continuous artichoke production. Losses of 25 to 50% of all harvestable buds are not unusual even with stringent pest management programmes. Control depends on strict sanitation

practices, including removing infested artichokes found by harvesters and immediately incorporating plant debris into the soil after plant cutback. Integrated pest management techniques combine sanitation, appropriate cultural methods, insect growth regulators (IGR), pheromone mating disruption, biological control agents and mass trapping with the reduced use of conventional pesticides.

Aphids including the bean aphid (*Aphis fabae*), green peach aphid (*Myzus persicae*) and artichoke aphid (*Capitophorus elaeagni*) can be a problem at certain times of the year. In addition to affecting growth, the artichoke aphid may cause sooty mould on the buds, resulting in yield loss. Cribate weevil (*Otiorhynchus cribricollis*) larvae feed on the roots, while adults feed on the foliage and buds. Caterpillars, including the salt marsh caterpillar (*Estigmene acrea*) and cutworms (Peridroma saucia and others) feed on artichoke foliage and buds. Caterpillars are a particular problem in transplanted annual production where they can destroy the growth point of developing seedlings.

The proba bug (*Proba californica*) emerged recently as a serious pest in most production areas. Its life cycle and feeding habits are similar to the lygus bug (*Lygus hesperus*). Proba nymphs and adults feed mainly on young leaves that are in the frond stage. While feeding, they inject a toxin into the plant that causes stunting. Their feeding on the stalk of developing buds causes unsightly scars. The developing buds may also become deformed by the phytotoxin.

Serious infestations of two-spotted spider mites (*Tetranychus urticae*) can cause a serious loss of plant vigour and yield. Larvae of the chrysanthemum leafminer (*Phytomyza syngenesiae*) damage the foliage by mining the leaves.

Other pests

Grey garden slug (*Agriolimax reticulatum*) and brown garden snails (Helix aspersa) feed on leaves and rasp off the outer surfaces of artichoke buds, blackening the surface and lowering quality.

Field mice (Microtus spp.) and gophers (*Thomomys bottae*) cause considerable economic damage in perennial artichoke fields. These rodents feed on the fleshy roots, young shoots and developing buds of the plants. Trapping and baits are used to control these pests.

Diseases

Powdery mildew (*Leveillula taurica*) and Ramularia leaf spot (*Ramularia cynarae*) can cause serious economic losses in artichokes. The pathogens attack bracts and foliage and can lead to premature leaf senescence and leaf drop. Damaged buds are unmarketable.

Verticilium wilt (*Verticillium dahlia*) causes wilting, chlorosis and stunting of plants. Diseased plants produce smaller buds and the plants may collapse in severe infections. All artichoke varieties are susceptible to Verticillium wilt. Annual artichokes can be rotated with broccoli to help reduce inoculum levels and manage this disease.

Botrytis rot (*Botrytis cinerea*) is common during rainy weather and prolonged periods of moderate temperatures and high humidity. The fungus usually invades tissue damaged by the frost, insects or improper handling. A grey or brown fungal growth develops on the affected plant parts. Millions of spores quickly develop and are spread by the wind. Postharvest control of botrytis rot requires appropriate handling, removal of infected heads before packing and proper cooling during storage and shipment. No practical method for controlling botrytis rot in the field has been developed.

Curly dwarf is a viral disease that severely stunts and eventually kills off infected plants. Symptoms include curling leaves, plant dwarfing and reduced bud production. Buds may become misshapen and remain small. Curly dwarf is insect-transmitted but the specific vector is not known. The virus survives on milkthistle (*Silybum marianum*) and artichoke plants. The only known control measures are to use non-infected planting stock and immediately remove infected plants.

Bacterial crown rot (*Erwinia chrysanthemi*) causes stunting of artichoke plants and wilting during hot weather. In advanced stages, the plants may collapse. The crown and root tissues become soft, rotted and turn black or brown. The disease is possibly spread by harvesting tools. The only known control is to use clean propagation material and avoid spreading the disease during harvesting and propagation.

Black tip is probably a physiological disorder that usually damages only the exposed bracts of small axillary buds. The tips of the affected bracts turns dark brown or almost black, dry and leathery. Although the edible portion of the bud is not affected, the bud is rendered unmarketable. In annual seeded production, black tip appears most frequently during sunny, warm, windy conditions that increase the growth rate and put plants under moisture stress. The exact cause of the disorder is not known.

Harvesting and handling

Perennial artichokes are harvested year-round, but the highest volume of production occurs between March and May. Seeded artichokes also produce year-round. The highest yields are from fields slated for autumn, winter and spring production. Artichokes are generally hand-harvested once or twice a week, depending on the weather. During cold winter weather, perennial fields may go 2 weeks or more between harvests. Perennial artichokes are usually harvested thirty or more times

during the season. Annual artichokes have a shorter, more concentrated production period that reduces harvesting costs.

Artichokes should be harvested when the buds have achieved maximum size but before the bracts begin to spread open or before the internal pappas (fibrous central part of the bud) grows up above the top edges of the cup-shaped receptacle. The terminal or primary bud is harvested first and is the largest in size. Secondary and tertiary buds are harvested as they reach maximum size. The bracts of some seeded artichoke varieties do not spread open with increasing maturity as readily as do those of the perennial Green Globe. This makes it more difficult to know when to harvest a particular bud. Subtle differences in the colour and appearance of the buds as they mature are the only outward clues as to when to harvest. Buds of these seeded varieties do not increase in size if left on the plant past their optimal harvest time. Overmature buds have an internal pappas, turn purple inside, become bitter and woody and have less fleshy tissue that is edible. Cutting a few buds in half, from the stem to the tip of the bud, to observe the level of maturity in relation to the bud's external colour and appearance can help a grower decide when to harvest.

Artichokes are cut by hand with 7,5 to 10 cm of stem remaining with the bud. Crews select and cut harvestable buds as they walk down the rows. Harvested buds are placed in cloth artichoke bags that are held open by a metal backpack frame. Artichokes are packed on mobile packing frames that move through the field with the crew. Some artichokes are placed in bins for inclusion in value-added packs.

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http://www.grow-it-organically.com/growing-artichokes.html

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