

Production Guidelines for Globe Artichoke in Florida¹

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Introduction

Globe artichoke (*Cynara cardunculus* L.) belongs to a genus of thistle-like plants in the sunflower (Asteraceae) family and is cultivated for its flower buds. Globe artichoke is usually referred to simply as “artichoke” and should not be confused with Jerusalem artichoke (*Helianthus tuberosus*), which is cultivated for its tuber. Artichoke is native to the Mediterranean region and was brought to the United States in the 1800s. It was first grown in Louisiana by French immigrants and later in California by Spanish and Italian immigrants. Today, California produces more than 99% of commercially grown artichokes in the United States. In 2015, artichokes were planted on 6,500 acres in California, producing 89 million pounds and generating \$73 million gross sales (US Department of Agriculture 2016). The retail price of an artichoke ranges typically from \$1 to \$5.

Climatic Requirements

Artichoke is a cool-season crop that prefers the Mediterranean climate characterized by dry summers and mild, moist winters. The optimal growing temperature ranges from 45°F to 85°F. The ideal day and night temperatures are 75°F and 55°F, respectively. To initiate bud development, plants require sufficient chilling exposure or “vernalization,” which is generally 250 to 500 hours of temperatures below 50°F. Therefore, bud formation must be artificially induced to produce artichokes in Florida. One vernalization technique is the use of gibberellic acid (GA), a plant hormone that can induce the expression of the same genes activated by cold weather (Catalá et al. 2012). This vernalization

technique is described below in the “Artificial Vernalization by Gibberellic Acid” section.

Plants can tolerate light freezes, but buds may suffer freeze damage and show a blistered, whitish appearance. When temperatures fall below 28°F, plants can suffer significantly, and yield may be reduced. High temperatures above 86°F reduce the tenderness and compactness of the “heart” and cause buds to open quickly.

Growth Characteristics and Phenology

Artichoke is a perennial plant and can easily reach more than 4 feet in height and width. In commercial production, artichoke is grown as an annual or as a perennial. In Florida, annual culture between October and May is recommended to avoid the hot and wet summer, during which weather conditions are conducive to disease and pest development.

Seedlings (Figure 1) should be transplanted in the field no later than mid-November. Artichoke plants initially grow in a rosette form with arching, deeply toothed, silvery, woolly green leaves that are normally 20 to 32 inches long (Figure 2). As described in the “Climatic Requirements” section, artichokes do not initiate flower-bud formation or “bolting” without artificial vernalization in Florida because of insufficient chilling hours. With successful vernalization (see “Artificial Vernalization by Gibberellic Acid” section), bolting normally occurs in early to mid-February (Figure

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2). Typically one flower stalk rises from the center of the bushy rosette to produce a large bud or “head” (Figure 3). Crown heads develop slowly and reach marketable size in about 30 to 35 days after the initiation of bud formation. Crown heads are always largest and can weigh more than 1 pound per head (Figure 4). Lateral branches emerge from the main stalk and produce several smaller heads. Harvests take place from early March through early May, depending on the weather conditions.



Figure 1. Six-week-old artichoke seedlings that are ready for transplanting: (A) seedlings grown in a 128 polystyrene tray and (B) an ideal artichoke seedling for transplanting.

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Artichoke buds are harvested at an immature stage by cutting the stems 2 to 3 inches below the base of the buds. Immature buds are surrounded by layers of thickened, fleshy triangular scales or bracts (Figure 4). The edible portions consist of the large fleshy base or receptacle,

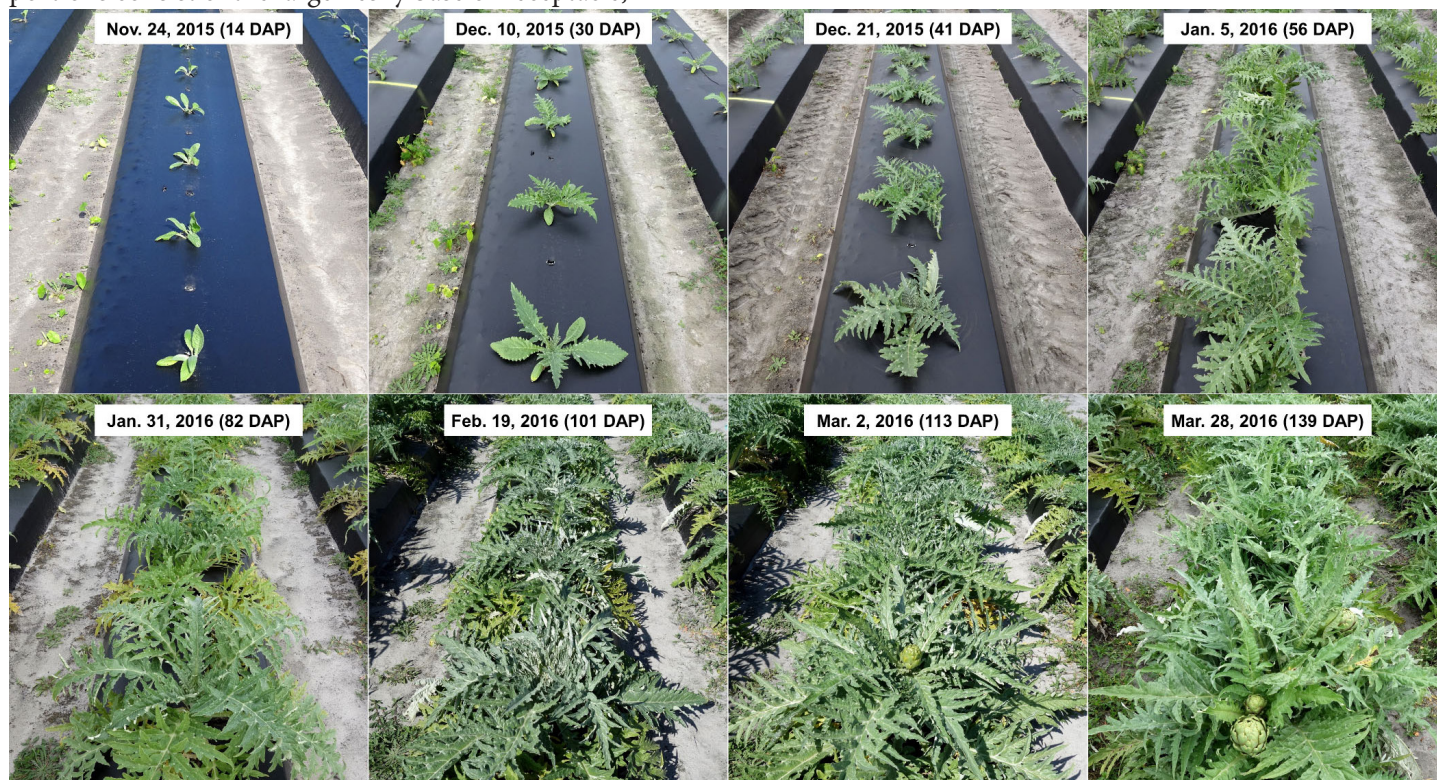


Figure 2. Growth and development of artichokes grown at the GCREC in Balm during the 2015–2016 season.

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known as the “heart,” the fleshy lower portion of each bract, and the stem attached to the receptacle (Figure 5). The mass of immature florets in the center of the bud, often called a “choke,” is inedible. If the buds are not harvested, purple thistle-like flowers develop.

Cultivars

All cultivars listed below have been or are currently being tested at the UF/IFAS Gulf Coast Research and Education Center (UF/IFAS GCREC) in Balm, FL. They grow 3 to 4 feet in height and width. They are thornless and suitable for fresh market.

‘Green Globe Improved’ is an open-pollinated cultivar. It is an improvement of the traditional ‘Green Globe’ and has more uniform growth and higher yield. It produces green, large (> 0.9 lb), round buds.

‘Imperial Star’ is an open-pollinated cultivar. Compared with ‘Green Globe Improved’ or hybrid cultivars, this cultivar has a lower germination rate and more variable seedling quality. It produces green, large, round buds.

‘Madrigal’ is a hybrid cultivar. It produces green, large, slightly elongated buds. It has a high germination rate (> 90%) with high and uniform seedling quality.



Figure 3. Artichoke flower-bud formation or bolting.
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‘Opal’ is a hybrid cultivar. It produces purple, medium, cylindrical or conical buds. It has a high germination rate (> 90%) with high and uniform seedling quality.

Propagation

For annual production systems, the use of transplants is recommended instead of direct seeding. Seedlings can be grown in the 128-cell polystyrene trays that are commonly used for tomato seedlings (Figure 1A). Trays with more than 128 cells per tray are not recommended for artichokes because they promote weak, spindly growth. Germination of artichoke seeds is variable depending on the cultivar and generally ranges from 50% to 90% (Basnizki and Mayer 1985). After sowing, it normally takes 6 to 7 weeks for seedlings to be ready for transplanting. The optimal size of seedlings is 5 to 6 inches in height with 4 to 5 true leaves (Figure 1B).

Field Management

Site Preparation and Planting. Artichoke plants can perform very well on the same beds and drip irrigation that are used for tomato production in Florida (Figure 6). Fumigation is recommended especially for weed control. The recommended row and in-row spacing is 5 to 6 feet and 36 to 42 inches, respectively. Do not set artichoke transplants too deep in order to avoid damage on delicate shoot meristems located at the base of leaves.



Figure 4. A large marketable artichoke crown head harvested from the main stalk.
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Figure 6. Artichokes grown on standard commercial beds for tomatoes at UF/IFAS GCREC in Balm during the 2015–2016 season.
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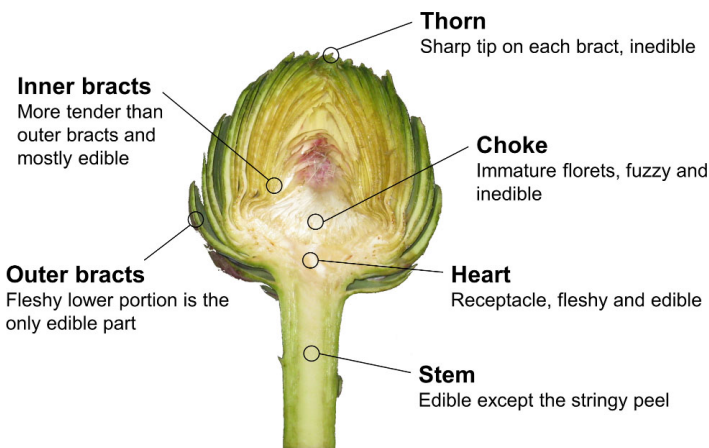


Figure 5. Edible and inedible tissues of an artichoke.
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Irrigation. Adequate soil moisture is critical for artichoke production. Artichoke plants are sensitive to both under- and over-watering, especially during the transplant establishment period. Although artichokes can grow well in Florida’s well-drained, sandy soils, frequent irrigation,

almost daily, is required to maintain adequate soil moisture. Inadequate irrigation during bud formation can result in loosely formed, tough, poor-quality buds that do not size well. Water stress can also cause browning on the tips of buds and make affected buds unmarketable.

Fertilization. Artichokes require moderate amounts of nitrogen (N) to support the large foliage that can reach more than 4 feet in height and width. Based on our studies, 200 to 250 pounds of N per acre is recommended to achieve maximum yield in Florida. Up to 50 pounds of N can be incorporated in the soil during the bed preparation. The remaining N can be applied via fertigation at up to 2 pounds per acre per day depending on the plant size. Phosphorus (P) and potassium (K) fertilization should be based on the soil test. No supplemental P and K fertilization is required when soil P and K levels are above 60 and 150 ppm, respectively. For soils below these levels, up to 100 pounds of P and 200 pounds of K per acre can be applied.

Insect Control. Several insect species have been known to attack artichokes in Florida, including aphids, spider mites, stink bugs, and flea beetles. Some of these insects are occasional pests, but aphids and spider mites may require chemical control. Currently there are on-going field trials to monitor and identify insects for artichoke production in Florida.

Disease Management. Common diseases of artichokes in California include artichoke curly dwarf, bacterial crown rot, damping-off, gray mold (botrytis rot), powdery mildew, *Ramularia* leaf spot, and *Verticillium* wilt. However, no disease has been identified to cause severe damage on artichokes in Florida. Currently there are on-going field trials to monitor and identify diseases for artichoke production in Florida.

Artificial Vernalization by Gibberellic Acid

To produce artichokes in Florida, chilling requirements must be overcome by artificial vernalization. The application of GA can induce bud formation even when plants are grown under insufficient chilling conditions. There are several commercial formulations of gibberellic acid registered for artichokes, including ProGibb LV and GibGro 4LS. Our study showed that 20 ppm GA sprayed at 50 gallons per acre at 43 and 64 days after transplanting was effective in inducing bud formation; whereas, untreated plants remained vegetative until the end of the growing season. Additional experiments are currently being performed to optimize the application rate and timing.

Literature Cited

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