

SUNFLOWERS



Sunflower, or *Helianthus*, is native to North America. It was used by Native Americans, whose careful selection increased the seed size by approximately 1,000 percent in the last 3,000 years. They used sunflowers for food, dye and medicine, and extracted the oil for ceremonial body painting and pottery. The Hopi believe that when the sunflowers are numerous, it is a sign that there will be an abundant harvest.

Early settlers grew sunflowers for food and garden decoration, and European explorers brought sunflowers along trade routes to Spain, Italy, Egypt, Afghanistan, India, China and Russia. The seeds yield a variety of products, ranging from snack food to soap, and the stems and heads can be made into paper or used for fuel. One English herbalist boiled and ate the buds with butter, vinegar and pepper, like artichokes.

Several species of native sunflowers are often seen growing along roadways in Kansas, their large, colorful blooms following the sun from east to west. Their beauty and abundance prompted the state legislature to designate sunflower the state flower in 1903. Recently, the sunflower has yet another use, this time as a cut flower.

Cultivars to Grow

H. annuus (common sunflower, annual)

'Abensonne'—7–8' tall; yellow flowers, bronze center.

'Autumn Beauty'—5–7' tall; 4–5" wide flowers; mix of yellow, bronze, purple, bicolors.

'Full Sun'—gold-yellow flowers; 3–4' tall; pollenless; day-neutral.

'Gold Crest'—3–4' tall; small, golden flowers.

'Hallo'—5' tall; 5–6" wide flowers; golden yellow flowers, dark brown center.

'Italian White' 5–7' tall; 5" wide flowers; creamy white flowers, black center.

'Lemon Queen'—5' tall; 4–5" wide flowers; lemon-yellow flowers; brown center.

'Orange Sun'—3 1/2' tall; apricot-orange double flowers.

'Sunbeam'—4–5' tall; 6–8" wide flowers; golden yellow flowers; light brown to yellow center.

'Sunbright'—5–6' tall; 4–5" wide flowers; golden-yellow flowers, dark brown center; pollenless.

'Sunburst Mixed'—4' tall; 4" wide flowers; crimson, lemon, bronze and gold flowers.

'Sunrich Lemon'—yellow flowers, black center; pollenless; day-neutral.

'Sunspot'—2' tall; 10–12" wide flowers; golden yellow flowers, golden brown center.

'Taiyo'—5' tall; 6" wide flowers; gold-yellow ray flowers, black center.

'Valentine'—5' tall; 6" wide flowers; lemon-yellow flowers; black center.

Cultural Requirements

Planting. Sunflowers adapt to a wide range of soil types and climates. They prefer full sun in well-drained soil, although they also grow well in poor soil and with dry conditions. They prefer a near-neutral soil pH, in the range of 6.5–7.5.

Annual sunflowers are grown from seed sown directly in the field after threat of frost has passed. Plant seeds 9–12 inches apart in the row with 18–36 inches between rows. The ideal planting depth is 1 1/2–2 1/2 inches. The soil temperature 4 inches below the surface should be above 50°F.

Sequential planting every 2–4 weeks is useful to provide continuous harvest and to take advantage of long terminal flower stems. Laterals are shorter and flowers are smaller after the terminal has been cut.

Most cultivars appear to be day-neutral, but they tend to flower faster during short days. Warm temperatures result in faster flower development than cool temperatures. Temperatures below 50°F slow development significantly.

Watering. Kansas growers should not attempt to produce sunflowers as a specialty cut flower without providing supplemental irrigation. The dollar value of the crop and demands of the market are such that it is inadvisable to attempt production under natural rainfall in Kansas.

Overhead watering is not recommended. It may physically damage the flowers, cause spotting on the petals, splash soil onto the foliage and promote the spread of disease. Drip irrigation is recommended because it places water on the ground where it is needed, not on the flowers or foliage.

Sunflowers are drought tolerant; their deep roots can extract water at depths up to 6 feet. However, sunflowers do best when they are not stressed for water. Withholding water may reduce stem length and decrease flower diameter. The amount and frequency of water required will vary with the weather and maturity of the crop. Base the irrigation schedule on the soil moisture status in the root zone, and irrigate to provide sufficient but not excessive water. Insufficient water will reduce crop production and quality, whereas a consistently saturated soil will reduce growth and promote development of root rot. On average, a sunflower in active growth uses about 0.15 inch of water per day. A mature sunflower plant with a full leaf canopy under conditions of 95°F and low relative humidity may use 0.3 inch of water per day.

Fertilization. Before initiating a fertilizer program, always test the soil for nutrient content. The increased water requirement of cut flowers creates an increased requirement for fertilization. The application of fertilizer should coincide with crop needs.

Germinating sunflower seed is sensitive to soluble salts from fertilizer applied in the row with the seed. No more than ¼ pound of actual nitrogen and potash per 1,000 square feet of production area should be placed in the row in contact with seed. Higher levels of phosphate can be placed with the seed at planting. Cold soils reduce availability and uptake of nutrients. During a cool, wet spring, some starter fertilizer placed with the seed or in bands 2 inches to the side and 2 inches below the seed can help produce vigorous seedlings.

Apply fertilizer at the rate of 2–2½ pounds of actual nitrogen per 1,000 square feet. Apply a small amount prior to planting. Apply the majority of the nitrogen as a sidedressing before the plants are 1 foot tall. A small portion of the total amount may be applied as the terminal bud shows signs of forming the flower head.

Apply phosphorus (P_2O_5) and potassium (K_2O) only on the basis of a soil test. If soil test results indicate low phosphorus levels, apply one pound of P_2O_5 per 1,000 square feet of production area. If the soil test indicates medium to high levels of phosphorus, apply ½–¾ of a pound of P_2O_5 per 1,000 square feet. Broadcast the phosphorus before tillage.

If soil tests indicate low levels of potassium, apply 2 pounds of K_2O per 1,000 square feet. Soils with medium levels of potassium require an application of 1–1½ pounds of K_2O . Broadcast the potassium after shoot emergence and before the sunflower plants are 1 foot tall.

Weed Control. Growers must control weeds in the field production of sunflowers, as weed competition reduces the quantity and quality of floral production. A bed full of weeds also increases the time required to harvest, raising labor costs. Several options are available to combat weed growth: herbicides, barriers or mulches, hoeing and hand-weeding.

Due to limited production of many species of specialty cut flowers, only a few herbicides are labeled for use. In 1993, trifluralin (Treflan), dimethyl tetrachloroterephthalate (Dachthal), ethalfluralin (Sonalan) and pendimethalin (Prowl) were labeled for sunflower production. Contact your county Extension agent for an update on herbicides currently labeled for sunflower production.

Weed barriers and mulches prevent weed growth and restrict soil splash on foliage and flowers from rain and irrigation.

While hoeing and hand-weeding are excellent methods of weed control, availability and cost of labor may be prohibitive in all but the smallest production situations.

Insect Control. Good cultural practices are the best insect control. A healthy, actively growing sunflower plant is more resilient to insect attack. The ideal approach is a preventive program. Control insects early, when they are first detected; do not wait until a serious infestation occurs. Less chemical can be applied to spots as they develop than would be required to spray the entire crop. As far back as 1936, 66 different species were recorded as pests on sunflowers, although the occurrence of a specific pest is sporadic.

In seed production, pests that feed within stem and head tissues are of the greatest concern; they may structurally weaken plants, disrupt nutrient flow and reduce or destroy seed. In cut flower production, external feeders are of greater concern; the cut flower market demands perfect or near perfect flowers, and visible insect damage reduces product value and marketability.

Little is known about the impact of specific insect pests on sunflowers grown as cut flowers. As the industry builds, a database may emerge on the most important pests, their frequency of appearance and geographical range. For now, it can only be speculated which pests will do the most damage.

Insect pests associated with sunflowers are either primary, specifically feeding on sunflowers; or secondary, subsisting on whatever plants are convenient.

Primary Feeders

Sunflower beetle. Overwintered adults, similar in appearance to Colorado potato beetles, feed on developing foliage and deposit eggs. Cream-colored larvae with a hump-backed appearance feed on foliage an additional 4–6 weeks after which they enter the soil to pupate. Newly emerged adults feed on foliage in preparation for overwintering. There is one generation per season.

Sunflower bud moth, sunflower (head) moth and banded sunflower moth. Depending on the specific species, one or all stages of development could be present at the same time during the growing season. The adult moths do no damage. The larvae may prevent head formation, or feed on or enter the receptacle from which they tunnel into and destroy seeds. Flowers may become distorted, appear trashy due an accumulation of frass and webbing, or be destroyed by soft rot organisms often associated with head-feeding activities. Also, the presence of the larvae may be disturbing to consumers.

Sunflower maggot, sunflower midge, sunflower seed weevil, sunflower stem weevil, sunflower head-clipping weevil. These are considered infrequent in appearance and of minor concern. For all but the head-clipper, noticeable damage results from the cumulative activities of many individuals.

An individual female head-clipping weevil girdles the stem just below the head and lays eggs on the head. The head eventually drops off. When head-clipping weevils occur, the number of clipped heads is 1–3 percent in field situations.

Secondary feeders

Caterpillars. Although generally sporadic in occurrence, several species of butterflies and moths may be

found in great numbers. When they occur, each female deposits many eggs on available foliage. The resulting larvae—caterpillars—may actively feed on sunflowers. Butterfly species include the painted lady (thistle caterpillar), silvery checkerspot and imported cabbageworm. Moth species include the armyworm, beet armyworm, fall armyworm, cabbage looper, corn earworm, virgin tiger moth (woolly bear caterpillar), variegated cutworm, and webworms.

Grasshoppers. Many grasshoppers are general feeders. Three of the most common species in Kansas are the two-striped, red-legged and differential grasshoppers. These occasionally reach outbreak population levels. Especially in dry years when usual vegetation is insufficient to support existing populations, grasshoppers will move great distances in search of food. Sunflower plantings may be destroyed.

Control

Because of their small size, insects may easily escape notice until substantial damage has occurred. While spray treatments prevent additional damage, the quality of flowers and foliage cannot be restored, and their marketability may decline. Growers should closely monitor their plantings for insect pests. Scouting is a labor-intensive activity which, when started, must be faithfully conducted. A knowledge of the various pests' life stages, habits, damage potential, and time of appearance is essential.

Because the cut sunflower industry is so new, there is a lack of specifically registered insecticides. In the National Pesticide Information Retrieval System (NPIRS), which accesses approximately 23,000 current federally registered pesticide product labels, no product is registered for sunflowers grown for ornamental purposes. However, various products are registered on field crop sunflowers grown for oil or confectionery seed production.

These materials include some formulations of the active ingredients *Bacillus thuringiensis* var. *kurstaki* (BioBit, Condor, Cutlass, DiPel, Larvo-BT, Steward, Vault), carbaryl (Sevin), chlorpyrifos (Lorsban 4E), endosulfan (Thiodan), esfenvalerate (Asana), methidathion (Supracide), and methyl parathion. Some of these materials are restricted-use products, legally for sale only to certified persons who may use the products or directly supervise use by noncertified personnel. Under the umbrella term of "field grown sunflowers," one could legally use these materials on sunflowers grown for ornamental purposes.

Sunflower Diseases

| Disease | Symptoms | Control |
|---|---|--|
| Sclerotinia wilt, stalk rot and head rot <i>Sclerotinia sclerotiorum</i> | Sudden wilting of leaves. Root rot. Gray-green to brown canker at base of stem. Seed layer falls away, leaving a bleached, shredded skeleton interspersed with large sclerotia. Upon harvest, infected heads shatter. | No resistant hybrids are available. Plant in noninfested soil. Do not plant sunflowers next to infected fields. Use clean seed. Prevent buildup of sclerotia in soil by monitoring the field for Sclerotinia diseases and rotating crops. No chemical is registered. |
| Downy mildew <i>Plasmopora halstedii</i> | Dwarfed and yellowed (chlorotic) leaves. In humid weather, white cottony masses of the lower or upper leaf surfaces. Little if any seed produced. | Rotate crops. Destroy volunteer sunflowers early. Avoid poorly drained fields. Delay planting until soil temperatures support rapid seed growth. |
| Phoma, black stem and head rot <i>Phoma</i> sp. | Large, black lesions on stems. Lesions also on leaves, the back of the head and at the crown or base of the stalk. The leaf wilts, the petiole turns black, and the stem lesions expand to form a large, shiny, black patch with definite borders. Plants produce smaller heads and the stem may rot through. | No hybrids are immune, though some are more tolerant than others. Rotate crops to minimize the concentration of Phoma fungus in the soil. Control insects to reduce insect transmission of the fungus. |
| Rust <i>Puccinia helianthi</i> | Cinnamon-colored spots on leaves, possibly on stems, petioles, bracts and back of the head in severe infestations. The spots eventually turn black. | Destroy volunteer plants early. Control wild annual sunflower around commercial fields. Avoid large concentrations of susceptible hybrids in one area. Avoid high rates of nitrogen fertilizer and high plant populations. |
| Rhizopus head rot <i>Rhizopus stolonifer</i> | Heads turn brown and mushy. Threadlike fungus develops on surface of head and within fleshy receptacle. Tiny, black structures form on fungus growth. Sometimes heads separate from stalk and drop off. | Head rot is usually associated with insect feeding on the seed. Insect control is important in preventing this disease. |

Additional materials become available if one uses the term “ornamentals” to include sunflower plants grown for cut flowers: Bacillus thuringiensis var. kurstaki, chlor-pyrifos (Dursban 4E, Pageant*DF, Acme Dursban), cyfluthrin (Tempo 2), fluvalinate (Mavrik), rotenone (Rotacide EC) and rotenone/pyrethrin (Pyrellin EC).

As always, before purchasing a product, check the label to ensure that the product can be used legally on the target site and against the specific pest. Follow label instructions when mixing and applying materials.

Bird Control

Birds are not a problem if sunflowers are harvested as fresh cut flowers. If left to dry in the field as seed heads, sunflowers will be attractive to birds. The seeds are readily accessible and high in nutritional value, and the flower head provides a perfect perch. Although many species of birds feed on sunflowers, migrating flocks of red-winged blackbirds do the most damage. Yellow-headed blackbirds and common grackles also cause significant losses.

Blackbirds often come to feed on the insects and weed seeds in a sunflower field before the crop is vulnerable to damage. Once the crop matures and the birds include the sunflower seed in their diets, efforts to move the birds fail. Although blackbirds are protected under the Migratory Bird Treaty Act, one section of the act provides that control of blackbirds damaging agricultural crops is legal without a special permit (check with the Kansas Department of Wildlife and Parks to be sure this section of the law is still in effect). A combination of cultural practices, mechanical and chemical harassment is most successful in controlling blackbirds.

Several cultural practices may be used. First, do not plant sunflowers next to cattail sloughs, marsh areas or woodlots because blackbirds are likely to roost in such areas. Control weeds early to eliminate one food source from the field. Also, delay plowing the harvest stubble of other crops to provide an alternate feeding area for harassed birds.

Use both mechanical and chemical harassment to frighten birds away from sunflower fields as soon as they are seen in the vicinity, regardless of the maturity of the crop. Use of rifles, automatic exploders and other electronic frightening devices works with variable success. Many of these may only be practical for large growers, as they can be expensive. Fright-producing repellents may also be available; check with the Kansas Department of Wildlife and Parks to see which are labeled for use in sunflower production.

Disease control. Diseases often reduce the quantity and quality of sunflowers and, in some cases, cause

significant plant mortality. Diseases such as Sclerotinia head rot, Rhizopus head rot and rust are perennial, while others may be sporadic. The table lists some common sunflower diseases, their symptoms and control. Certain plant diseases are difficult to identify by field symptoms. Be sure to consult a plant pathologist for accurate diagnosis.

There are no fungicides currently labeled for control of sunflower diseases. Nevertheless, many of these diseases can be suppressed or controlled by starting with clean seed, maintaining good cultural and sanitary practices during the growing season, rotating planting sites each year, and controlling insects that feed on the seed.

Yields

Approximately 75–80 percent of the seeds planted will germinate, grow and produce acceptable flowers in a well-managed crop. The potential exists for significantly reduced yields of marketable flowers if the grower fails to adequately care for the plants.

One terminal flower and 3–5 axillary flowers may be harvested from each mature plant. The terminal flower will have the longest stem. Axillary flowers may have stem lengths too short to be marketed through wholesale or retail florist channels. Alternative outlets such as farmers markets or sales in dried form may be developed for these shorter stemmed flowers.



Harvest

Even if sunflowers look sturdy growing in the field, care must be exercised during harvest and handling. They have the highest quality before they are cut.

- Harvest stems during the cool part of the day—morning or late in the day—when the plants and flowers are free from dew and moisture.
- Harvest when flowers are almost completely open.
- Cut stems as long as possible.
- Use clean, disinfected harvest containers and cutting utensils.
- Strip excess and damaged foliage from the stems in the field.
- Place newly harvested stems in commercial floral preservative or acidified, clean water (pH 3.5 citric acid works well).
- As soon as possible, remove stems from the field to cold storage or to a cool, shady place until the flowers can be graded and processed.

Research at the University of California showed that pulsing sunflowers with a nonionic detergent, Triton X-100, improved vase life. Longest vase life was achieved with a 1-hour pulse with 0.01 percent Triton X-100. The prestorage Triton pulse worked in three ways: increasing solution uptake during the 1-hour pulse, minimizing weight loss during the dry storage period, and significantly improving the uptake of water after dry storage.

Postharvest

- Strip leaves from the bottom half of the stem.
- Grade by stem length and flower size.
- Bunch by buyer's specifications.
- Recut stems under water to a uniform length.
- Store graded and bunched stems in commercial floral preservative in clean, disinfected containers.
- Store at 36–40°F and 85–90 percent relative humidity for up to 1 week. Vase life is 7–10 days.

Dried and Preserved Sunflowers

Handling and processing methods for dried sunflowers depend on the intended use. If the sunflowers are for decorative arrangements in which the flower is the focal point, harvest them at the same time as flowers for fresh use. Hanging the stems upside down will produce a twisted and tattered look, which may be desirable in some design work. The surround-and-cover drying method will preserve the natural petal shape best.

Surround and Cover Method:

- Remove most of the stem, leaving about 1/2–1 inch, because flowers dry most efficiently in shallow containers.

- Choose a drying substance, such as white cornmeal, sand, borax, kitty litter, silica gel or a specially formulated product. Do not choose something that will soil the flowers or be difficult to remove.
- Place the flowers with stems removed on a 1/2- to 3/4-inch layer of drying substance in a container 3–4 inches deep.
- Carefully pour the drying substance over, around and through the petals to cover the flowers.
- Specific instructions regarding light, temperature and length of drying time will vary with the drying material. Books describing specific handling methods for each material are available. (See References.)

If seeds are desired in the flower head, flowers can be left on the plant in the field to dry. Insect control may be necessary to reduce infestations of seed-eating insects that can emerge after flowers are harvested and sold. Black-birds may feed on the flower heads as they mature.

Packaging and Packing

Packaging and packing will depend on the buyer's specifications. Local consumers, retail florists or wholesalers selling directly to local retail florists often will accept flowers delivered in buckets in floral preservatives. Flowers for regional, national and international markets are packed dry in boxes. Standard flower boxes are 21 inches wide and 12 inches deep with lengths ranging from 42–57 inches. They are often insulated. Most fresh specialty cut flowers are shipped air freight to market because of their short vase life and high value.

Dried materials are fragile and prone to crushing easily unless packed well cushioned. Do not overfill boxes. Sleeve small bunches with cellophane or similar material to prevent abrasion. Use a packing material such as biodegradable foam peanuts as a cushion layer in the bottom of the box. There are no standard container dimensions for packing dried materials, but the buyer may have specific requirements. The buyer will require the dried material to be packed well enough to arrive in good condition.

Marketing

It is important to identify and organize market strategies before investing in seed, plants or equipment. Knowing how and where to sell the product is crucial to the success of a business. Be flexible, and determine more than one outlet; have a backup plan. The goal is to create a successful, profitable and sustainable business.

Market Outlets

Local direct retail markets:

- farmers markets
- roadside markets
- restaurants
- caterers

Local wholesale markets:

- florists
- grocery stores
- flower brokers

Regional/national/international wholesale markets:

- cooperatives
- flower brokers

An attractive market for small or new growers is the local farmers market. Sunflowers sell well where fresh local produce is sold directly to the public. They can be marketed singly or in mixed bouquets.

Additional Sources of Information

Field Development of the Sunflower. North Central Regional Extension Publication 161-1981. Jeff Coultas, Agricultural Extension Service, University of Minnesota, St. Paul, MN 55108. Full color pictures and description of stages of growth of the sunflower plant.

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Product names appearing in this publication are used for identification. No endorsement is intended, nor is criticism of similar products not mentioned.

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