

## University of Missouri Extension

G4290, Reviewed October 1993

# Sunflower: An American Native

**Robert L. Myers and Harry C. Minor**  
Department of Agronomy

Of all crops harvested for seed around the world, only one was domesticated in America — sunflower. This widely adapted crop is now grown in every temperate region, including many parts of the U.S.

In the U.S., 2.7 million acres were grown in 1991, about 85 percent of which was oilseed sunflower. The rest was grown for whole-seed confectionary uses. North Dakota has been the leader in sunflower production, with 1.4 million acres in 1991. South Dakota and Minnesota are the next biggest sunflower producers.

Kansas grew about 75,000 acres of sunflower in 1991, about two-thirds of it oilseed varieties. Nearly 20,000 acres were grown in Missouri in the late 1970s, but Missouri acreage declined to a few thousand acres after prices fell. The 1990 Farm Bill has renewed interest in sunflower, since it established new farm programs to promote sunflower and other minor oilseeds.

## History

Sunflower is believed to have been domesticated from wild sunflower around 1000 B.C. in the western U.S. As can be seen along most Missouri roadsides in mid to late summer, wild sunflower is highly branched with small heads and small seeds, in contrast to the large seed head of domesticated sunflower.

Spaniards brought the sunflower to Europe in 1510, but it was never really viewed as a food plant by Europeans until it reached Russia in the late 1800s. The process of improving sunflower into a modern crop began in Russia around 1860. By the late 1940s, Americans were able to bring back sunflower varieties with oil contents of nearly 50 percent. American varieties at the time had 20 to 30 percent seed oil content.

U.S. production has emphasized oilseed varieties, but sunflower as a snack food has gradually increased. Sunflower acreage peaked in the late 1970s, then fell due to lowered prices and pest problems. More



pest-tolerant varieties, new government support and growing demand are again increasing sunflower acreage.

## Description

One reason that sunflower (*Helianthus annuus*) is grown so widely is its relatively short growing season, generally requiring 90 to 100 days from planting to maturity in the north-central U.S. and somewhat longer for more full-season varieties in Missouri. The crop's progression through its growth stages depends more on growing degree days than photoperiod. Full-season sunflower flowers during July in Missouri, while double-cropped varieties flower in August.

Sunflower heads consist of 1,000 to 2,000 individual flowers joined together by a receptacle base. The large petals around the edge of a head are actually individual ray flowers, which do not develop into seed. Pollination and seed development begin at the periphery of the grain head and move toward the center. It usually takes about 30 days from the time the last flower is pollinated until maturity.

A well-known sunflower characteristic is that the flowering heads track the sun's movement, a phenomenon known as heliotropism. Most newer varieties have heads that will droop to face the ground as the plants mature. This has the potential of reducing bird damage and reducing some disease development that could occur if water collected in the seed head.

Sunflower plant heights vary widely, but most full-season field crop varieties range from 5 to 7 feet tall, except for dwarf varieties, which are more typically 3 to 4 feet tall with smaller grain heads. Stems normally are unbranched, with a single seed head on each plant.

## Uses

### Food

Vegetable oil is the main market for sunflower in the U.S. and worldwide. Sunflower oil generally is considered a premium oil due to its light color, mild flavor, low level of saturated fats and ability to withstand high cooking temperatures. Despite these advantages, it is normally handled in the U.S. marketplace as a commodity vegetable oil. In the U.S., sunflower is perhaps better known as a snack food, even though that is actually a smaller market for the crop.

### Birdseed

Another well-known use of sunflower in the U.S. is as a birdseed, most typically mixed with millet and other grains. The black oilseed varieties usually are favored over the striped confectionary seeds, since they cost less per pound. Sunflower seeds' high oil content provides a good energy source for birds.

### Livestock

Sunflower is sometimes used as a livestock feed and in recent years has been determined to be a reasonable silage crop for certain situations.

The material remaining in the seed after oil extraction, called meal, has 28 to 42 percent protein and is an adequate feed source. Most often the seed is not dehulled or is only partially dehulled, somewhat lowering the protein percentage.

Hulled or partially dehulled sunflower meal is higher in fiber but lower in energy value and protein than soybean meal. Sunflower meal is best substituted for soybean meal on an equal protein basis, which means that a larger amount of sunflower is needed.

Sunflower hulls are sometimes used as a roughage for ruminants, but more often are burned at the processing

facility due to the cost of transportation.

Sunflower can be used as a forage, although this is not common. When it is grown as a silage, the most appropriate harvest stage is when about half of the head area has immature seeds. The plants should be allowed to wilt and lose moisture before being ensiled.

The crude protein level of sunflower silage is greater than that of corn silage. It is about the same as that of tall fescue hay but lower than that of alfalfa hay. If sunflower is not cut for silage until after the flowering stage, crude protein level will decline and lignin content will increase. Sunflower silage is considered adequate for steers and dry cows or low milk producers, but not for high-producing milk cows.

### **Industrial**

Like most oilseeds, sunflower has potential for many industrial products, but has not been used much for non-food, non-feed purposes in the U.S. Because sunflower oil is used for food purposes, its price is higher than is currently competitive with petroleum feedstocks for oil-derived products.

Sunflower hulls have been marketed for specialty purposes such as poultry litter, fireplace logs and other high-fiber products, but these markets are limited. Sunflower oil has been researched as a potential diesel fuel substitute, since sunflower oil has an energy content equivalent to 93 percent of number 2 U.S. diesel fuel.

## **Marketing and economics**

Sunflower profitability depends greatly on price levels. In 1991, sunflower prices were as high as 11 to 12 cents a pound, but fell to 8 cents a pound by the end of the year. At the higher price level, and with yields of 2,500 pounds per acre (which is achievable but not certain), sunflower is competitive with corn, especially if government payments are received. Under the minor oilseed provisions of the 1990 Farm Bill, which will be in effect until at least 1995, a producer can plant sunflower on normal flex acres and still receive deficiency payments for the program crop. Another option is to enroll program crop acres in the 0/92 program and plant sunflower.

Lack of crushing facilities limit oilseed sunflower marketing in Missouri. The closest sunflower processors probably are those in western Kansas. Sometimes soybean processors will crush sunflower during the off season, but only if there is a substantial volume of seed. Cost-effective transport requires that enough sunflower be grown locally to fill a rail car or barge. Trucking oilseed sunflower to an out-of-state processor usually is too costly for an individual producer.

Fortunately, a substantial in-state sunflower market exists for birdseed mixes. Missouri birdseed manufacturers consumed an estimated 10,000 tons of sunflower in 1991, most of it from out of state. Two major birdseed processors are The Grainery (Mexico, Mo., 573-581-3980) and Pennington Seed (Greenfield, Mo., 800-492-4175). (Keller's, in Quincy, Ill., also has purchased large volumes of sunflower seed for packaging.)

These processors usually prefer oilseed varieties over the striped seed varieties, since striped seed sells for a premium. Producers are encouraged to obtain a contract with a birdseed processor or other market outlet before planting a sunflower crop.

## **How to grow sunflower**

Sunflower produces large quantities of vegetable oil per acre, since oilseed-type seeds generally are 40 to 50 percent oil by weight. Yields can be more than 3,000 pounds per acre, although most Missouri soils are more likely to be in the 1,000 to 1,500 pounds-per-acre range, with up to 2,500 pounds per acre possible under

good growing conditions. Variety selection and pest pressures are major determinants of yield. Sunflower yields are less affected by dry conditions than corn yields, which is an advantage in Missouri.

As with most alternative crops, it is best to identify a market outlet before growing sunflower. Producers should start with a small acreage to get a feel for yield potential, then adjust acreage levels based on current prices and projections of sunflower stock levels.

## Rotations and site selection

Sunflower can be grown either as a full-season crop or a double crop. From an economic standpoint, it is particularly attractive as a double crop, since the yield reduction due to planting late (after the wheat harvest) is less than the yield reduction normally seen with soybeans.

As a full-season summer annual crop, sunflower can follow any of Missouri's other summer annual crops. Sunflower seeds will volunteer as weeds in the next year's crop, but can be easily controlled by herbicides available for corn, sorghum or soybeans. Sunflower volunteers, most of which will emerge in the first year, also can be controlled by cultivation and hand weeding, or by extra spring tillage.

It is important to use a long rotation period, since disease organisms can build up quickly and become quite severe. Producers should not grow sunflower more than once every three to four years on a given field. An even longer rotation period is preferable, since some sunflower diseases can stay in the soil for several years (up to 10 years for *Verticillium spp.*). The shorter the rotation, the more important it becomes to select disease-resistant or tolerant varieties.

If a field is already in row crop production, it is probably suitable for sunflower. The only situations likely to severely limit sunflower are poorly drained soils or soils that would prevent taproots from penetrating. Sunflower survives droughts through its extensive tap root; the above-ground portion of the plant does not use water very efficiently. Sunflower can tolerate pH values from 5.7 to 8.0.

## Choosing a variety

Sunflower varieties have steadily improved over time. Numerous options are now available, including dwarf types and specialty oil (high oleic) types. Hybrids are the most common and normally have higher yields and higher oil percentage. Most modern varieties are autogamous, able to produce seed without help from insect pollinators. Besides yield and oil percentage, traits to consider in variety selection include lodging and disease resistance, maturity, and seed size if the crop is for the snack food market.

## Field preparation

Sunflower is more likely to be limited by nitrogen than any other nutrient. If nitrogen is limited, yields and oil percentage will be reduced. Amount of nitrogen fertilizer needed depends on soil type, organic matter and the preceding crop, but around 100 pounds per acre should be adequate following corn, (60 pounds per acre following soybeans).

Research suggests sunflower is somewhat more sensitive to phosphorous than potassium. A 2,000 pounds-per-acre sunflower crop would take up about 40 pounds of phosphorous per acre and 80 pounds of potassium per acre. Use a soil test to determine how much of each should be added through fertilizer.

Seedbed preparation can be much like that for other row crops. No-till can be used as long as the soil drains adequately, but most sunflower fields receive some spring tillage. Preserve soil moisture, since sunflower

seeds require high moisture for good germination. If soil crusting limits seed emergence, a rotary hoe can be used to help loosen the crusted layer.

## Planting

The most critical planting requirements are getting the seed into adequate soil moisture and choosing an appropriate seeding rate. Planting date and row widths can vary considerably without seriously affecting production. For heavy soils, seeding depth should be 1 to 1.5 inches, depending on depth to moisture.

Seeding rate is especially important for sunflower varieties intended for the snack food market. A high seeding rate will cause seed to be smaller, which is undesirable for snack food. A general recommendation for this type of sunflower is 17,000 seeds per acre (roughly 4 pounds per acre), while a general recommendation rate for oilseed varieties is 23,000 seeds per acre (roughly 3 pounds per acre). The higher seeding rate is recommended for oilseed types to improve yields. Seed size will be reduced, but market prices for oilseed sunflower are unaffected by seed size.

Yields from April or May plantings normally will be higher than June or July plantings. Sunflower can germinate and emerge from soils as cool as 46 degrees Fahrenheit if the seed is of good quality. Frost will not cause long-term damage until plants are around the six-leaf stage, which is normally after the danger of frost has passed. Mature sunflower also tolerates low temperatures, being able to withstand temperatures down to 25 degrees Fahrenheit.

Row spacings should be wide enough to permit cultivation, typically 20 to 30 inches. Various row spacings show little effect on yield, except that dwarf sunflower will close a canopy better and yield more when rows are less than 30 inches apart. Row orientation is another factor often debated for sunflower. Research has shown no yield difference among possible row orientations, but some have suggested that a north-south row orientation can make harvesting easier.

A common planting method is to equip a corn planter with special sunflower seed plates, which are sold by various companies. A fungicide seed treatment prior to planting is often recommended.

## Weed control

When planted in wide rows, sunflower can be easily cultivated for weed control. Delaying planting to allow more time for shallow tillage can aid in control of some early season weeds. Most sunflower varieties grow rapidly and can compete effectively with weeds once they are well established (this is less true for dwarf sunflower).

Several herbicides are registered for sunflower, including compounds such as Eptam, Treflan, Sonalan, Poast, Assert and Prowl. Since the list of registered products changes periodically, growers are encouraged to contact MU Extension personnel or industry representatives for up-to-date information.

## Insects

Both beneficial and pest insects can be found on sunflower plants in the summer, especially around the head. Many insect pests are known to cause head damage, but the damage usually is quite limited.

Insect pests that occasionally appear on sunflower plants include sunflower moth, sunflower maggot and sunflower beetle. Heads can be clipped off or leaves damaged by cutworm, headclipping weevil and assorted caterpillars. Grasshopper, wireworm, and sunflower maggot also can cause plant damage.

Of these pests, sunflower moth is the most likely to cause damage in Missouri. Unfortunately, economic threshold levels have not been determined for sunflower insects, so it is sometimes difficult to know when it is profitable to spray for pests unless massive damage is clearly being done.

Several insecticides are labeled for sunflower use, but such sprays should be used with caution during pollination with varieties that depend on insect pollinators (autogamous varieties can achieve 85 to 100 percent seed set without insect pollinators).

## Diseases

Diseases can be a serious problem in a sunflower field. Newer varieties have significantly improved resistance or tolerance, but once a disease occurs, little can be done for control. Verticillium wilt and sclerotinia stalk/head rot are two of the worst diseases. Rust, phoma and downy mildew also can appear. Sclerotinia is hard to avoid, since varietal resistance is minimal and sclerotinia organisms can be built up in a field by soybean, alfalfa, canola, and weeds such as lambsquarter and wild mustard.

## Harvesting and storage

Sunflower is ready to harvest when the back portion of the head turns brown. The seeds actually mature somewhat earlier, but the head will be too wet for efficient harvest until the brown color appears. Timely harvest is important to minimize losses due to birds and late season diseases.

Efficient harvest requires a modified grain head on the combine. A standard combine header will cause excessive seed loss to the ground from shattering, so a special sunflower header should be obtained, or a conventional header can be modified by adding catch pans, deflectors and possibly a smaller reel.

The modifications are intended to collect the sunflower head while minimizing stem material collection. Cylinder speeds should be relatively slow, from 300 to 450 rpm. A proper concave adjustment is necessary to prevent dehulling the seeds.

Seeds can be stored at up to 12 percent moisture for short periods, but should be dried to 9 percent moisture for long-term storage. It is best to have on-farm storage available, since some of the current market outlets in Missouri accept sunflower delivery only during certain time periods.

## Sources of sunflower seed

Agri-Pro	Shawnee Mission, Kan.	913-384-4940
Agway	Grandin, N.D.	701-484-5313
Cargill Seeds	Fargo, N.D.	800-634-8941
Dahlgren and Co.	Crookston, Minn.	218-281-2985
ICI Seeds	Coon Rapids, Iowa	800-348-2742
Interstate Seed	Fargo, N.D.	800-437-4120
Jacques Seed Co.	Prescott, Wis.	800-321-2867
Kaystar	Huron, S.D.	800-288-8791
Pioneer	O'Fallon, Ill.	618-624-8222

Sigco Sun Products	Breckenridge, Minn.	800-654-4145
Triumph Seed Co.	Ralls, Texas	806-253-2584

G4290, reviewed October 1993

## Related MU Extension publications

- G4090, Alternative Crops in Double-Crop Systems for Missouri  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G4090>
- NCR160, Diseases of Sunflowers  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=NCR160>
- PS14, Sunflower Insect Pests I  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=PS14>
- PS15, Sunflower Insect Pests II  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=PS15>

Order publications online at <http://extension.missouri.edu/explore/shop/> or call toll-free 800-292-0969.



■ Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211  
■ an equal opportunity/ADA institution ■ 573-882-7216 ■ [extension.missouri.edu](http://extension.missouri.edu)