Fact Sheet Series 22-1

Sunflower Production

Summary

- Sunflowers can increase diversity in grain crop rotations, which is imortant for managing fertility, insects, weeds and diseases
- They can contribute to the diversification of farm revenue through access to a variety of markets
- Sunflowers are a versatile crop that is adapted to grow in a variety of soil types and climates
- They can be incorporated into a wide range of organic rotations, including soybean, corn and wheat

WHY ADD SUNFLOWERS TO AN ORGANIC GRAIN ROTATION?

Sunflowers are a versatile crop that is adapted to grow in a variety of soil types and climates which can increase diversity and add value in grain crop rotations. A diverse crop rotation is especially important in organic systems for managing fertility, insects, weeds and diseases. Sunflowers can be incorporated into a wide range of organic rotations, including soybean, corn and wheat. With their extensive fibrous and tap root systems, sunflowers are fairly drought tolerant and can offer the advantage of increasing rotation length and attracting pollinators and beneficial insects.

Sunflowers can also contribute to the diversification of farm revenue through access to a variety of markets. Three primary types of sunflowers are grown include oilseed, non-oilseed (also known as confectionary), and conoil. Oilseed sunflowers are used for vegetable oil production and there are a few market classes based on their oil profile including linoleic, mid-oleic (NuSun™) and high oleic. In the US and Canada, mid-oleic is planted on the most acreage. Oilseed sunflower can also be processed into feed. Non-oilseed sunflowers are grown for human food, such as snacks or nut butter and bird food. Conoil hybrids, a cross between oilseed and confection hybrids, are also available. They are usually used for dehulling, but can be used for oil or bird food as well. Sunflower marketing usually uses cash forward contracts, but on-farm storage is also common. Non-oilseed sunflower and specialty oilseeds are generally contract grown.

Photo credit: Ben Brockmueller

AGRONOMIC DECISIONS FOR SUNFLOWER PRODUCTION

Growth and Development

Sunflowers, like most crops, are sensitive to soil conditions at planting. In northern regions of the US, planting dates range from April 15 – July 10. Germination can be negatively impacted by cold and wet soil, which can be a particular concern for organic growers with respect to damping-off diseases and weed management. A soil temperature of 50°F to 55°F is optimal for germination. Sunflower development requires around 2,500 growing degree days, with physiological maturity (R-9) reached when the back of the head has yellowed, the bracts are turning brown and seed moisture is around 35%. Bract color may not be a good indicator of maturity in stay-green hybrids. After physiological maturity, plants require time to dry down to a moisture level that can be combined. The industry standard for dry is 10% but starting at 15% will reduce harvest shatter loss and can be easily air dried.

Variety Selection

Some key factors to consider for hybrid selection are maturity, dry down, yield potential for your area, oil percentage and disease resistance. Frost damage before physiological maturity can decrease yield, oil content, and test weight. In more northern regions, selecting early to midseason varieties that dry down quickly may be important to consider, although shorter

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season sunflowers can have lower yields. Disease resistance can also be considered, as traditional breeding techniques have led to sunflower varieties that are resistant to downy mildew, rust or Verticillium wilt.

Soil and Fertility

Sunflowers are adapted for a range of soil types. They do best in well-drained soils but with good water-holding capacity and a more neutral pH between 6.5 and 7.5. Due to their deep tap roots, sunflowers are able to scavenge nutrients as deep as 3 to 4 feet.

Nitrogen is generally the most limiting nutrient for sunflowers with recommendations dependent on soil type and yield goals. Sunflowers tend to be less nitrogen (N) demanding than corn, with N rates of 75-90 pounds per acre typically applied before planting. Sunflowers are also sensitive to N overapplication with higher N rates leading to greater susceptibility to lodging, increased susceptibility to disease and lower oil content. Soil phosphorus (P) and potassium (K) are recommended in the range of 30-50 pounds per acre for P and 60-80 pounds per acre for K.

Planting Practices

Sunflower planting dates and growing conditions will affect yield, oil content and fatty acid composition. Early planting can lead to higher yield, reduced bird damage due to earlier harvest date, and reduced losses from Sclerotinia head rot. Especially in northern regions, earlier planting can increase yields and oil percentages. Later plantings often have lower yields, lower oil content and may require mechanical drying if harvest is delayed by weather.

When planting sunflowers, even spacing is important to reduce competition between plants. Corn planters or air seeders are recommended for planting sunflowers while grain drills often result in skips and doubles.

Seeding Rates and Depths

Target seeding rate in organic production should be 26,000 seeds per acre for oilseed varieties, depending on soil type and yield goals. Non-oilseed varieties can be planted at lower seeding rates (approximately 20,000 seeds/acre). Ideal seeding depth is 1.5-2.0" depending on seed bed conditions and soil moisture, with row spacing ranging from 20"-36" depending on planting and cultivation equipment. A range of seeding densities can lead to similar yield as the plants adjust head diameter, seed number per plant and seed size depending on the plant population. However, head size can affect drying rate as heads with a smaller diameter have been found to require shorter drying time.

Weed Management

The first few weeks after planting are critical for managing competition from weeds to maximize sunflower yields, but after the plants are well established, they compete well with weeds. Mechanical cultivation with a tine weeder pre-emergence and up to 2 weeks postemergence provides successful weed control. Targeting blind cultivation towards weeds in the white thread stage that have yet to emerge is the most effective. Additional postemergence cultivation with a row crop cultivator or spring-toothed harrow can be performed once sunflowers reach the 4- to 6-leaf stage. Once the canopy closes, there is very little pressure from newly emerged weeds. Mechanical cultivation can affect the harvest population and a higher seeding rate may be justified depending on cultivation strategies.

Pest Management

A variety of pests can affect sunflowers including sunflower beetle, sunflower bud moth, stem borer, sunflower stem weevil, thistle caterpillar, sunflower midge, red sunflower weevil, gray sunflower seed weevil, sunflower moth, banded sunflower moth, wireworms, cutworms, grasshoppers, pale striped flea beetle, and lygus bug. A careful crop rotation is an important part of an effective pest management strategy. Planting sunflower in rotation with grasses and other broadleaf crops is recommended with sunflower planted once every 3 to 5 years. If there is significant pest pressure, the rotation can be increased to 5 to 7 years until the pressure subsides.

Disease Management

Major sunflower diseases include Sclerotinia stalk and head rot, Verticillium wilt, rust, phoma black stem, downy mildew and leaf spot. Disease prevalence can be managed through carefully planned rotations with non-susceptible crops. For example, to control Sclerotinia, it is recommended to plant sunflowers no more than once every 4 years in the same field in a rotation with grasses or other non-susceptible crops. Downy mildew can also be managed through resistant hybrids. Controlling the microclimate at the soil surface by adjusting row spacing and plant density is recommended. Thirty-inch rows tend to be wide

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enough to decrease humidity near the soil surface. This may reduce fungal pressure while maintaining sufficient cover to reduce weeds.

Managing Bird Damage

Bird flocks can result in serious yield losses and are best managed with a combination of cultural practices, habitat management, and harassment tactics. Cultural practices include (1) keeping unplanted trails to enable access to the fields to scare birds away (2) early weed control to help prevent birds from being attracted to the fields in the first place, as they will first feed on the weeds and then the sunflowers and (3) delaying land preparations after crops in other fields until after sunflower harvest to provide an alternate food source for the birds. Managing blackbird roosting sites, especially cattail marshes, can also help reduce bird pressure. Harassment tactics include (1) pyrotechnic devices, which can be effective but should be used with caution (2) electronic frightening devices, which are not as effective due to their limited broadcast range and (3) drones, which can be somewhat effective especially if combined with other harassment tactics.

Frost Damage

Sunflowers seedlings are initially tolerant of frost, but this decreases as they develop. The disk flowers are particularly sensitive to frost with frost damage resulting in undeveloped seed. However, frost tolerance increases after pollination and once the sunflowers mature, the risk of frost is minimal. For oilseed sunflower, frost damage can result in lower test weight and lower oil percentage. For non-oilseed sunflower, frost can cause quality problems for both the confectionary and birdseed markets.

Harvesting, Drying and Storage

Optimal harvest timing is important for sunflower seed yield and quality. Physiological maturity is reached when seed moisture is around 35%. When seed moisture is less than 20%, sunflowers can be combined, but 10-15% moisture is preferable. If seed moisture is above 20%, it can result in scuffing during harvest. However, if seeds are too dry, they can shatter in the combine and have poor oil content. Higher yield can be achieved by harvesting sunflowers at higher moisture due to less field loss to bird damage and reduced exposure to cold weather, but mechanical drying will be required. Low-temperature bin, high-temperature bin, batch flow, continuous flow, and natural air dryers can be used. Sunflowers can be combined using a corn head with roller knives or other row crop headers. Platform headers are not recommended. Most organic corn growers will need no additional equipment to harvest the crop.

For storage, seed should be cleaned to remove excess residue. It is recommended that seed moisture not be above 10% during the winter and 8% during the summer for oilseed sunflower and should not be above 11% during the winter and 10% during the summer for non-oilseed sunflower. During storage, regular temperature monitoring and adjustments are needed to reduce the possibility of deterioration due to insects or mold.

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The OGRAIN (Organic Grain Resource and Information Network) program provides resources and support for new, transitioning, and experienced organic grain farmers throughout the upper Midwest. OGRAIN is housed in the Organic and Sustainable Agriculture Research and Extension Program within the UW-Madison Department of Plant Pathology under the leadership of associate professor Dr. Erin Silva. For more information visit our website at ograin.cals.wisc.edu. To contact us, email Erin at emsilva@wisc.edu, or call (608) 890-1503. Learn more at https://ograin.cals.wisc.edu/.