Chapter 4: Seedbed Preparation and Planting

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Planting good quality seed with high germination is an important step in successful sunflower production. Poor seed sourcing may inhibit stand uniformity and vigorous early season growth. Seed is typically sold in units based on seed count. Most seed is treated with fungicide and insecticide to protect the germinating seedlings. As mentioned previously, results from university, local or regional hybrid trials should play an important role in hybrid selection.

The first trait that growers select for when they chose a sunflower hybrid is usually yield. However, since oil content can vary dramatically between hybrids and environments, if the sunflowers are designated for the oilseed market, oil content should also be an important characteristic when selecting a hybrid. In addition to yield and oil content, maturity and test weight are important as well.

Depending on soil moisture, sunflowers are typically seeded at a depth of 1 ½ to 2 ½ inches. Sunflower's woody hull means that soil-to-seed contact is essential to ensure the seed imbibes moisture. Hence, proper functioning of seed-firming wheels and row closers is critical. Sunflowers perform well on a wide range of soil types and pH's ranging from 6.5 to 7.5. They also tolerate saline soils relatively well; particularly where adequate soil moisture and nutrition are available.

Sunflowers offer a flexible planting window with the majority of growers in South Dakota planting from late May to late June. This often makes sunflowers the last crop harvested in the fall. Sustained soil temperatures of about 50°F are required for seed germination. Previous SDSU research indicates that oil content is more sensitive than yield to later planting dates. Therefore, as planting stretches into late June, oil content may be more adversely affected than yield. Typically, oil-type sunflowers mature earlier than confection sunflowers and hence, can be planted later in the planting window.

Because of the later planting dates, tillage generally has less effect on soil temperatures with respect to seed germination. However, since much of the sunflower production exists in the more semi-arid regions of South Dakota, no-till or conservation tillage practices are the predominant tillage systems utilized in sunflower production with the purpose of maintaining soil cover and soil moisture.

Seeding Rate and Spacing

Sunflowers are quite sensitive to seed spacing. Uniform stands are critical for successful production, and to meet contract specifications for seed size for confection types. Hence, seeding rates often vary depending on the type of sunflower planted and its expected end use. Sunflowers will compensate for lower plant populations by producing larger seeds and heads, and

vice versa. In order to promote large seed size, it is recommended that confection sunflowers be planted at lower populations than oil-type sunflowers. For example, producers across South Dakota generally plant confection sunflowers in a range from 14,000 to 18,000 pure live seeds (pls) (plants) per acre, with many producers on the lower end of this range in drier climates. On 30-inch row spacing, this equals 9.4 to 12.1 inches in distance between seeds.

For oilseed types, the recommended planting population generally increases from 16,000 to 22,000 pls per acre (10.6 to 7.7 inches between seeds). ConOil sunflowers, as the name suggests, are hybrids developed from both confection and oilseed parentage. Typical ConOil stands are generally at the midway point between confection and oilseeds with a range of 17,000 to 18,000 pls per acre.

Most producers plant on 30-inch row spacing for sunflowers with a row planter. In some cases, growers will plant sunflowers using an airseeder or drill on narrower spacing (e.g., 15-inch row spacing). Planting sunflowers with an airseeder will result in a less uniform stand, which, as mentioned earlier, will result in variability in head and seed size. It is recommended to increase seeding rate by 2,000 to 3,000 pls per acre when using an airseeder or drill. This will help decrease the potential for variable depth placement and inconsistent metering.

Crop Rotation

A well-designed crop rotation can help spread weather and price risks, manage weed populations, reduce plant diseases, manage workloads, and create proper environments for subsequent crops. Producers design crop rotations to meet their individual needs.

There are four crop types that can be included in crop rotations to build diversity: cool (C3) and warm season (C4) grasses, and cool and warm season broadleaf crops. Rotations that face the least weed, disease and insect issues contain at least three of the four crop types, preferably one, or more, of each type of grass and a broadleaf crop. Research also indicates that a crop rotation that includes a two-year interval between any given crop type will help to reduce pest pressure. Some crops will benefit from longer than a two-year interval between crops.

Sunflowers are a full season crop and have a deep taproot that can utilize water and nitrogen from deeper in the soil profile than many common Midwest crops. This can make sunflower a good crop choice during dry years. However, these same characteristics can limit crop options the year after sunflowers. This is especially true for crops grown early in the season (wheat vs millet) because soil moisture is still depleted from the sunflowers.

Other important considerations when determining placement of sunflowers in a crop rotation revolves around disease and other pests. The fact that sunflowers are native to North America means that there are many native disease and insect pests that can affect sunflowers. The disease section of this manual recommends managing many common sunflower diseases with crop rotation. Growing too many sunflower crops on a field within a short interval will lead to high pest pressure. Crop rotations that include only one sunflower crop every four years, at a minimum, are recommended to help mitigate pest concerns. In addition, because there is some crossover between soybean and sunflower pests, such as charcoal rot, *Diaporthe*-associated diseases, white mold and Dectes stem borer, it is not recommended to include soybean in any of the three years between sunflower crops. This recommendation would include canola, alfalfa as well as some pulse crops such as peas, dry beans and lentils due to their susceptibility to *Sclerotinia sclerotiorum* (the white mold fungus).

A common and relatively successful four-year crop rotation used in central South Dakota includes (year 1) spring cereal, (year 2) winter wheat, (year 3) corn/sorghum, (year 4) sunflowers/soybeans. This rotation does present some issues with grass pressure in the wheat crops after several cycles. It is being replaced by rotations that add a second warm-season grass.

A successful crop rotation will increase pest management options and reduce the occurrence of pest resistance. It should also optimize water use, include diversity, increase profitability and reduce risk.

Selected References

Beck, D. L. 2014. Managing Agricultural Ecosystems. SDSU Agriculture Experiment Station.

Notes

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