
Sunflowers

Management Highlights

- Target pH: **6.0**
- Split N requirement into 2 or more applications to increase N-use efficiency.

Yield Goals

Grain yield of sunflowers is influenced by many factors, including the cultivars selected, planting date, winter weather, soil type and water-holding capacity, nutrient and water availability, weed, insect and disease pressure and crop management practices. Few yield measurements are available for sunflowers grown on Delaware soils. However, in nearby states with similar soils and climates, **80 bu/ac** is a realistic yield goal for sunflower production in a good to average year.

When field history supports the use of a different yield goal, growers should use that information to adjust management decisions and fertility programs accordingly.

Soil pH and Liming

The target pH for sunflowers on most Delaware soils is **6.0**. Soils that are higher in organic matter ("black" soils) have a lower target pH (5.6) because organic matter moderates some of the negative effects of excessive soil acidity (e.g., aluminum toxicity). The lime recommendation for a specific field is calculated from the soil pH and buffer pH measurements using the steps outlined in *Calculating the Lime Requirement – Chapter 3, Section 3.4*. Avoid overliming in order to prevent deficiency of micro-nutrients such as manganese.

In most cases, the lime requirement can be met by either calcitic or dolomitic limestone.

Dolomitic limestone is recommended if:

- soil test Mg is less than 50 FIVs, or
- soil test Mg is between 50 and 100 FIVs *and less than soil test Ca*.

Calcitic limestone is recommended if:

- soil test Mg is greater than 100 FIVs, or
- soil test Mg is between 50 and 100 FIVs *and greater than soil test Ca*.

Nitrogen Management

Nitrogen (N) is recommended at a rate of *1 lb N per bushel of expected grain yield* for sunflowers. An expected yield of 80 bu/ac would, therefore, require a total N application of **80 lbs N/ac** per growing season. Split applications of N have been shown to increase N-use efficiency by the crop, thus requiring less total N to achieve the same grain yield.

When a single application is planned, N should be applied as close to planting as possible to reduce the potential loss of nitrogen by leaching prior to crop uptake. When a split application is utilized, apply a small portion (20-25%) of the total N requirement at or just prior to planting. Apply the remaining N (75-80%) in one or more applications during the growing season.

Wildlife Plantings

For wildlife plantings of sunflowers, the N rate can be reduced by half. Apply only a small amount at planting to minimize early weed competition. Apply the remainder in one or more applications during the growing season.

Phosphorus Management

Yield-limiting phosphorus (P) deficiency is rarely a concern on Delaware soils. Long-term applications of fertilizers and manures have resulted in P accumu-

lations in many soils that are capable of supplying crop needs for several years with no further additions.

To determine whether P fertilization is necessary for a specific field, conduct a routine soil test. University of Delaware P recommendations for sunflowers are dependent upon the soil test P value. A summary of those P recommendations are given in Table 1 below.

Table 1. Broadcast application rates for P for sunflowers.

P Index Value						
0	10	20	30	40	50	60
----- lbs P ₂ O ₅ / ac -----						
132	110	88	66	44	22	0

Note: These rates are for a broadcast application. If P is to be applied in a fertilizer band, rates should be cut by half.

Potassium Management

The need for potassium (K) fertilization of sunflowers is best determined by the use of a routine soil test. Potassium recommendations are based on the the soil test K value and the K needs of the crop. A summary of University of Delaware K recommendations for sunflowers is given in Table 2. Potassium can be broadcast prior to planting or applied in the fertilizer band. *To avoid salt injury to seedlings, do not band more than 75 lbs K₂O/ ac or (N+K₂O) /ac.*

Table 2. Broadcast rates of K for sunflowers.

K Index Value						
0	10	20	30	40	50	60
----- lbs K ₂ O / ac -----						
118	100	81	62	44	25	0

Magnesium Management

Mg application to sunflowers is recommended if the soil test Mg value is less than 38 FIVs. If liming is also recommended, use dolomitic limestone to raise soil pH and increase soil Mg. If, however,

liming is not necessary but Mg fertilization is still indicated, apply Mg as Mg sulfate or Mg chloride to increase soil Mg. Application rates are summarized below in Table 3.

Table 3. Application rates for soluble Mg as a function of Mg fertility index value.

Mg Index Value								
0	5	10	15	20	25	30	35	40
----- lbs soluble Mg / ac -----								
80	70	60	50	40	30	20	10	0

Manganese Management

Manganese (Mn) deficiency may occur in sunflowers grown on Delaware soils, most often as a result of overliming soils that are naturally low in Mn. The University of Delaware Soil Testing Program uses an availability index based on the soil test Mn value and soil pH to predict the likelihood of Mn deficiency. That availability index is calculated using the equation:

$$MnAI = 101.7 - (15.2 \times pH) + (2.11 \times ST-Mn)$$

where:

MnAI = Mn availability index

pH = water pH of the soil

ST-Mn = Mehlich 3 soil test Mn in lbs/ac.

Table 3-14 in *Chapter 3, Section 3.5.5.2 (Manganese Management)* gives a summary of MNAI values for various soil pH-soil test Mn combinations. Interpretations of the Mn availability index for sunflowers are given below in Table 4.

Table 4. Interpretation of the Mn availability index for sunflowers.

MnAI Value	Interpretation
Less than 12	Mn deficiency is likely at this soil pH and Mn concentration.
12 or greater	Mn deficiency is unlikely.

Suspected Mn deficiency can be confirmed by tissue analysis. Confirmed deficiency situations can be

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corrected in season by foliar applications of Mn of 1-2 lbs/ac of actual Mn as Mn sulfate, Mn oxide or Mn chelate.

If deficiency is predicted by the availability index or was observed during the previous growing season, it can be prevented by an application of 8-10 lbs/ac of actual Mn in the fertilizer band. Band applications of acid-forming fertilizer, which lower soil pH in the area of plant roots, may correct Mn deficiency without the addition of Mn fertilizer.

Other Nutrients

No other nutrients are known to be limiting to sunflower production in Delaware.

Additional Information

See Soil Test Notes 1, 2, 4 and 5 (Appendix APP-7) for additional information concerning fertilization of sunflowers.