Grain Sorghum

Management Highlights

- Target pH: **6.0**
- Base N application rates on the crop rotation in use. Sorghum has shown only minimal response to N when following an average or better soybean crop (e.g., 30 bu/ac or more yield) or other legume. Increase N rates when sorghum follows a corn or sorghum crop.

Yield Goals

Grain yield of sorghum 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. On Delaware soils, **80 bu/ac** is a realistic yield goal for grain sorghum 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 grain sorghum on most Delaware soils is **6.0**. Soils that are high 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 to prevent deficiency of micronutrients 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

University of Delaware nitrogen (N) recommendations for sorghum are based upon the crop rotation in use. A total nitrogen (N) application rate of **50-75 lbs N/ac** per growing season is recommended for a grain sorghum crop following corn or sorghum. When the sorghum crop is following an average or better soybean crop (e.g., 30-40 bu/ac or higher yield) or another legume in the rotation, the N application rate should be reduced to **25-50 lbs N/ac** per growing season.

To reduce the potential loss of N by leaching prior to crop uptake, N should be applied as close to planting as possible.

When planting into fields where manure has been applied, fertilizer N rates should be reduced. To calculate the adjustment, see ***Nitrogen Rate Adjustments -- Chapter 3, Section 3.5.1.2.***

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 accumulations 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 grain sorghum 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 grain sorghum.

P Index Value						
0	10	20	30	40	50	60
---------- lbs P_2O_5 / ac ----------						
100	80	60	50	30	10	0

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

Potassium Management

The need for potassium (K) fertilization of grain sorghum is best determined by the use of a routine soil test. Potassium recommendations are based on the soil test K value and the K needs of the crop. A summary of K recommendations for grain sorghum 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 K_2O/ac. If both N and K are be banded, the sum of N and K_2O rates should not exceed 75 lbs/ac or salt injury to seedlings may occur.***

Table 2. Broadcast application rates for K for grain sorghum.

K Index Value						
0	10	20	30	40	50	60
---------- lbs K_2O/ac ----------						
90	75	60	45	30	15	0

Magnesium Management

Mg application to sorghum 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 grain sorghum grown on Delaware soils, most often as a result of over-liming 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:

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

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 grain sorghum are given in Table 4.

Table 4. Interpretation of the Mn availability index for grain sorghum.

MnAI Value	Interpretation
Less than 17	Mn deficiency is likely at this soil pH and Mn concentration.
17 to 25	Mn deficiency is possible at this soil pH and Mn concentration. Monitor crop for deficiency symptoms if liming has been recommended.
Greater than 25	Mn deficiency is unlikely.

Suspected Mn deficiency can be confirmed by tissue analysis. Confirmed deficiency situations can be 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 a band application of 8-10 lbs/ac of actual Mn or, where banding is not possible, a broadcast application of 20-30 lbs/ac of actual Mn. 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.

Manganese toxicity has also been observed in grain sorghum grown on Delaware soils with low soil pH. Symptoms of Mn toxicity include generally stunted growth, yellowed or chlorotic leaves, and, in severe cases, a series of reddish purple bands which run parallel to the leaf veins about ½ to ⅓ of the way back from the leaf tip. Suspected Mn toxicity can be confirmed by a tissue and/or soil pH test. When detected early, the problem may be corrected by broadcasting lime over the top at a rate of 1ton of lime/ac. Later in the season, little can be done to correct the problem in-season. Note the area of toxicity so that lime can be applied to raise the pH for future crops.

Other Nutrients

Sulfur (S) deficiency has occasionally been observed early in the season in sorghum grown on sandy soils. Use of ammonium sulfate as the N source or the addition of a small amount of ammonium sulfate to the liquid UAN would prevent S deficiency fom occurring.

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

Additional Information

See Soil Test Notes 1, 2, 4 and 5 (Appendix APP-7) and Extension Bulletin No. 148: ***Grain Sorghum -- A Manual for Production and Marketing*** *(Taylor, 1988)* for additional information about nutrient management of grain sorghum.