
Sudan or Millet Hay

Management Highlights

- Target pH: **6.0**.
- Apply N at planting to aid in establishment and after the 2nd and 3rd cuttings to encourage stand recovery and subsequent growth.

Yield Goals

Forage yield of sudan - millet hay production is dependent upon many factors: the cultivars selected, seeding date, stand composition, soil type and water-holding capacity, nutrient and water availability, weed, insect and disease pressure and crop management practices. *On Delaware soils, 3.0 to 5.0 tons/ac of hay is a realistic forage yield for a sudan - millet hay field in a good to average year.* When field history supports the use of a different yield goal, the grower should adjust management decisions and the fertility program accordingly.

Soil pH and Liming

The target pH for sudan - millet hay fields on most Delaware soils is **6.0**. *If the soil pH is 5.3 or lower, soil is too acid for good growth of sudan-millet hay.* Surface applications of limestone will not be effective in correcting soil pH. Apply lime at the recommended rate and plow down prior to seeding the field.

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*. Use care to avoid overliming in order to prevent micronutrient deficiencies (e.g., 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

The University of Delaware recommends a total nitrogen (N) application of **140-160 lbs N/ac** per growing season for sudan - millet hay fields. *At seeding, apply 40-60 lbs N/ac* to aid in establishment of the crop. The higher N rate should be used on sandier soils to compensate for greater leaching losses. *Apply an additional 50 lbs N/ac after both the second and third cuttings* to encourage recovery and subsequent growth of the plants.

Nitrogen applications should be reduced when seeding a field where manure has been applied prior to planting or a legume cover crop has been produced. To calculate the necessary adjustment, see *Nitrogen Rate Adjustments -- Chapter 3, Section 3.5.1.2*.

CAUTION: To avoid *nitrate toxicity* in the crop which could be dangerous when used as feed for livestock, be cautious when cutting hay or grazing the field during or after a drought or if a recent application of N was followed by cool, wet weather. Both situations can result in nitrate-N accumulation in the plant.

Phosphorus Management

Yield-limiting 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.

Adequate concentrations of soil test P are important to sudan-millet hay production. To determine whether P fertilization is necessary for a specific field, conduct a routine soil test. University of Delaware P recommendations for sudan-millet hay production are dependent upon soil test P value. A summary of those P recommendations is given in Table 1.

If soil test P is *Low or Medium* (e.g., 50 FIVs or less), P should be broadcast and plowed down prior to seeding. If soil test P is *Optimum* (e.g., greater than 50 FIVs), P can be broadcast and incorporated prior to planting or surface broadcast at planting.

Table 1. Phosphorus fertilizer recommendations for sudan-millet hay production.

P Index Value									
0	10	20	30	40	50	60	70	80	90
----- lbs P ₂ O ₅ / ac -----									
120	108	96	84	72	60	48	36	24	12

Potassium Management

Potassium (K) is very important to sudan-millet hay production. The need for K fertilization is best determined by the use of a routine soil test. Potassium recommendations are based on the soil test K index value. A summary of University of Delaware K recommendations for sudan-millet hay production is given in Table 2.

Applications of K should be broadcast prior to or shortly after planting. Incorporating K by disking or plowing down will decrease potential salt effects from higher application rates.

Table 2. Potassium fertilizer recommendations for sudan-millet hay production.

K Index Value									
0	10	20	30	40	50	60	70	80	90
----- lbs K ₂ O / ac -----									
120	108	96	84	72	60	48	36	24	12

Calcium and Magnesium Management

Calcium (Ca) and magnesium (Mg) needs of sudan-millet hay production are usually met through routine liming. *Magnesium application is recommended if the soil test Mg value is less than 38 FIVs.* If liming has been recommended, use dolomitic limestone to raise soil pH and increase soil Mg. If, however, liming is not necessary but Mg is still indicated, apply Mg as Mg sulfate or Mg chloride to increase soil Mg. Appropriate application rates are given 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 sudan-millet hay fields 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 = soil test Mn in lbs/ac.

Forage Crops

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 sudan-millet hay fields are given below in Table 4.

Table 4. Interpretation of the Mn availability index for sudan-millet hay fields.

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 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 broadcast application of 20-30 lbs/ac of actual Mn in the fertilizer band. Broadcast 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 but may be less effective than applications of Mn.

Other Nutrients

No other nutrients are known to be limiting to sudan-millet hay production in Delaware.

Additional Information

See Soil Test Notes 1, 3, and 4 (Appendix 7) for additional information concerning fertilization of sudan-millet hay fields.