

Commercial Strawberry Production

Management Highlights

- Target pH: 6.0
- Split N applications for most efficient N-use by the crop.
- Use a B soil test or apply B annually at recommended rates to prevent deficiency in the crop.

Yield Goals

Yield of strawberries is influenced by many factors beyond soil test results and fertilizer application. Cultivar selection, planting date, weather conditions, soil type and water-holding capacity, weed, insect and disease pressure and crop management practices are just a few. *For that reason, the University of Delaware does not use yield goals in determining nutrient recommendations for small fruit crops at the present time. Instead, recommended rates are designed to produce maximum economic yields of high market quality in a good to average year.* Growers should use these nutrient recommendations along with field history data, their knowledge of specific crop requirements, their management plans, and conditions from the current growing season to develop an appropriate fertilizer program for the crop.

Soil pH and Liming

The target pH for commercial strawberry production 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 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 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 commercial strawberry production are dependent upon crop status (e.g., new planting versus established bed) and soil type as summarized in Table 1. *For most efficient N-use by the crop, N applications should be split during the growing season* according to the schedules outlined in the appropriate sections below. When planting into legume cover crops or fields where manure has been applied, fertilizer N rates should be reduced. To calculate the adjustment necessary, see *Nitrogen Rate Adjustments -- Chapter 3, Section 3.5.1.2.*

Table 1. Total N recommendations for commercial strawberry production.

Crop Criteria	N Rate
<u>New plantings</u>	
	--- lbs N/ac ---
sandy loams, loams, silt loams	180 - 230
loamy sands, sands	165 - 230
<u>Established plantings</u>	
sandy loams, loams, silt loams	80 - 90
loamy sands, sands	90 - 110

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New Plantings

The total nitrogen requirement for the growing season should be split into three applications for new plantings on loamy sands and sands. For new plantings on finer textured soils, only two applications are necessary during the first growing season. The recommended time and rate of N application are outlined below in Table 2. *Strawberries should not be fertilized with N at planting.*

All new plantings should be fertilized with 30 lbs N/ac in late February or early March of the second year.

Table 2. Recommended rate and time of N application to new plantings of strawberries.

Method and Time of Application	N Rate
Loamy sands, sands — lbs N/ac —	
Sidedress 2 weeks after planting	30-50
Sidedress when first runners start	30-50
Topdress in mid-August	75-100
Sandy loams, loams, silt loams	
Sidedress when first runners start	75-100
Topdress in mid-August	75-100

Established Plantings

All established beds should be topdressed with two applications of N annually: the first at renovation and the second in later February or early March of the following year. Application rates at renovation are dependent upon soil type as summarized in Table 3. *The early spring application rate is 30 lbs N/ac for all soil types.*

Table 3. Recommended N rates for renovation of established strawberry plantings.

Soil Type	N Rate
— lbs N/ac —	
Loamy sands, sands	60-80
Sandy loams, loams, silt loams	50-60

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 commercial strawberry are dependent upon the soil test P value and the P needs of the crop. For strawberries, the P requirement varies with crop status (e.g., new versus established plantings and soil type). A summary of those P recommendations is given in Table 4 below. Phosphorus should be broadcast and incorporated prior to planting.

Table 4. Phosphorus fertilizer recommendations for commercial strawberry production.

Crop Status	P Index Value								
	0	10	20	30	40	50	70	90	
New Plantings		———— lbs P ₂ O ₅ / ac —————							
LS, S	165	145	125	105	85	65	40	15	
SL, L, SiL	150	130	110	90	70	50	30	10	
Established Plantings									
All soil types	165	145	125	105	85	65	40	15	

NOTE: LS=loamy sand, S=sand, SL=sandy loam, L= loam and SiL=silt loam

Potassium Management

The need for potassium (K) fertilization of commercial strawberry 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. As with phosphorus, the K requirement of commercial strawberry also varies with crop status and soil type. A summary of University of Delaware K recommendations for commercial

strawberry is given in Table 5. Potassium should be broadcast and incorporated prior to planting.

Table 5. Potassium recommendations for commercial strawberry production.

Crop Status	K Index Value							
	0	10	20	30	40	50	70	90
New Plantings	----- lbsK ₂ O / ac -----							
LS, S	165	145	125	105	85	65	40	15
SL, L, SiL	150	130	110	90	70	50	30	10
Established Plantings	-----							
All soil types	165	145	125	105	85	65	40	15

NOTE: LS=loamy sand, S=sand, SL=sandy loam, L= loam and SiL=silt loam

Calcium and Magnesium Management

Calcium (Ca) and magnesium (Mg) needs of commercial strawberries 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 fertilization is still indicated, apply soluble Mg as Mg sulfate or Mg chloride to increase soil Mg. Appropriate application rates are given below in Table 6.

Table 6. 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	50	30	20	10	0

Boron Management

Boron (B) deficiency may occur in strawberries grown on Delaware soils. The best way to determine the need for B fertilization is with a soil test.

Interpretation of and application rates based on the B soil test are summarized in Table 7. In the absence of a soil test, apply 2.0 lbs/ac of actual B in a blended, broadcast fertilizer. *Avoid over-application of B to prevent plant injury from B toxicity.*

Table 7. Interpretation of the B soil test for commercial strawberries.

Soil Test Rating	Soil Concentration	Recommended Application
	--- lbs B/ac ---	--- lbs B/ac ---
Low	0.00 - 0.70	2.0
Medium	0.71 - 1.40	1.0
Optimum	> 1.40	0

Manganese Management

Manganese (Mn) deficiency may occur in strawberries 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:

$$MNAI = 97.8 - (14.4 \times pH) + (1.63 \times ST-Mn)$$

where:

- MNAI = Mn availability index
- pH = water pH of the soil
- ST-Mn = 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 commercial strawberry are given below in Table 8.

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Table 8. Interpretation of the Mn availability index for commercial strawberry production.

MnAI Value	Interpretation
Less than 12	Mn deficiency is likely at this soil pH and Mn concentration.
Greater than 12	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 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/acre of actual Mn in the fertilizer band. Band applications of acid-forming fertilizer, which lower the 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 commercial strawberry production in Delaware.

Additional Information

See Soil Test Notes 1, 4, 5 and 7 (Appendix 7) and Extension Bulletin 137: *Commercial Vegetable Production Recommendations - Delaware* (Kee et al., 1996) for additional information concerning nutrient management of commercial strawberry production.