

Tomatoes - Fresh Market

Management Highlights

- Target pH: 6.5
- Split N applications to increase N use-efficiency in tomatoes. Apply part at planting and the remainder as a sidedress application when first fruits are set.
- Use a B soil test or apply B annually at recommended rates to avoid deficiency in the crop.

Yield Goals

Yield of tomatoes 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 vegetable 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 tomatoes on most Delaware soils is 6.5. Soils that are higher 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 micro-nutrients such as manganese.

In most cases, the lime requirement can be met by either calcitic or dolomitic limestone. When soil test Mg is less than 38 FIVs, use dolomitic limestone to prevent Mg deficiency and increase soil Mg concentrations.

Nitrogen Management

The University of Delaware recommendations for rate, method and timing of nitrogen (N) application for fresh market tomato production are dependent upon the cultural practices to be used. In all cases, fertilizer N rates should be reduced when planting into legume cover crops or when manure has been applied. To calculate the adjustment, see *Nitrogen Rate Adjustments – Chapter 3, Section 3.5.1.2*.

Traditional Production

The University of Delaware recommends a total N rate of **50-90 lbs N/ac** for fresh market tomatoes in traditional culture, depending upon soil type. The rate should be split in two treatments and applied as shown in Table 1 below. The higher N rates should be used on the sandier soils where excessive leaching of N may be a problem or on soils with a history of higher yields.

Table 1. Nitrogen recommendations for tomatoes in traditional production for fresh market production.

Soil Type Application Method and Timing	N Rate (lbs N /ac)
<u>Loamy sands and sandy loams</u>	
Broadcast and plow down	40 - 45
Sidedress when first fruits are set	40 - 45
<u>Loams and silt loams</u>	
Broadcast and plow down	50
Sidedress when first fruits are set, <i>if needed</i>	25 - 30

Commercial Vegetable Crops

Drip / Trickle Irrigation

Prior to mulch installation, apply **40 lbs/ac N, P₂O₅ and K₂O** and incorporate thoroughly into the soil. Install the drip/trickle irrigation lines and the plastic mulch.

Within one week of transplanting tomatoes, apply a complete, soluble fertilizer in the irrigation water at a rate of **40 lbs N, P₂O₅ and K₂O/ fertilized mulch acre**. Repeat the soluble fertilizer application at the same rate when the first fruit reach 1 inch in diameter and again when the fruit begin to color and ripen.

A fourth application of fertilizer applied 2 weeks after the third application has been shown to increase yield, however this application is not always economical. Growers should evaluate this on a case by case basis. For further information on the use of drip/trickle fertilization of fresh market tomatoes, see **Cooperative Bulletin No. 137: *Commercial Vegetable Production Recommendations - Delaware 2003*** (Kee et al., 2003).

Phosphorus Management

Yield-limiting phosphorus (P) deficiency is rarely a concern on Delaware soils. Long-term applications of fertilizer and manures have resulted in P accumulations on 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 tomatoes are dependent upon the soil test P value and the P requirement of the crop. A summary of those P recommendations is given in Table 2.

Table 2. Phosphorus recommendations for fresh market tomatoes.

Application Method and Timing	P Index Value			
	0-25	26-50	51-100	101 +
	----- lbs P ₂ O ₅ / ac -----			
Broadcast and plow down	200	150	100	0

Potassium Management

The need for potassium (K) fertilization of tomatoes is best determined by a routine soil test. Potassium recommendations are based on the soil test K value, soil type and the K requirement of the crop. A summary of University of Delaware K rates for tomatoes is given in Table 3.

Table 3. Potassium recommendations for fresh market tomatoes.

Soil Type Application Method and Timing	K Index Value			
	0-25	26-50	51-100	101 +
	----- lbs K ₂ O / ac -----			
Sandy loams and loamy sands				
Broadcast and plow down	300	200	100	0
Loams and silt loams				
Broadcast and plow down	250	150	100	0

Calcium and Magnesium Management

Calcium (Ca) and magnesium (Mg) needs of tomatoes are usually met through routine liming. If the soil test Mg value is low (e.g., less than 38 FIVs) and liming is indicated, 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 4.

Table 4. 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

Boron Management

Boron (B) deficiency may occur in tomatoes 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 5. In the absence of a soil test, apply **1-2 lbs/ac of actual B** in a blended, broadcast fertilizer or as a soil or foliar spray. *Avoid over-application of B to prevent plant injury from B toxicity.*

Table 5. Interpretation of the B soil test for tomatoes.

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 tomatoes 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 tomatoes are given below in Table 6.

Table 6. Interpretation of the Mn availability index for tomatoes.

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 an application of 8-10 lbs/ ac 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 tomato 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 2003*** (Kee et al., 2003) for additional information concerning nutrient management of tomatoes.