Tomatoes - Processing – Machine Harvest

Management Highlights

- Target pH: **6.5**
- Split N applications on sandy soils to increase N use-efficiency in tomatoes. Apply part at planting and the remainder as a sidedress application at the first cultivation.
- 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 micronutrients 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 processing tomato production for machine harvest are dependent upon the soil type. A summary of those rates is shown in Table 1 below. ***Please Note: N rates for machine harvested tomatoes are lower than those harvested in other ways as excess N delays the concentration of fruit maturity needed for efficient harvesting of the crop.***

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.***

Table 1. N recommendations for processing tomatoes to be machine harvested.

Soil Type Application Method and Timing	N Rate (lbs N /ac)
Loamy sands and sandy loams	
Broadcast and disk in	25
Sidedress at first cultivation	25 - 50
Loams and silt loams	
Broadcast and disk in	50

Phosphorus Management

Yield-limiting phosphorus (P) deficiency is rarely a concern on Delaware soils. Long-term applications of f 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, the soil type and the P requirement of the crop. A summary of those P recommendations is given in Table 2.

Table 2. Phosphorus recommendations for processing tomatoes for machine harvest.

Application Method and Timing	P Index Value			
	0-25	26-50	51-100	101 +
	---------- lbs P_2O_5 / ac ----------			
Sandy loams and loamy sands				
Broadcast and plow down	100	50	0	0
Broadcast and disk in	100	100	100	0
Loam and silt loams				
Broadcast and plow down	100	100	50	0
Broadcast and disk in	100	50	50	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 processing tomatoes for machine harvest.

Soil Type Application Method and Timing	K Index Value			
	0-25	26-50	51-100	101 +
	---------- lbs K_2O / ac ----------			
Sandy loams and loamy sands				
Broadcast and plow down	150	50	0	0
Broadcast and disk in	100	100	100	0
Loams and silt loams				
Broadcast and plow down	150	100	50	0
Broadcast and disk in	100	50	50	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:

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

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 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 processing tomatoes for machine harvest.