—Calcium

Calcium is needed to prevent blossom-end rot. A target soil pH of 6.5 is needed to supply adequate calcium. Blossom-end rot is caused by inadequate calcium reaching the fruit. This condition may occur due to insufficient soil calcium, typically as a result of low pH, or inadequate transport of calcium to developing fruit due to drought stress. ***Water management is very important to prevent this disorder.*** A good liming program normally provides sufficient calcium to the plant.

—Sulfur

Sulfur deficiency occurs more often on sandy soils due to leaching. A sulfur recommendation will be given when soil sulfur levels are low. Ammonium sulfate (21-0-0, 24% S), potassium sulfate (0-0-50, 18% S) or sulfate of potash magnesia (0-0-22, 23% S) can be used in a blend to supply sulfur at planting. Later, if tissue tests indicate a need for sulfur, Epsom salts can be applied through drip tape.

—Water Quality

Water filtration is important for any drip system to function properly. It traps contaminants before they enter the drip tape.

Note: Any fertigation system that draws directly from surface or ground water has the potential to pollute a water supply through back siphoning. Use backflow devices to prevent fertilizer from entering water sources. Take care when back-flushing, however, to prevent contaminants in the filtration system from entering water sources.

Additional information is available in N.C. Cooperative Extension publication AG-489, *Plasticulture for Commercial Vegetables*.

North Carolina Department of Agriculture and Consumer Services

Steve Troxler, Commissioner of Agriculture

NCDA&CS Agronomic Division

www.ncagr.gov/agronomi/

(919) 733-2655

Mailing Address
1040 Mail Service Center
Raleigh NC 27699-1040

Physical Address / Location
4300 Reedy Creek Road
Raleigh NC 27607-6465

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NOTE 7: Fertilization of Tomato Grown under Plasticulture

Growing tomatoes with drip irrigation allows for timely delivery of both water and nutrients to optimize fruit yield and quality.

Tomatoes require a high level of fertility for desired production. Correction of soil pH by lime application is extremely important to promote a healthy root system, neutralize toxic effects of aluminum and manganese and supply calcium and magnesium in adequate amounts. Adequate calcium decreases the potential of blossom-end rot. A soil pH of 6.5 is sufficient to supply adequate calcium and magnesium for optimum growth and fruit development.

Lime Sources

For agricultural purposes, there are two types of lime: calcitic and dolomitic. Calcitic lime is calcium carbonate ($CaCO_3$); it does not contain magnesium. Dolomitic lime is a mixture of calcium and magnesium carbonates [$CaMg(CO_3)_2$] and contains at least 120 lb of Mg per ton.

Most agricultural lime available in North Carolina is dolomitic. Generally, it is preferred because it supplies magnesium. However, when Mg levels are adequate, especially on the fine-textured soils of the mountains and piedmont, calcitic lime can be used without concern.

Low levels of Mg are indicated on the soil report by the number *25* in the **Mg** column of the **Recommendations** section. When soil pH and Mg are both low, apply dolomitic lime.

If the soil report indicates that Mg is low but lime is not needed, apply Mg at a rate of 20–30 lb/acre from a readily soluble source such as sulfate of potash magnesia (0-0-22, 11.5% Mg).

Lime Rates, Timing & Application

The soil report lime recommendation is given in units of tons/acre. It should be sufficient to raise soil pH to about 6.5. However, the actual pH obtained will vary depending on soil texture, lime quality (particle size, neutralizing value) and method of application (depth of incorporation).

If a soil report recommends lime, apply it as soon as possible to allow time for soil acidity to be neutralized. For the best results, use a high-quality, agricultural-grade lime and incorporate it thoroughly into the upper 6–8 inches of soil. Since lime tends to move through the soil and react slowly, incorporation helps hasten this process. Once plastic is laid, nothing else can be done to correct soil pH.

Soil texture affects the lime requirement. Very coarse-textured soils in the coastal plain may need lime every year. Fine-textured soils and those with high levels of organic matter typically require lime once every two to three years. Where high rates of acid-forming nitrogen fertilizers are used, lime may be needed more often.

N, P & K Preplant Fertilization

Preplant nitrogen is recommended at a broadcast rate of 40–60 lb/acre. All recommended phosphorus and potassium should be applied and soil-incorporated prior to forming beds.

The higher rate of nitrogen (60 lb/acre) is needed on soils with little residual N, such as coarse, light-colored, low-CEC soils most often found in the coastal plains. Soils in the piedmont or mountain regions with higher amounts of clay and higher CEC may have more residual N; soils with darker color also may have higher levels of residual N. In these cases, the 40-lb/acre rate may be best.

Early growth of tomatoes may be stimulated by application of a water-soluble, high-phosphate starter fertilizer at transplanting. Use rates typically are 2–4 lb per 100 gallons of water. Starter fertilizers used in transplant water do not add significant amounts of N or P, so do not adjust rates when used.

N & K Postplant Fertilization

Postplant fertilization is extremely important in tomato production. ***The best way to monitor nutrients throughout the season is to collect and submit tissue samples beginning at first bloom and continuing on a a weekly basis throughout the season.*** Typically, there is little if any need for additional phosphorus if preplant phosphorus recommendations have been followed.

—Nitrogen

Preplant nitrogen typically is depleted about the time the lower fruit reaches the size of a dime. General guidelines are to apply 3–4 lb N/acre/week through the drip line at this time. A rate of 6–7 lb N/acre/week is usually needed about two weeks after first harvest when lower fruit are about the size of a dollar coin. This rate should be continued throughout the peak harvest season. Afterwards, N application can be reduced to 3–4 lb/acre/week through the remainder of season.

—Potassium

Potassium supplies from residual soil K and fertilizer K will typically need to be replenished by K supplied through the drip tape during the season. Early season K sufficiency, as indicated by tissue tests, should be 3–4.5% for trellis tomato. If K in plant tissue is low, apply 10–12 lb K_2O/acre/week until first harvest.

Even when tissue tests indicate sufficient levels of K, it is advisable to begin applying 10–12 lb K_2O/acre/week two weeks before harvest. After first harvest, apply 20–25 lb/acre/week and continue throughout peak harvest. Beyond peak harvest, rates of K_2O can be reduced to 10–12 lb/acre/week.

—Fertilizer Solubility

Solubility of dry fertilizers is essential when using drip irrigation for uniform applications and to prevent clogging of drip lines. Solubility is mostly dependent on fertilizer source and rate, water pH and water temperature.

When solubility is exceeded, fertilizers will settle out on the tank's bottom or create cloudy suspensions. To help prevent these situations, use greenhouse-grade fertilizers in drip lines, and keep water pH between 5.8 and 7.8. Agitation, and sometimes heat, can also help dissolve fertilizers. Because mixing fertilizers together can affect solubility, it is a good idea to mix up a small batch of the intended mixture in jar to see if the components will dissolve.

Other Important Concerns

—Boron

Tomato has special boron needs. Deficiency may cause brittle stems, dieback and deformed fruit. Boron is needed in very small amounts and can be toxic to plants when overapplied.

Boron should be applied with the preplant fertilizer. Rates of 1 and 2 lb/acre are recommended for sandy, coastal plain and piedmont/mountain soils, respectively. Additional boron can be applied through drip tape or by foliar application (0.25 lb/acre), if needed, as determined by tissue testing.