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## Nutrition Management for Greenhouse and High Tunnel Tomato Production

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Tomatoes are a very popular crop throughout Pennsylvania. As with other crops, growers should become familiar with the growing requirements for tomatoes before planting any tomato plants in a greenhouse or high tunnel. The following are recommendations for fertility management for either a spring or fall crop. These tips and guidelines will help produce healthy, productive, actively growing tomato plants and reduce or eliminate potential nutrition problems.

Always conduct a soil test of the greenhouse soil or media before planting tomato plants. Results to be evaluated include soil pH, soluble salts (optimum range 2.0 to 3.5 mmho/cm) and all the major and minor nutrients. Any deficiencies should be corrected before planting tomatoes, NOT after planting tomatoes.

Be sure the cations ( $K^+$ ,  $Mg^+$  and  $Ca^{++}$ ) are balanced and approximately in the following range: Potassium – 3 to 5%, Magnesium – 8 to 12% and Calcium – at least 65%. Potassium must remain above 2.5 % to prevent the appearance of yellow shoulders on mature fruit. Many growers find it beneficial to apply boron at least once in the

cropping cycle – preferably early in plant development. The recommended application rate is 8 oz. per 100 plants. Also – be sure to run the irrigation system long enough that all fertilizer is cleared from the lines. This will insure that all plants receive an equal amount of fertilizer at each application. Flushing will also help prevent plugging of the emitters from salt build-up.

For optimum tomato production, a nitrogen (N) concentration of 120 to 150 ppm, maintained in the soil solution, will produce a tomato plant large enough to support 18 to 22 pounds of fruit. Too much N in tomato plants results in excessive vegetative growth and the plant will/can abort new flower clusters. High N causes the plant to switch from fruit production to vegetative growth. In addition, once excessive N has been applied to the plant it is nearly impossible to control plant growth. Once you encourage rapid vegetative growth in the tomato plant it will not switch back to fruit production until the extra N has been used-up in the plant. This means that the N level (from a tissue test) is readjusted to its normal range of 3.5% to 4.0% nitrogen. Monitoring a fertility program for tomato can be accomplished through tissue testing. An ideal N concentration in tomato leaf tissue from transplanting until the appearance of mature fruit clusters is 3.5% to 4.0%. While good foliage is necessary for fruit quality, too much foliage will reduce yields and ultimately profit.

The fertility program for a spring crop of tomatoes is distinctively different from that of a fall crop. For a spring crop, tomato transplants are set in a greenhouse during a period of short days and relatively low light intensity. As the spring progresses, days are getting longer. Growing conditions for a fall crop are just the opposite.

The following fertility guidelines should be modified according to growing conditions encountered at each farm. During prolonged periods of dark, cloudy weather, nutrient uptake by the tomato plant is greatly reduced and it may be desirable to skip feeding the tomatoes for one week. Excessive amounts of fertilizer should be avoided when plants are small and before fruit has set on the first cluster.

### Fertility Recommendations – Spring Tomato Crop

<u>Weeks after Transplanting</u>	<u>Fertilizer and Amount Applied per 100 Plants</u>
1 and 2	water only - no fertilizer
3 to 6	calcium nitrate – 3 pounds per 50 gallons of water
7	potassium nitrate – 6 pounds per 50 gallons of water
8	calcium nitrate + chelated iron - 6 pounds per 50 gallons of water + 0.25 lbs. iron
9	potassium nitrate - 5 pounds per 50 gallons of water
10	20-20-20 - 5 pounds per 50 gallons of water
11	calcium nitrate + chelated iron - 5 pounds per 50 gallons of water + 0.25 lbs. iron
12	potassium nitrate - 5 pounds per 50 gallons of water
13	calcium nitrate - 5 pounds per 50 gallons of water
14	20-20-20 - 4 pounds per 50 gallons of water
15	calcium nitrate - 5 pounds per 50 gallons of water
16	potassium nitrate - 4 pounds per 50 gallons of water
17	potassium nitrate - 4 pounds per 50 gallons of water
18	20-20-20 - 4 pounds per 50 gallons of water
19	calcium nitrate - 3 pounds per 50 gallons of water
20	potassium nitrate - 3 pounds per 50 gallons of water
21	potassium nitrate - 3 pounds per 50 gallons of water
22	20-20-20 - 2 pounds per 50 gallons of water
23	calcium nitrate - 2 pounds per 50 gallons of water
24	calcium nitrate - 2 pounds per 50 gallons of water

### Fertility Recommendations – Fall Tomato Crop

Modify the spring program as follows:

- Application of potassium nitrate in week 1 at 3 pounds per 50 gallons of water.
- Application of calcium nitrate in week 2 at 3 pounds per 50 gallons of water.
- From weeks 3 to 9, application of potassium nitrate at the rate of 6 pounds per 50 gallons of water.
- From weeks 10 to 20, fertility schedule would be the same as the spring crop.

**Note:** Generally week 20 in a fall tomato crop would fall in mid-December when environmental conditions are sub-optimum for continued tomato production in the greenhouse.

1. Potassium Deficiencies



“Yellow Shoulders caused by tissue potassium levels below 2% at fruit set.”



“Uneven ripening caused by inadequate potassium levels during fruit development. This can be aggravated by high nitrogen levels.”



“Cracking and uneven ripening likely caused by a combination of potassium and calcium deficiency.”

2. Calcium / Magnesium Deficiency or Imbalances



“Insufficient calcium levels during fruit development.”



“Cracking caused by calcium or magnesium deficiency or imbalance. This can be aggravated by poor irrigation management or heavy rains with low calcium near fruit maturity.”



“Radial cracking likely due to low calcium levels on rapidly developing fruit.”



“Zippering and sidewall blossom-end rot. Zippering is considered a fruit set problem likely due to one or more anthers being stuck. Some varieties are more prone to this problem.”



“Blossom-end rot.”



“Ring-shaped symptoms of calcium deficiency.”



“One possible early calcium deficiency symptom is a water-soaked appearance on the lower fruit.”

Basic rules for growing great tomatoes:

- 1) Cultivar selection makes a huge difference, use only the best varieties for your market.
- 2) Do not try to plant tomatoes too early. Low soil temperatures can permanently damage a tomatoes roots with little advantage in ripening earliness.
- 3) Maintain even soil moisture.
- 4) Tissue test at first flowers, first developing fruit, and first pink.

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