

2015/16 High Tunnel Nutrient Management Update

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Working with collaborating farms and extension educators across New York State, the Cornell Vegetable Program is gaining valuable insight into the dynamics of soil and plant nutrient status coupled with on-farm management. Our focus has been on high tunnel tomatoes, due to their high return per square foot. On these farms we conduct pre-season soil tests then work with farmers to fine-tune amendments both to reduce over application of nutrients, and at the same time maximize yield and return. In season we take regular foliar tests to help make decisions for optimal nutrient levels in the plant. We have data from over 40 farms across the state reflecting different management approaches, including both certified organic and conventional.

In organic settings we find 6 emergent trends:

1. High levels of organic inputs such as compost and manure lead to sky high levels of calcium, phosphorus and magnesium in the soil.
2. Water pH and alkalinity are high and often not managed (see previous installment).
3. Soil pH trends upwards due to high Ca content of certified organic fertilizers and the above mentioned water.
4. Mid-to-late season macro-nutrients such as nitrogen and potassium become deficient.
5. Yield loss due to flower drop and poor fruit quality.
6. High tomato cull rates negatively affects local chicken feed sales volume.

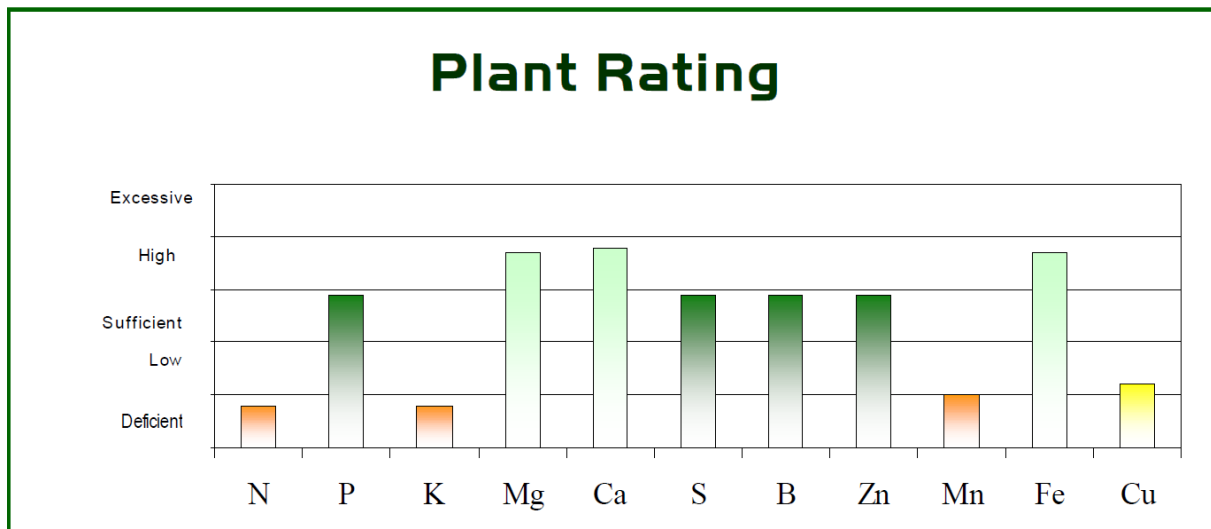


Figure 1. High calcium and magnesium along with low nitrogen and potassium. A common nutrient dilemma in organic high tunnel tomatoes.

Without the highly available, and often isolated, nutrients available to conventional growers, how do we approach this challenge in an organic high tunnel?

1. Soil test annually if not more often. Informed decisions require information.
2. Use high calcium inputs, including compost, in moderation, if at all.
3. Keep a close eye on soil pH and apply sulfur in the fall if there is an upward trend.
4. Apply macronutrients pre-plant. This means 100% of N, P, and K requirements (see side bar for certified forms).
5. Foliar test in season and make corrections with soluble materials (see side bar for certified forms).
6. Have a plan to rotate your high tunnel site to fresh soil every 2-3 years.
7. Harvest high quality tomatoes for human consumption, not chicken feed.

With conventional fertilizers we have a wide selection of options, often of specific nutrients in isolation. So, conventional growers should have no problem applying the precise needs of the crop without any impairment to long term soil health, right? Perhaps in theory, but in reality conventional fertilizers leave much to be desired as they are often employed in high tunnel tomato production.

HIGH TEST OMRI LISTED FERTILIZERS

Pre Plant-Alfalfa, Soy and Feather meal for Nitrogen

Pre Plant for pH-Elemental Sulfur

Rock Phosphate (analysis varies, not soluble)

Sodium Nitrate 16-0-0 (soluble for injection)*

Sulfate of Potash (0-0-52, (soluble for injection))

Magnesium sulfate (10% Mg-best applied foliar)

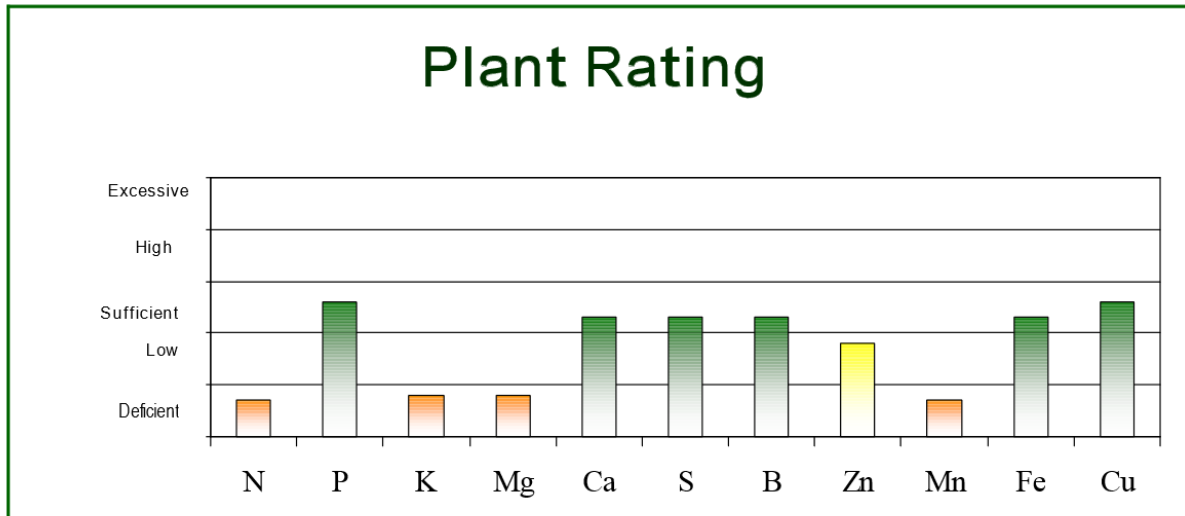


Figure 2. Over application of phosphorus is common on many conventional farms and may inhibit the uptake of other key nutrients.

Many growers begin their fertilizer program with a material such as 20-20-20. This leads to deep green, vigorous plants initially but, tomatoes grow and ripen fruit well when N, P and K are delivered in a 1.0:1.5:3.0 ratio. Thus we are over applying P and under applying K with any 1:1:1 material. The over application of P can decrease K uptake, which is already being under applied. This would lead us to believe that 9-15-30, or similar fertilizer is the solution. It often can be, but we must remember that high tunnels are not hydroponic systems and our soils have the ability to store P (as well as Ca) over time. With these nutrient excesses the soil becomes out of balance, resulting in reduced vigor, fruit set and quality.

Solutions? First soil test annually in the fall. The soil is still warm and biologically active at this point giving a more accurate measure of P. Fall testing also gives us time to add either lime or sulfur if indicated. Since it is hard to obtain soluble fertilizers in the perfect ratio, it may be wise to apply any P, K or micronutrients called for granular, pre-plant. Nitrogen could then be applied as a stand-alone nutrient in the drip. Regular foliar testing is the next step in the process, allowing us to fine tune any imbalances as the season progresses. In our experience heavy bearing, early determinate tomatoes may be impossible to keep in the 'green' due to the intense nutrient sink that occurs during the main harvest. However, by matching our fertilizers and pH amendments to known levels in the soil, we are able to grow a higher yielding and quality tomato crop over the long term.

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