



Diagnosing nutrient deficiencies in vegetable crops

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This article was originally written for the July 28, 2011 Wisconsin Crop Manager

Diagnosing nutrient deficiency symptoms in vegetables can be a challenge. They may be crops or plants with which we have little experience working with or the symptoms may not be expressed as clearly as in grain crops. Often these symptoms express themselves similar to herbicide injury or disease. So, how do we know if it is a nutrient deficiency? When beginning to diagnose a deficiency symptom, ask the client the following questions:

- 1) Can you provide a picture? When approached by a client to diagnose a problem, the first thing to ask for is a picture (or take a picture yourself). Without a picture we are only basing our diagnosis on verbal descriptions which are often vague and potentially misleading. Two types of pictures are helpful, a picture of the whole plant and a picture of the symptomatic leaf. A picture of the whole plant can let us know where on the plant the symptom is occurring (e.g. new leaf tissue or older leaves) and a picture of the leaf can let us know what tissue parts are affected (e.g. leaf margin or interveinal).
- 2) What is your fertilizer management? Try to obtain as much specific information as possible related to: how much N, P, K, and other nutrients were added, how the fertilizers were applied, when the fertilizers were applied, and in what form the fertilizers were applied (e.g. type of fertilizer, liquid or dry product, manure or compost). If the product is a specialty product, ask if they still have the bag or label. Ask about previous years applications and what crops were previously grown.
- 3) Have any other products been applied? Ask them for information related to timing and rate of any pesticide, insecticide, fungicide, or specialty product that has been applied. Ask about previous years applications as well.
- 4) What are the environmental conditions? Specific questions to ask are: Has the soil been excessively wet or dry? What were environmental conditions when you applied the product? Does the soil appear to be compacted? Is it difficult to push a shovel in the ground?
- 5) Have you had your soil tested recently? A recent soil test (within the past 3-4 years) may provide insight into the situation. Even some sort of knowledge of what their soil pH is can be incredibly beneficial for diagnosis. If they have not had their soil tested in the past 4 years, recommend a soil test.

If forwarding an issue to a colleague, attach photos and answers to all of these questions. This information will allow for a more accurate diagnosis and will provide a shorter turn-around time for recommendations. If a diagnosis cannot be made from a picture and a description of management and environmental conditions, the next step will be to recommend plant tissue and soil tests. Plant tissue sampling



protocols (timing of collection and number of samples) can be found at www.soils.wisc.edu/extension/pubs/pa_sampling.pdf. There are two ways to use plant tissue testing: (1) to evaluate the nutrient status of leaf tissue and (2) to comparison between symptomatic and healthy plants. When testing to learn about the nutrient status of the leaf tissue, you are essentially comparing the nutrient concentrations in the symptomatic plant to predetermined values of sufficiency. If your plant tissue test value is in the sufficient range for a given nutrient, then that nutrient can be ruled out as the cause of deficiency. But if your plant tissue test value is below the sufficient range for a given nutrient, this does not necessary mean that this nutrient is the cause of the deficiency symptom. Sufficiency ranges are based on the best available knowledge, but may not reflect advancements in variety selection or differences in region. In addition, the sufficiency ranges pertain only to specific growth stages of the crop. If your deficiency symptom occurs during a growth stage not listed, then no sufficiency range is available. Thus, it is always preferable to diagnose a nutrient deficiency in vegetable crops by comparing them with healthy plants. If there is a clear portion of the field that has the deficiency symptom, we recommend that you collect plant tissue samples and soil samples (0-6" depth) from the "deficient" area and plant and soil samples from the "healthy" area. If your plant tissue analysis comes back below the sufficiency range for a given nutrient, and if there is a soil test for that nutrient, the soil can be analyzed to determine if the soil is also deficient. It is important to note that even if the deficiency can be identified as a nutrient deficiency, there may not be adequate time to correct the deficiency. Also, even if there were time, the deficiency may have already caused a reduction in yield or quality.

When the area of production is small (often a small garden) and the area of infection is small the client may not have adequate plant tissue to make reliable comparisons. In these cases, we would recommend only submitting the symptomatic plant tissue for analysis along with a soil test. We will have to rely only on pre-established sufficiency ranges to make our diagnosis. Make sure the symptoms are well documented (multiple photos). The minimum amount of material that is needed for analysis is one gram; however, submitting such a small sample will not allow for re-analysis if necessary.

When collecting leaf tissue samples, wipe off any soil particles and remove any foreign particles, but do not wash the samples. Use paper bags for storage and shipment. If the sample is to be mailed, then air-dry the sample (near a heating vent or in the direct sun are two options). We also recommend the samples not be tightly packaged during transit. Soil samples should also be collected in paper bags. Collect 10 to 15 soil cores and composite them as one sample and mix thoroughly.

Further information on plant testing: http://www.soils.wisc.edu/extension/pubs/pa_sampling.pdf

Further information on soil testing: <http://www.soils.wisc.edu/extension/pubs/A2100.pdf>