

Missouri Produce Growers Bulletin

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Gold Fleck of Tomato....by Dave Trinklein

There were a number of reports of excessive gold fleck (sometimes called gold speck) on tomatoes in Missouri this year. Gold fleck is characterized by the presence of a multitude of very tiny gold or yellow specks uniformly spread across the epidermis of the tomato fruit. When gold fleck is very heavy, the fruit takes on a yellowish-orange hue instead of being red.

It is easy to mistake gold fleck for feeding damage from insects such as thrips, spider mites or stink bugs. As a matter of fact, the cause of gold fleck originally was mistakenly identified as thrips feeding damage. However, insect damage produces larger yellow specks which usually are irregular in their distribution (often clumped in patches) on the surface of the tomato fruit whereas gold fleck is more uniform.

Gold fleck is a physiological disorder and not a disease. Disorders are not pathogenic in

cause and cannot be spread from one plant to another, although a majority of plants in a planting might manifest the disorder. There are several theories relative to the cause of gold fleck; most involve the elements potassium and calcium making it a nutritional problem. It has been documented that calcium accumulation and calcium-oxalate crystallization in the fruit increases gold fleck severity. This helps to explain why those tomato varieties less susceptible to blossom-end rot (unfortunately) seem to be more susceptible to gold fleck. Most likely this is due to the tendency of BER-resistant varieties to accumulate calcium in their fruit.

Second, calcium frequently accumulates when potassium is not being properly supplied to tomato plants due to potassium's tendency to antagonize calcium uptake. Therefore the potassium:calcium ratio of tomatoes is known to influence gold fleck

severity. Growers who fertilize tomatoes calcium nitrate heavily without supplying additional potassium are more likely to experience gold fleck than those who rotate calcium nitrate with a fertilizer high in potassium such as 4-18-38.

Finally, gold fleck has been associated with humid conditions and high tunnels early in the harvest season certainly fit that description. There is some evidence that points to the fact that potassium uptake by the tomato is more rapid in low humidity and less so in high humidity. Slow potassium uptake would adversely affect the potassium to calcium ratio and gold fleck severity for the reason described above.

Just as beauty is only skin deep so is gold fleck. It does not affect the internal tissue of the tomato fruit nor alter its flavor. However, consumers associate appearance with quality and quality with price. Measures should be taken to control gold fleck whenever possible.

The Missouri Disease Beat....by James Quinn

Onion-

- Xanthomonas leaf blight from Barton County. This is a somewhat uncommon disease in the Midwest. It is described in a Colorado fact sheet. It can cause the plant to mature early but is not reported as damaging the bulb (in Colorado).

Summer Squash-

- Choanephora wet rot from Barton County (but was seen statewide this late spring/early summer). This disease is prevalent during periods of continued damp weather. Wet rot affects both blossoms and fruits. In squash, the fungus

usually enters through the blossom end, but can enter through wounds. There is no chemical control. Cultural methods to hasten the drying of foliage will help. Picking off blossoms before they rot, but after fruit is set, may also help. It was seen in 2010 as well.

Tomato-

- Bacterial canker has been confirmed in Morgan County. It is also suspected around Jamesport. This disease is usually introduced by infected seed and then spreads. It sometimes causes fruit damage, but affects a great deal of

the foliage and can eventually kill the entire plant. Leaf margins get a scorched black look. Good photos and a description are in the Penn State Vegetable Disease Booklet. There is no treatment.

- Fusarium Crown Rot- Audrain County. While both Fusarium Crown Rot and Fusarium Root Rot are mentioned in the Midwest Vegetable Production Guide, 'root rot' is more commonly seen.
- Southern Blight- Barton County, in a high tunnel.
- (author's opinion) Growers seem to be struggling less with Bacterial Speck and/or Bacterial Spot this year.

Want to worry less about micronutrients? Get your pH right for high tunnel tomatoes this off season

.....by James Quinn and Manjula Nathan (Director of MU's Soil Test Lab)

I've been surprised by how many growers are concerned with micronutrient deficiency in high tunnel tomato production. The concern seems to center on boron and manganese, sometimes zinc. Why the concern? Is it justified? What to do about it? These will be addressed below.

Why the concern?

- The foremost reason is because the production system of high tunnel tomatoes is very demanding of soil fertility. Growers are often picking 20 or more pounds per plant when training the plants up strings. There is a lot of foliage and vines growth, which growers are advised to remove from the area for disease prevention. Due to the high yield and plant residue removal a lot of macronutrients (N, P, K, Sulfur, Magnesium, and Calcium) and micronutrients are being removed from the soil.
- Early season tomatoes are quite valuable; every pound counts!
- A soil test or a tissue analysis may indicate a micronutrient is lacking.

Is it justified?

Of course if a soil test or tissue test indicates a micronutrient is lacking, one should remedy the situation. But what is not as appreciated, is why this might be developing in the first place.

Micronutrients are generally in sufficient supply in most Missouri soils-

Most producers are growing on soils that have ample silt and clay as primary soil components (Missouri is not known for sandy soils except along the major rivers and in the boot heel). Soils rich in clay and silt in Missouri generally have good levels of micronutrients.

Micronutrient availability is sensitive to high soil pH

As the soil pH approaches and goes over 7, most micronutrients become less available (the exception is Molybdenum). A soil test may recommend raising the level of a micronutrient because some of what is in the soil is not available at a higher pH. A tissue analysis indicating a micronutrient is lacking may mean that some of it is in an unavailable form for plant uptake.

See the pH and nutrient chart on this page.

Missouri soils in high tunnel production are likely to increase in pH

High tunnel tomatoes are primarily irrigated; in Missouri well water frequently has a somewhat high pH and a bit of alkalinity, generally due to calcium carbonate. *(Both are easily tested for and we have been providing these tests at no cost when we've been at the produce auctions this year and last)* The more years a crop is grown in a high tunnel, the more water that has been applied, and the more risk the pH of the soil is to have increased. While surface water sources (e.g. ponds) are lower in alkalinity levels and/or pH, they are not commonly used for high tunnel irrigation.

What to do about it?

Growers should review their soil pH and the pH and alkalinity level of their irrigation water. If the pH is over 7, adding sulfur should be considered. If the pH is 6.7 to 7.0 AND the irrigation water has a pH over 7.0 or has an alkalinity level above 300 ppm, adding sulfur should be considered. Normal soil test recommendations are for field production and sulfur as a pH reducing amendment will not be recommended unless the pH reaches around 7.5 or 8.0, depending on the crop and soil test lab^{***}. Most soil test labs do not have recommendations tailored for intensive high tunnel tomato production.

Finely ground elemental sulfur should be applied in the fall and incorporated. As with lime, it can take up to 6 months to have full effect. An ideal time to apply is just before or after seeding an off season cover crop.

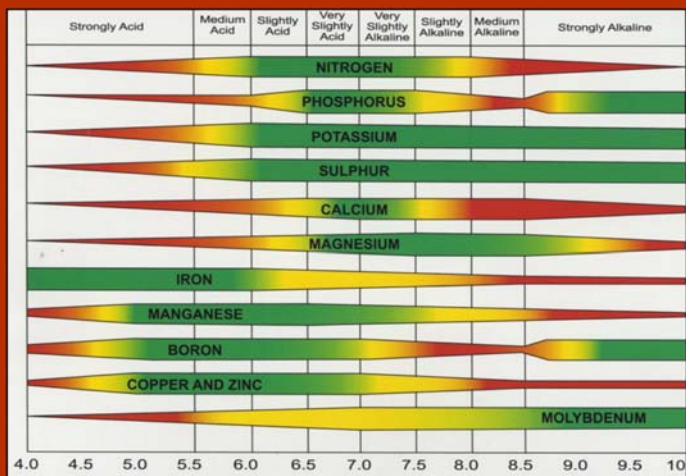
How much to apply? The best way to determine this is contact the soil test lab you used for your high tunnel sample. Give them the target pH you'd like for your soil, and they can calculate a specific rate. According to the Midwest Vegetable Production Guide for Commercial Growers the optimum range for tomato is 6.0 to 6.8, with 6.4 ideal. If the pH in your soil is likely to increase, shooting a little low (e.g. 6.2) might be a good idea. If you don't have the time or a phone to call the soil test lab, below are two standard rates for finely ground elemental sulfur-

- To lower a clay loam soil pH by 1.0 (e.g. from 7.2 to 6.2)- apply 20 pounds per 1,000 sq feet
- To lower a silt loam soil pH by 1.0- apply 12 pounds per 1,000 sq feet

* When you want to increase calcium, but not raise soil pH, use gypsum

** We strongly discourage growers from using 'home kits' for determining their soil pH or nutrient levels; a quality soil sample should be submitted to a reputable soil test lab.

***Most soil test labs use a water based pH test. Some labs use a salt based pH test; the MU soil test lab uses the salt based test. To convert a salt pH test results to a water based pH test, add 0.5. E.g. an MU soil pH test of 7.0 is really 7.5 for a comparable water based test. The recommendations given in this article, and in publications like the Commercial Vegetable Production Guide for Commercial Growers, assume a water based soil pH test.



Dos and Don'ts reminders

Do not add lime unless is prescribed. It raises the pH.*

Do not add wood ashes, as they act similar to lime and increase the pH.*

Do take a soil test annually **and** follow the recommendations. Get a complete analysis, including the micronutrients. **

Do add micronutrients when recommended, **but** be sure to broadcast evenly over the entire soil area. Adding micronutrients to the soil in a band or any concentrated method can lead to micronutrient toxicity. Micronutrient toxicity is difficult to correct.

Do understand the pH testing method your soil test lab uses.***

NRCS Assists with Pond Project Plans

Last winter, a vegetable producer near Rich Hill, Mo., contacted the Bates County USDA field office for assistance with a pond project. The producer's goal was to transform an unproductive, seeping, swampy area into a pond that could be used to water livestock and, potentially, to irrigate vegetables for market.

The producer spoke with Chuck Lewis, Natural Resources Conservation Service (NRCS) Soil Conservation Technician and set a time to visit the site. Lewis and Dean Borland, also a Soil Conservation Technician for the Natu-

ral Resources Conservation Service, walked the site with the producer, probed for rock and discussed the geology. xx Lewis said the landowner was well prepared for the meeting: he had soil surveys and was very familiar with the soil types, and had already dug several holes.

Borland said their task was to take the normal NRCS recommendations, which called for large machinery, and adapt them for horse-drawn machinery and manpower. Lewis added that all the rock on the

site would have presented a challenge even for a bulldozer.

Respecting the producer's request to not have NRCS initiate contact, Lewis and Borland have not been back to the property to see the completed project.

For more information about NRCS technical services available at no cost, stop in, write or call your local NRCS field office, or ask your local Extension agronomist to personally introduce you to the NRCS staff.

Heat Stress and Heat Stressed Tomatoes....by Sanjun Gu

Wrapping up July, 2011, I realized that I have never heard complaints about summer being not hot this year. Channel 17 claimed this summer one of the top ten hottest summers in record. So, "Is the excessive heat enough to "cook" tomatoes"? The answer probably could be a "yes".

Warm season vegetables, such as cucumber, tomato, eggplant, pepper and green beans, grow best at temperatures of 68-86°F. Growth slows down significantly beyond 86°F and stops roughly above 104°F (Please note head index does not apply to plants). Temperatures above 86°F will result in heat stress to warm season vegetables (not for heat tolerant species such as Watermelon). The growth, development, biomass accumulation, and yield will all be adversely affected by heat stress although the damage depends on the crop's ability to withstand, acclimate, or recover from the stress. Heat stress is also closely associated with drought stress. The combination of heat/drought stresses kills or will kill a plant quickly.

For a tomato plant, when sufficient water is available in soil, visual symptoms of heat stress include reduced plant size, low number of leaves, small and curling leaves, and dry flowers. Fruit set is poor as pollen and stigma viability, anthesis, pollination, pollen tube growth, fertilization, and early embryo development are all highly susceptible to heat stress. Typically we would see a gap of fruit set along the plant (picture 1). Plants

with some heat tolerance (picture 2) may set fruit, but fruit will be small and ripen early--cell expansion is inhibited but more plant hormone ethylene (responsible for fruit ripening) is released.

There are no good ways to fight high temperatures in field. Over head sprinkling would help to some extent to reduce air/leaf temperatures. This, however, has limited help under continuous and excessive heat condition, and may cause disease problems.



Picture 1: symptoms of heat stress. Note the fruit set change.

Shade cloth to cover high tunnels will ease the case. For plants to survive, water plants more frequently, about 2-3 times more. Growers can flood between rows in a raised bed system. Mowing weeds between rows instead of Rounding-up to keep moisture in soil. There are some tomato cultivars will survive better in high temperatures because of the built-in heat-tolerant genes, for example, some Florida and BHN series (Picture 2). Information on heat tolerant tomato varieties will be summarized later.



Picture 2): a heat tolerant cultivar with small fruit.

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We'd like to thank two supporting agencies for their financial assistance with our outreach activities, such as this newsletter and travel costs associated with educational activities:

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Hero®: A Newly Approved Insecticide for Missouri ...by Jaime Pinero

New in the 2011 Midwest Vegetable Production Guide is Hero® (FMC Agricultural Products), a broad-spectrum insecticide that has been labeled in Missouri for use in vegetables (tomatoes, succulent peas and beans, eggplant, peppers (bell and non-bell), head lettuce, head and stem brassicas, root and tuber vegetables), nuts and vines. The active ingredients for Hero® are the pyrethroids zeta-cypermethrin (the same active ingredient as in Mustang) and bifenthrin (the same active ingredient as in Capture). Hero® is a new generation insecticide that provides fast knockdown and longer-last control of many insect pests and several types of mites. Mites are often problematic during dry and hot periods; Hero® can be considered as a control option. [Other miticide choices that are effective on spider mites, but do not control other insect pests, are abamectin (Agri-Mek; Epi-Mek), bifenazate (Acramite), spiromesifen (Oberon) and wettable sulfur.]



Leaf stippling or 'flecking' is a typical symptom of spider mite problems

Hero® is a restricted-use pesticide and therefore growers interested in using it need to have a pesticide applicator license. Pre-harvest intervals are 3 days for cucurbit crops and 1 day for tomatoes. Consult the label for more information including the rates of application for the insect to be controlled, as well as for precautions and restrictions. Hero® holds the signal word 'caution'. Always follow all the label directions carefully and wear protective clothing during mixing and application.

The description of the above product is for informational purposes only. No discrimination is intended and no endorsement by Lincoln University Cooperative Extension is implied. Remember, as part of an Integrated Pest Management (IPM) program, pesticides are the last line of defense against insect pests and diseases. Pesticides should only be used when other preventive tactics have failed to contain pest injury to acceptable levels, when reasonably certain that a benefit will result from a pesticide application (e.g., when pest population/incidence has reached a threshold level). Pesticides should be used in the best way possible to minimize associated risks. Always choose pesticides by evaluating their efficacy, cost, toxicity, persistence, and environmental effects.

An enlarged picture of the two spotted spider mite, our most common mite pest. They can be seen with the aid of a 10x hand lens

