

Missouri Produce Growers Bulletin

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Water Testing and GAPs...by James Quinn and Bob Schultheis

What one's water is tested for at most farms will fall into one of two categories:

- Being potable (so you can wash produce with it); you can then also use it for pesticide sprays which contact produce that may be eaten raw (e.g. tomatoes, green beans or leafy greens), or any irrigation uses.
- Not being potable. At the current time for the USDA GAPs audit, there are no specific guidelines for preharvest water usage. It is up to the producer to decide how high the levels of total coliform and E. coli CFU (colony forming units) to use, and what

to do (if anything) if the producer feels the levels are too high. Pesticides mixed from non-potable water should not be applied directly to produce which may be consumed raw, but could be applied to crops like sweet corn, potato foliage, or pumpkins.

By far the least expensive and simplest way to test water is with the county health department, which has a courier service to get your water to a state lab. The cost is only \$10 per sample, but they will not accept surface water sources and only test to see if it is potable.

Most growers should have at least some potable water, for drinking water and for certain pesticide applications. GAPs certification will require that this water is sampled and submitted annually. Any other well water, even if only for field irrigation, could be submitted at that same time. If it passes, then that is all you need to do. It could smell like rotten eggs and be an awful color, such that you'd never drink it, but it only matters that it passes the microbial testing. What do you do if your well does not pass the potable test, or is a surface source (e.g. pond or stream)?

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From the Plant Diagnostic Clinic....by Patricia Wallace

Greetings,

I am the new Director of the Plant Diagnostic Clinic. I grew up in Ava, MO and was thrilled to be chosen to fill this position. It is my pleasure to serve my home state of Missouri by diagnosing your plant disease issues and identifying pesky pests or plants you may be dealing with. The clinic officially reopened April 1st. The only April's fool joke was the cold weather and storms that followed. Despite the 'stormy' start we have received a number of plant samples. Several samples have had winter injury due to a drought year followed by a hard, long winter and also due to several warm days followed freezing temperatures. If you are seeing some dieback on your ornamental plants it could be related to these things. If you suspect something else, I am happy to receive your samples. Information for sample collection,

submission and associated fees can be found at your local Extension office or on the clinic's website <<http://plantclinic.missouri.edu/>>.

If you have a pre-2014 copy of the *Midwest vegetable Production Guide*, I recommend purchasing a revised 2014 edition. There are some nice features in the latest guide such as comparison charts of active ingredients, showing if you can get more disease prevention from a single application. The guide is available for purchase through the MU Extension publications for \$12. The item number is MX384 and can be ordered by phone (1-800-292-0969). It is also available as a free at <http://mwvegguide.org/>. Below are a few notable updates to the manual.

- For tomato a **new fungicide** is recommended for the suppression of **white mold**, Priaxor® at 4 -8 fl. oz / A applied prior to

disease development and continue on a 7 to 14 day interval during conditions that are conducive to disease. It can also be used on sweet corn and legumes. [This is the 1st foliar fungicide for white mold (also called timber rot) on tomato. Contans can be applied to the soil before planting.]

- For watermelon a **new fungicide** is recommended for the suppression of **Fusarium wilt**, Proline 480 SC® at 5.7 fl. oz / A. This product may be applied by ground or chemigation application equipment but cannot be used in water used for hand transplanting. The label allows for one drip application, at the time of transplant.
- Also the watermelon variety, Distinction, now has a resistance rating of '++++' against Fusarium wilt.

Cold Late Spring and Control of Gray Mold

By Zelalem Mersha and James Quinn

Growers should consider having a chemical control product on hand and to apply it at first sign of the disease. This is preferred to hoping the weather will change and then having to control the disease when it becomes severe.



Figure 1: Typical gray mold symptoms on tomato stem.

The consequence of a cool late spring for tomatoes in greenhouses or high tunnels is the increased incidence of *Botrytis* blight or Gray mold. It is a disease caused by the ubiquitous fungus *Botrytis cinerea*. The disease is highly favored by cool weather and it is always associated with excessive moisture and highly humid (damp) environment. In covered beds and greenhouses with poor ventilation, just the humid condition within a tomato canopy at night suffices for the disease to develop. Although the disease begins in cool weather, it could also potentially infect tomatoes in a warm temperature but at a reduced rate. In protected systems like hoop houses and greenhouses, the disease can establish and spread itself very rapidly resulting in a significant economic loss on many crops.

The best 'cure' for the disease is warm, sunny weather, which we often get, and then it can rapidly diminish. But in years like this spring and last year, the weather has persisted for the disease to worsen. Growers should consider having a chemical control product on hand and to apply it at first sign of the disease. If the weather changes so the disease lessens, then stop applying product. This is preferred to the other way around (hoping the weather will change and then having to control the disease when it becomes severe). There are five chemical control options that provide good or very good

control (see Table to right). Just a few years ago we only had two products and the better of the two (chlorothalonil, Bravo or Equus) only provides fair control. Understanding a bit more about the disease is important to realize that it can build up in the growing environment to more readily infect next year's crop.

As mentioned above, *Botrytis cinerea* requires a relatively cool temperature 64.4 – 73.3 °F (18-23°C) for best growth. Growth of this fungus is inhibited as temperatures go beyond 89.6 °F (32 °C). The fungus produces conidia that are easily windborne and hence can be easily blown from field to field. Conidia are borne on conidiophores and it is the arrangement of conidia which gives the fungus its name, botrys which means 'a cluster, bunch of grapes' in Greek. In addition, the fungus produces overwintering spores called sclerotia to be able to survive from season to season. Sclerotia may be formed in a plant tissue and may germinate forming mycelia that produce conidia.

Symptoms and signs: symptoms start as gray to brown discoloration, water soaked, tan, brown spots that become covered with a profuse growth of gray, velvety dusty mold (mycelium and conidia) arising from these necrotic tissues. This growth gives the diseased tissue a fuzzy, gray-brown appearance (Fig. 1). Gray mold infects all the above ground parts of a tomato plant and it is mostly associated with mature plants that have a dense canopy. Pruning of leaves and clusters provides wounds that are

ideal for the initiation of gray mold (Fig. 1).

Non-chemical methods of disease control: It's always good to remember that cool and damp weather favors the disease! The following cultural methods will be useful to prevent gray mold:

Keep leaves dry – avoid sprinkling water, since the fungus is easily spread by splashing water and wind.

Maintain healthy plants – follow proper fertilizer and irrigation recommendations as well as pruning practices.

Provide good air circulation – do not overcrowd plants, remove weeds timely.

Sanitation – is one of the best ways to reduce this disease. Collect and discard affected plant parts.

Liming acid soils to increase calcium content of plants will reduce the susceptibility of the plants.

Disease Management using Fungicides: regardless of the type of fungicide type, sprays should start before a dense canopy of the tomato plant develops. In addition, most fungicides registered to control gray mold are protective in their action and will not suppress an established infection. Always, read the label and consult extension associates nearby your area for any updates on fungicide uses.

Disclaimer on pesticide use, from the authors: Before applying ANY pest control product, 1) read the label to be sure that the product is labeled for the crop and for the disease you intend to control and 2) read and understand the safety precautions and application restrictions. Trade names in this publication are used solely for the purpose of providing specific information. Such use herein is not a guarantee or warranty of the products named and does not signify that they are approved to the exclusion of others. Mention of a proprietary product does not constitute an endorsement nor does it imply lack of efficacy of similar products not mentioned. Do not use any of the products unless registered for the given crop in the state.

Gray Mold of Tomato.....continued

The following is a table modified from the 2014 Midwest Vegetable Production Guide for Commercial Growers.

REI = re-entry interval in hours, *PHI* = pre-harvest interval in days.

Newer fungicides for control of gray mold of tomatoes						
Name of product	Common name	Fungicide rating	REI / PHI	Approximate cost per ounce	Rate	Comment
Endura®	boscalid	Very Good	3/0	\$6	9-12 oz./A, 3.5 oz./A on fruits	Restricted use fungicide. Increase spray volumes as plants grow. Suppression only on fruits. <u>Not for greenhouse use.</u>
Botran®	2,6-dichloro-4-nitroaniline	Good	12/10	\$0.8	16 oz/100 gal. @ 20-100 gal./A	Very effective for the stem phase up to a height of 24". Greenhouse use allowed.
Fontelis®	penthiopyrad	Good	12/0	\$2	10-24 fl. oz./A	See label for greenhouse uses. Greenhouse rate is 0.5-0.75 fl. oz./1360 sq ft.
Scala®	pyrimethanil	Good	12/0	\$2	7 fl. oz./A	May be used in greenhouses, see label for cautions.
Switch®	cyprodinil, fludioxanil	Good	12/0	\$5.75	11-14 oz./A	Don't apply to cherry or grape tomatoes in a greenhouse.

Water Testing for GAPs Certification.....continued

Unfortunately, you then need to get it tested at a lab that can provide a number count for total coliform and E. coli CFU. We have chosen to provide two labs (later in this article) which provide this service. Both ask that growers contact them to get sample bottles and instructions for submission. Since the samples need to be received the following day, one will have to express mail the sample, unless delivery is reliable within a single day by UPS for ground service.

So why even test water that you can use anyway? Because guidelines are being developed on allowable levels for irrigation water, and the USDA GAPs inspector would be able to alert a grower if their source was a possible problem. Then the grower could consider what action might be taken to reduce the microbial levels. [The Food Safety Modernization Act may eventually provide water testing guidelines, but the proposed rule has been withdrawn for revision, and water testing was one area that will likely be revised. Thus what the GAPs inspectors are currently using is the most important for now.]

To submit water sample to a county health department, contact them directly (<http://health.mo.gov/living/lpha/lphas.php>). You will need to get a sampling kit from them. [Should you need their contact information, feel free to contact a nearby MU Specialist, either by phone or in writing. Our office support staff should be able to find the county health department information if we are not in the office.] This is a time-sensitive test so you need to find out when the courier leaves for the lab, and from where. Say that's at 11 a.m. in your county. Collect the sample according to the kit's directions, transport it back to your county health department before 10 a.m., in a

cooler to keep the sample cool and away from light, so it gets on the delivery truck to the lab in Jefferson City the same day. Sample Monday through Thursday (excluding holidays), to assure the sample is tested within 24 hours.

To submit 'non potable' or 'surface' water for testing, contact a lab providing this service directly. Listed below are two which do and have good customer service. There are certainly other labs that also provide this service, but we were unable to find a comprehensive list for labs that do so, and which provide customer service expected by the general public.

- Midwest Labs (<https://www.midwestlabs.com>) — The cost is \$20 and is called "Generic E. coli and Total Coliforms". But they request you contact them ahead of time. They will ship you the correct sample containers and form to fill out. Phone: 402-334-7770. The test is under the 'Environmental-microbiology' area. Unfortunately, only NW Missouri is close enough to Midwest Labs for Ground Rate UPS to deliver to them the next day. Thus, next day shipping would have to be used for other areas of Missouri, at a significant increase in shipping cost.
- Penn State University (<http://agsci.psu.edu/aasl/water-testing/drinking-water-testing>) — They provide a 'Total Coliform and E. coli' test for \$35, under Drinking Water Individual Test (Bacteria), for surface sources (but non potable well water is accepted, too). Contact their lab for a 'Drinking Water Test Kit'. Phone: 814-863-0841.

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Water testing continued (from page 3)

Sampling your well or surface source:

For a well, sample as close to the well head as practical. Many county health departments provide the option where they will sample for you, at a very reasonable charge. This may be worth considering if getting to the pick-up/drop off point may be difficult. Wells need to be sampled annually.

For surface water like a pond, use the nearest point of contact which is usually where the pump lines hook up to the drip lines or out of the sprinkler nozzles. [The best water from a pond is at 18 to 36 inches below the surface. Consider this for your pump intake.] Surface water sources are often sampled quarterly, thus if one samples a pond in May, and will continue to irrigate into September, another sample should be taken again in August. However, the GAP inspector may suggest more frequent testing based on one's results.

Samples should be kept cool; if shipping a sample, the lab should provide instructions for keeping the sample cool during transit.

Was the Tomato Survey Useful to Growers?.....by James Quinn

In the last newsletter the results from the Missouri Growers Tomato Survey was included as an insert. [The survey was mailed in December and responses received until the end of January.] Also included in this last newsletter was a postcard that basically asked "was the results of the tomato survey useful to you?" Fifty-six individuals responded, which was just over 1/2 of the number of tomato growers that returned the survey.

Note the graph which gives the results. Growers (for the most part) are already confident on what they grow, but appreciated the results. But for almost 1/2 of the growers the results are giving them some direction or ideas on tomatoes to try. A surprising number of comments were received, and they were entirely positive or appreciative. Below are comments that I thought would be of interest to many:

Most typical: Thanks for the interesting work.

Most positive: I appreciate all the time/effort MU does for growers and everybody.

Reassured grower: It was very interesting, seems we're already growing the right types.

Assisted grower: It gives me more confidence in trying what I was going to this year.

About our market: We are doing mostly open pollinated and heirlooms, as our customers want that.

Regarding a variety: I think Florida 91 is grown more for heat tolerance south of I-70.

My favorite: Although being unsure what varieties to plant, I neglected my survey; I'm glad not everybody did.

A buyer critique: To us buyers for our roadside markets, we look more for the best taste, not production. Many of the buyers at our auction have been "let down" when the Goliath tomato was "dropped", as that's how we built our market base- the good flavor. Big Dena (Bigdena) lacks in that very much.

Below are the original questions (*bar title & number of responses*):

(no responses)- It was very helpful; I will make some substantial changes to the varieties I grow.

(helpful- 9)- It was helpful; I will make several changes on tomatoes I plant because of it, or will try several new varieties.

(some use- 18)- I will use the information to make some minor changes (e.g. try a new tomato variety or two or adjust some of what I grow)

(interesting- 28)- It was interesting, but won't make any difference on the tomatoes I plant.

(of no use- 1)- It wasn't of any use to me.

