

Missouri Produce Growers Bulletin

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Food Safety Issue Heats Up....by James Quinn

The FDA (Food and Drug Administration) 're'-released the proposed rule for the food safety modernization act (FSMA) in September. As expected, it addressed a number of issues that the FDA said they would when they pulled the proposed rule for revision. To aide growers in quickly understanding the changes, an insert has been included in this newsletter. It contains 3 key postings from the FDA website:

- an 'at a glance' fact sheet regarding the changes,
- a brief question and answer regarding the FSMA's produce rule and these changes,
- and an explanation about the phase in of the produce rule.

A brief reminder may be helpful for those who haven't followed this issue closely. The FSMA was signed into law in Jan. 2011 and it took 2 years, until Jan. 2013, for the proposed rule to be released. The commentary period on that rule was extended several times last year until almost the year end (Nov.). It was then pulled and the final rule was expected. But the FDA shortly announced it would 're'-release the proposed rule and address 4 key issues that were receiving most of the comments.

The publishing of the final rule is anticipated by this coming summer or fall. The comment period for the proposed

rule is open until Dec. 15th.

Becoming certified under Good Agricultural Practices (GAPs) will still be part of the process. So growers working on that should still continue with their efforts. While the water testing requirements are proposed with significant changes, these will only be definite with the final rule. In the meantime, the GAP certifier works with the grower to comply for GAPs.

The FSMA will not just affect which growers and facilities will need to be GAP certified. The FDA will also be changing its inspection of fresh produce. See the short article on the back page about Missouri produce auctions having produce sampled.

Whitefly on Field Tomatoes....by Dave Trinklein

Tomato is a "favorite food" of whitefly and this past growing season proved this fact. While whitefly infestation of greenhouse-grown tomatoes is common, it is much less so on outdoor crops. A number of Missouri growers reported whitefly problems with their field tomatoes this past growing season. This article is written to address the problem next year.

There are two species of whitefly which most often are responsible for infestation of tomatoes grown in Missouri. They are the greenhouse whitefly (*Trialeurodes va-*

porariorum) and the sweet potato whitefly (*Bemisia tabaci*). A second strain of the latter has been identified and given the name of silverleaf whitefly.

Whitefly is a member of the insect order *Hemiptera* and family *Aleyrodidae*. It goes through a life cycle that begins with an egg and ends with an adult. In between, there are four stages of nymphs. The fourth is called a pupa, although this technically is incorrect. Under field conditions, the life cycle takes between 25 and 50 day, depending upon temperature.

Other than the egg and pupa, all stages of whitefly feed on plants by inserting their piercing mouthpart into the phloem and extracting sugary sap. In the process they secrete a toxin in their saliva which decreases the turgor pressure of the cell. Heavy whitefly infestation not only weakens a plant, but also leads to the development of sooty mold which grows on honeydew secreted by the whiteflies. Sweetpotato whitefly is especially damaging because it also causes tomato fruits to ripen unevenly.

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Bacterial Canker: a disease to watch for.....by Zelalem Mersha



Top photo: Marginal necrosis or “firing” symptom on tomato leaves.

Lower: yellow to brown discoloration of vascular tissues on infected tomato stem.

Photos by Dr. Z. Mersha from central Missouri in 2013.

Bacterial canker of tomato, caused by the gram positive bacterium *Clavibacter michiganensis ssp. michiganensis* (*Cmm*), is a sporadic but destructive disease of field and greenhouse grown tomatoes in the Midwest US and other parts of the world. Yield losses, resulting from wilting and eventual death of plants as well as culled fruits due to the “birds-eye-spot” symptom, during outbreak seasons could reach as high as 70-80%.

Historically, bacterial canker of tomato was first discovered in 1909 from a greenhouse in Grand Rapids, Michigan and is at times referred as the Grand Rapids disease. The disease was very well described by the pioneer plant pathologist Erwin Smith over one hundred years ago. There were devastating outbreaks of the disease in North America including the US Midwest in 1930s and 1980s. During the years 1983-1985, the disease was of high concern to tomato growers in Canada, Michigan, Ohio, Indiana, Iowa and Kansas.

Undocumented seasonal reports of the disease have been trickling from different counties of Missouri in the past years. There was, however, a noticeable disease outbreak in Missouri and other Midwestern states as recent as 2011. In response to this urgent call, Lincoln University’s IPM program has organized a webinar on diagnosis, identification and management of

bacterial canker. Power point presentations by Drs. Sally Miller (The Ohio State University) and Dan S. Egel (Purdue University) as well as a recorded video of the discussions are available at (<http://www.lincolnu.edu/web/programs-and-projects/ipm>).

The disease slowed down for two years (at least not officially reported) until it showed some resurgence in 2014 with three confirmed cases of the disease from Daviess, Vernon and Lawrence counties. All these three cases have been persisting for the past few years, according to the farm owners and conversations with extension educators. Records from the University of Missouri’s plant diagnostic clinic indicated 7 confirmed cases of bacterial canker in years 2009 and 2011, and 2 confirmed cases in 2014. On the other hand, a farm in central Missouri which was hit hard by the disease during the years 2011-2013 seemed to show a significant improvement. It may most likely be that other unreported cases of the disease could exist elsewhere. But one thing is certain, the disease unfortunately continued to prevail in Missouri although great strides have been made in containing the epidemic. As growers are getting ready for next year and the cold winter is just on the door, we felt that they should be proactive about this disease and put a disease prevention strategy in place.

Bacterial canker is a seed-borne disease capable of spreading fast in nurseries or greenhouses and hence difficult-to-manage once it is established in a farm. A very wise decision in managing this

disease is to put together a holistic prevention plan for each component of the production system.

A useful hint would be to start by drawing the map of production flow. The foremost strategy will be to target pathogen avoidance. Make sure that your starting plant material (seeds or transplants) is clean and obtained from a reliable source. Keep a good record of the seed lots used and location of the fields. This will help to trace back the source of the problem and to succeed in a smart rotation plan. Next, identify and train individuals responsible for each activity. These activities include maintaining aseptic environment in the nursery, getting rid of any crop residue or alternate hosts, sanitizing all equipment used in tomato production, keeping the field clean, monitoring seedlings and transplants frequently and detecting the disease as early as possible.

Once detected, a prompt action shall be taken before the bacterial inoculum spreads with splash or windy rain. For further information on this disease and any aspects of its management you may contact Zelalem Mersha (Assistant Professor and State Extension Specialist, Lincoln University Cooperative Extension, 900 Chestnut St., 214 Allen Hall, Jefferson City, MO 65102; e-mail mershaz@lincolnu.edu, Tel. 573-6815634.

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Bacterial Canker & its symptoms.....continued

Symptomatically, the disease can be differentiated on the basis of whether it arises from systemic or localized infections. A systemic infection, initially manifested by wilting symptom, occurs from the bacterial inoculum that is carried with the seed or penetrates through wounds (created during pruning or cultivation) and reaches vascular tissues. Very often only half of the plant wilts or leaflets on one-half of the petiole wilt while the other half remains healthy looking. Localized infections may result in localized symptoms such as marginal necrosis (“**firing**”) when infection occurs through broken trichomes or natural openings such as hydathodes. Vascular tissue of infected stems will show a yellowish discoloration which may change to brown. These yellow to brown streaks gradually darken and

sometimes open resulting in dark brown cankers. One way to easily distinguish bacterial canker from other wilt diseases caused by fungal pathogens like *Fusarium* and *Verticillium* is by slicing a symptomatic plant and placing them in water. If bacterial masses ooze out of the vascular tissues, the wilting is most likely caused by bacteria. An accurate diagnosis is a key to a successful and effective control of this disease. If you see any suspect transplant, get it diagnosed at MU’s diagnostic lab or contact staff of Lincoln University’s Plant Pathology Program (Dr. Zelalem Mersha mershaz@lincolnu.edu, Tel.: 573 681 5634 or Ms. Martha O’Connor OConnorM@lincolnu.edu, Tel.: 573 681 5633) right away before the disease spreads.

Whitefly on Field Tomatoes.....continued

Additionally, whiteflies are known to be vectors of plant diseases caused by viruses. For obvious reasons, control of this insect is important.

Control of whitefly in field plantings is best accomplished following an integrated approach. Whitefly cannot overwinter outdoors in Missouri. Therefore, growers start each year with a “clean slate”. Outdoor infestations primarily are the result of using contaminated transplants, or the introduction of whitefly populations from southern states. Although they are poor flyers, whitefly can travel hundreds of miles on wind currents.

Starting with whitefly-free transplants is the first step in their control. When growing your own transplants, practice good whitefly management practices in the greenhouse and monitor populations diligently. Transplants purchasing from someone else should be carefully inspected before planting.

Field scouting of outdoor plantings is necessary to determine when a significant population has developed. Visual inspection of upper leaves for adults and lower leaves for nymphs should be done on a weekly basis. Concentrate scouting at field margins since these areas often are infested first.

If whitefly populations build to the point that chemical control measures are warranted,

there are several approaches that can be taken. Imidacloprid (Admire PRO) can be effective as a means of “cleaning up” transplants or for early season infestations. Given that imidacloprid has a 21 day P.H.I., it should not be used later in the season.

Insecticides with shorter P.H.I.s are needed later in the life of the crop, especially if harvest has begun. The table below lists chemicals with relatively short P.H.I.s recommended for whitefly control by the *Midwest Vegetable Growers Guide*. Rotation between modes of action will help to delay development of pesticide resistance.

Trade Name	Active Ingredient	P.H.I. (days)	Mode of Action Group
Actara	thiamethoxam	0	4A
Asana	esfenvalerate	7	3
Assail	asitamiprid	7	4A
Brigade	bifenthrin	1	3
Closer	sulfoxaflor	1	4B
Danitol	fenpropathrin	3	3
Fulfill	pymetrozine	0	9B
Movento	spirotetramat	1	23
M-Pede	K salts of fatty acids	0	not listed
Neemix	azadirachtin	0	IGR*
Oberon	spiromesifen	7	23

*= insect growth regulator

Whatever the control measure chosen, early intervention cannot be overstressed. Each female whitefly has the ability to produce 400 eggs in her lifetime, which leads to rapid population development. The warmer the temperature, the more rapid the infestation. Whitefly control is very challenging in heavily infested plantings.

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FDA samples produce at two Missouri auctions this fall.....by James Quinn

In early September specialists at MU Extension heard about an inspector working for the FDA taking samples at a SW produce auction. Following that we learned this was also done at a second auction. Dave Trinklein spoke with the FDA about this and was told that the Missouri Department of Health and Senior Services (DHSS) is also involved, to a lesser extent. Since then I have been in contact with two individuals, one each from the FDA and DHSS. I have invited them to write an article about sampling that they have done and are likely to carry out next year. The FDA appreciated the request and is working on an article. Increased sampling by the FDA due to the FSMA has been discussed in national fresh produce publications. Primarily of interest are microbial pathogens and the vegetables of cantaloupes, tomatoes and leafy greens. The two individuals I have been in contact with are:

FDA: Ms. Dina K. West (913) 495-5120

DHSS: Nancy Beyer (573) 522-6058

Feel free to contact them if you have concerns or would like more information in the meantime.

Delayed dormant fungicide sprays for small fruits...by Pat Byers

Delayed dormant fungicide sprays are useful tools for controlling or reducing the inoculum for many diseases that attack small fruits. These fungicides work by suppressing overwintering fungal colonies and spores on twigs and bud scales. This suppression reduces primary inoculum in the spring, which eliminates or minimizes initial fungal infections on leaves and green shoots. This in turn reduces later season infections. The fungicides are intended to be used while plants are dormant or have just broken dormancy (delayed dormant). If more than 1/2 inch of green tissue is present, these sprays may cause foliar burning and can damage floral parts.

Common delayed dormant fungicides include liquid lime sulfur (LS), Sulforix (S), and various forms of copper hydroxide (CH). Fungicide labels list the following small fruit diseases:

Blueberry: phomopsis cane and twig blight (LS, S); some activity against mummy berry (LS, S).

Blackberry: anthracnose (LS, S, CH), cane blight (LS, S, CH); some activity against Septoria leaf spot (CH).

Raspberry: anthracnose (LS, S, CH), cane blight (LS, S, CH), spur blight (LS, S, CH); some activity against yellow rust (LS, S, CH) and powdery mildew (LS, S).

Grape: anthracnose (LS, S), powdery mildew (S, CH); some activity against phomopsis cane and leaf spot (LS, S, CH), black rot (CH), and downy mildew (CH).

Delayed dormant fungicides are much more effective when accompanied by good sanitation. Remove and destroy primary inoculum sources such as mummified fruit, dead wood, and canes with cankers when pruning. Always read the fungicide label, follow all usage directions, and wear appropriate protective equipment when applying these fungicides. Note that several of these fungicides carry the signal word "DANGER". As these sprays may have an unpleasant odor and can damage skin and eyes, try to complete pruning in advance of the fungicide application to reduce exposure. Do not apply liquid lime sulfur within 14 days of an oil spray, or when the temperature is above 75° F. Additional information on usage of delayed dormant fungicides is found in the Midwest Small Fruit and Grape Spray Guide, available from MU Extension offices and at <https://ag.purdue.edu/hla/Hort/Documents/ID-169.pdf>.