

Missouri Produce Growers Bulletin

A joint publication of the University of Missouri and Lincoln University

MARCH 2011

WHO'S WHO

James Quinn
Lead Organizer
MU Horticulture
573-634-2824
QuinnJa@Missouri.edu

Sanjun Gu State Vegetable Specialist
LU Extension
573-681-5524
Sanjun.Gu@LincolnU.edu

Dave Trinklein State Floriculture Specialist
MU Extension
573-882-9631
TrinkleinD@Missouri.edu

Jaime Pinero State IPM Specialist
LU Extension
573-681-5522
PineroJ@LincolnU.edu

MU county offices, specialist & phone

Daviess— Tim Baker
660-663-3232

Greene— Pat Byers
417-881-8909

Harrison- H. Benedict
660-425-6434

Henry— Travis Harper
660-885-5556

Morgan— Joni Harper
573-378-5358

Vernon— Pat Miller
417-448-2560

Webster— Bob Schultheis 417-859-2044

Educational Outreach Activities for 2011....by James Quinn

Good News! The EPA Region 7 is providing financial support for another year so MU & LU Extension can continue with educational and other outreach activities related to Integrated Pest Management (IPM). The amount was increased so we'll expand what we have provided before. Here is a summary of what we're planning from April 2011 to March of 2012:

- Conduct 'pest review sessions' (we called them mini clinics last year) at up to 10 locations statewide this growing season. We hope to get back to some locations twice. Produce auctions will serve a central role again;
- Hold 5 honeybee workshops in the off season. One was held in Morgan County last year that

some produce growers attended;

- **Returning from 2008 & 2009....**All day vegetable production workshops in the off season. Four are planned and in addition to IPM we'll also address some topics of current



D. Trinklein, performs a water test while S. Gu, & J. Quinn consult with a grower in May 2010.

interest, such as the implementation of the Food Safety Modernization Act and how that might impact produce auctions;

- Coordination and/or assistance with farm tours. The Clark Produce Auction has had very successful farm tours in '09 & '10 which catered to just their growers. If you have an interest in something similar, contact the specialist closest to you and we'll try to assist. If your auction holds their own periodic 'evening tours' (or similar) try and give us advance notice and we can tag along to answer questions.
- We'll also direct mail 4 newsletters this year. That is made possible with support from OVRDC; see the article on the back page.

Snow Removal From High Tunnels.....by Dave Trinklein

On February 1 & 2 of 2011 a snowfall of historic proportion blanketed much of the central and west central Missouri. Snow up to 23 inches deep coupled with wind gusts between 35 and 40 m.p.h. wreaked havoc on many structures, including greenhouses and high tunnels. Reports indicate that a number of the latter were lost; here some tips on how to avoid snow damage in future storms.

Avoiding damage from snow, sleet or ice begins with planning the high tunnel structure, and the architectural style selected can make a big difference. As a rule, Gothic arch styles are able to cope with heavy snowfall better than Quonset styles. First, the

somewhat pointed ridge of the Gothic arch design helps to facilitate natural shedding of snow. Second, the weakest point of a Quonset unit is ridge, which is nearly horizontal. A Gothic arch (with its pointed ridge) distributes this weak point to the sides of its ribs which are more vertical in orientation, especially toward the edge of the unit.

Rib (bow) spacing also helps to determine a high tunnel's ability to withstand snow. Given the same pipe diameter, a high tunnel with four foot rib spacing will be significantly stronger than one with six foot spacing. Closer rib spacing does add to initial construction cost but the extra

strength (and peace of mind) might be well worth the cost in a heavy snow event.

Anchoring the ribs of a high tunnel properly during construction also helps strengthen it. In areas of high snow load or wind, anchoring every second rib in a concrete caisson is advisable. The caisson should be at least 24 inches in depth to prevent "frost heaving". Additionally, equipping the ribs of a high tunnel with cross members to form an A truss, greatly increases its strength. This can be done by securely attaching a metal pipe inside of the high tunnel from one side of the rib to its other, above head height or about eight feet from the ground.

Figure 1



Fruit thinning is a common practice in tomato production using protected climates in many Asia and Europe. By doing so, the number of desired marketable fruit such as No. 1s will be produced. It also increases light exposure to fruit and decreases fruit disease incidence because of the increased space between fruits. In most cases fruit will change color earlier.

Fruit thinning is more applicable to indeterminate varieties and more important for the first couple of clusters. In the early growing stage, berries face more competition with new flower clusters, leaves and branches (suckers). This, in combination with the adverse environment in March and April, discourages fruit set and then the growth of "set" berries,

which compete with each other for nutrients. By removing certain number of berries, the growth of remaining berries will be enhanced. While the number of berries to keep depends on varieties and soil fertility, the rule of thumb for a single-leader tomato plant is to keep 2-4 fruit/cluster for varieties of $\frac{1}{2}$ - $\frac{3}{4}$ lb/fruit (Picture 1), and 5-6 berries for varieties with single fruit weight of less than $\frac{1}{2}$ lb. For a double-leader plant, the number could be as low as 2 berries/cluster. The time to thin a fruit cluster is after fruit-set and a berry has grown to the size of kidney bean. Flower cluster thinning is not recommended in early spring as fruit abortion could occur. If you haven't thinned and the tomato fruit has already been developing for 2 to 3 weeks or even longer, it still

benefits to do fruit thinning. The lower one or two fruit can still be removed (Picture 2).

Thinning the rest of fruit clusters will depend on the time available to a grower. If time permits, keeping 4-6 berries/cluster should be applicable to most varieties (Picture 3). This, implemented with a good fertility management, would allow plants to continuously produce fruit and avoid poor fruiting in mid-clusters (the 6th to 8th). If your tomato plants were grafted onto a vigorous rootstock like "Maxifort", the number of fruit to keep could be more by one or two berries per cluster. Grafted tomatoes usually do not have the poor fruiting part in the 6th to 8th clusters because of the strong root system.

Figure 2



Figure 3



The Missouri NRCS reported that there were 45 high tunnels up that used their funding when this large snow-storm hit in early Feb. Two collapsed, and both were in 'hollers' where the wind had minimal effect shaking any snow off.

Snow removal (continued)by Dave Trinklein

Given a high tunnel of questionable strength is already in place and a heavy snow is predicted there are measures that can be taken to protect it. A rope thrown over the top of the structure and "walked" back and forth by workers holding the rope on either side can help to remove snow, especially from the high tunnel's ridge area.

Snow that builds up on the

sides of the ribs can be manually scraped off with a rake or scrapper with an extra long handle attached. Make sure that a material that will not damage plastic is attached to the bottom of the scraper. Also, a wooden pole or three-inch PVC pipe with several layers of carpet affixed to the end can be used to push or "poke" the plastic from the inside of the unit. The flexing of the plastic that occurs from this procedure causes

snow that has built up to slide off, in many cases.

Finally, adding internal support in the form of temporary purlin posts extending from the ground to the apex every other rib can be very helpful in preventing snow damage. Wooden 2X4's make excellent supports and are relatively easy to install if two of them are pieced together. Make certain, however, the internal support sits on something with a fairly wide "footprint" (e.g. concrete block) so the weight of the snow does not push the end of the support into the soil.

If none of the above is able to keep up with snow accumulation, a difficult managerial decision needs to be made. Slitting the plastic from the inside to allow accumulated snow to fall through to the ground will ruin the plastic but save the metal ribs. While not inexpensive, plastic is considerably cheaper to replace than metal ribs.



Copper resistant bacterial spot strains found in Indiana

By Dan Egel (Purdue University, IN)

In results confirmed in our laboratory late last year, several strains of the bacterium that cause bacterial spot of tomato and pepper were found to be resistant to copper. That is, the fixed copper products such as copper hydroxide and copper sulfate used for management of bacterial spot may not be effective management tools on these strains.

The strains of the bacterial spot bacterium resistant to copper are from both tomato and pepper. (Strains from pepper usually do not affect tomato and vice versa; the strains of the pathogen from bacterial spot of pumpkin do not affect peppers/tomatoes and vice versa.) One strain isolated in Indiana from tomato as far back as 1996 was resistant to copper. On the other hand, strains both resistant and sensitive to copper were isolated from tomato in 2010. Resistant strains of bacterial spot have been found on peppers, fresh market tomatoes and processing tomatoes. Bottom line— it is impossible to know whether the strains of bacterial spot in your tomatoes or peppers are resistant without testing them.

These results are not surprising. Strains of copper resistant bacterial spot pathogens have been known from Florida for decades. However, copper resistance has not been confirmed in Indiana until now.

Bacterial spot of tomato and pepper has been known in Indiana since 1921. Indiana was the 1st state in the U.S. to report this disease. Management of this disease has concentrated on applications of fixed copper applications.

With the first report of copper resistant strains in Indiana, growers should review their control measures. Growers should assume the strains of bacterial spot in their fields are resistant to copper.

Management guidelines for bacterial spot:

- Fixed copper— growers with strains of the bacterial spot pathogen resistant to copper may have to increase the frequency of copper applications to overcome the level of resistance in bacteria. This is especially true during periods of hot, rainy weather.
- The use of mancozeb products (e.g., Dithane®, Manzate®, Penncozeb®) to accompany applications of fixed copper may allow more copper to become available on the leaf surface, thus overcoming the level of copper resistance that exists. Mancozeb products are not labeled on peppers.
- The product Actigard® may help to lessen the symptoms of bacterial spot by inducing the plant to increase its resistance to disease. This increase in resistance is not related to copper resistance. Actigard® is not labeled on bell peppers. Follow the Actigard® label closely to avoid yield loss due to the application of this product.
- Products with the active ingredient streptomycin (e.g., Agri-mycin®, Firewall®) are not affected by copper re-

sistance. Applications of this product in the greenhouse at least once will help to manage bacterial spot. Streptomycin products are not labeled for use in the field.

- Serenade® is a biological product labeled for use on tomatoes and peppers for bacterial spot. Some research suggests that this product, used in alternation with fixed copper products, will help to manage bacterial spot. Serenade® is unaffected by copper resistance.
- The use of a virus disease of the bacterial spot strains is another option. AgriPhage® is a product that uses a virus disease of bacteria to kill the strains that cause bacterial spot. The use of such a product requires one to send in plant samples to the manufacturer so that they can customize the product for your field. Contact me for more information about AgriPhage®.
- Some pepper cultivars have resistance to some combination of races 1 through 5 of the bacterial spot pathogen. The more races the cultivar is resistant to, the better the chance of beating bacterial spot. However, any resistance may be overcome. In 2010, a race of pepper, race 6, was found in central Indiana. This race would have overcome any known resistance in commercial cultivars. Bacterial spot is an important disease. Accurate diagnosis and quick action will help to

IPM Tips for Tomato Disease Control in High Tunnels...by Jaime Pinero

Temperature and humidity are key environmental factors that need to be monitored constantly in high tunnels (HT) to avoid conditions that are conducive to disease development. The following IPM tips can help reduce disease development in HT tomatoes:

- Use disease-resistant varieties. Mountain Magic (indeterminate) and Plum Regal (determinate) are resistant to early and late blight. Fruits are crack-resistant.
- Raised beds, coupled with plastic mulch and drip irrigation tape buried beneath each bed, improves growth, fruit quality and disease and insect pest resistance.
- Maintain optimum crop growth by providing adequate nutrients and soil moisture. Soil moisture tension should be maintained between 10 and 20 centibars; irrigate when soil moisture tension exceeds 20 centibars. , irrigation should occur. Use Tables 10 & 11 from the Midwest Vegetable Production Guide for Commercial Growers to estimate centibars in the absence of a tensiometer.
- Limit the length of time above 90% relative humidity (RH) as foliar diseases are favored by high RH (above 85%). Remove suckers and (if possible once in fruit production) older leaves as they are more susceptible to fungal infections.
- Control weeds (e.g. horsenettle and other species in the tomato family) in and around the high tunnel.
- **DON'T OVER-FERTILIZE.** It may result in higher incidence of certain diseases (e.g., early blight), increases in pest pressure (e.g., two-spotted spider mites, aphids, thrips) , and in excessive salt build up in the soil (*over time*).
- Practicing good sanitation is critical. Always remove diseased tomato plants or plant parts, sterilize plant stakes prior to re-use, and clean tools and implements frequently to prevent transporting problems between fields
- Correct disease identification is critical for good disease control decisions. It saves time and money. Keep in mind that some diseases are difficult to manage once they become established. However, if an early infection is identified, cultural tactics, fungicides or bactericides can be used to reduce disease spread. Always apply a product according to label directions at the first sign of disease.

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:

- The Osage Valley Resource Conservation and Development Council (OVRCD)
1306 N. 2nd St., St. E
Clinton, MO 64735 660-885-5567, ext. 6
- EPA Region 7 Strategic Agricultural Initiative
901 N. 5th Street Kansas City, KS 66101 913-551-7003 or 800-223-0425

About this mailing list

You are being mailed this newsletter because you were involved in some type of MU Extension program recently. Names and addresses are only kept by your local specialist or James Quinn. They will not be shared with anyone else. If you would like to be removed please

let me know-

James Quinn

Cole County Extension

2436 Tanner Bridge Road

Jefferson City, MO 65101



OVRCD's Outreach to Produce Growers

By Brad McCord (USDA)

The Osage Valley Resource Conservation and Development Council, Inc. (OVRCD), has received grant funds from the Natural Resources Conservation Service (NRCS) to assist with the promotion of farmers market initiatives within a 10-county area. The purpose of the outreach effort is to increase awareness of NRCS and Soil and Water Conservation District (SWCD) programs and services, provide vegetable producer education, and increase consumer awareness and availability of locally produced vegetables and farm products. As part of the producer education component, OVRCD will be sponsoring the printing & mailing cost of this newsletter.

The OVRCD is a group of community leaders who volunteer their time to provide leadership to address

natural resource and community development demands in Central and West Central Missouri. County Commissioners and the Soil and Water Conservation Districts from the 10-county area are the primary sponsors of the Organization. The project focus area includes the following counties: Bates, Benton, Camden, Cass, Henry, Hickory, Miller, Morgan, St. Clair and Vernon. The Resource Conservation and Development (RC&D) program is administered by the US Department of Agriculture

(USDA) and the Natural Resources Conservation Service (NRCS).

The OVRCD plans to establish and distribute a list of farmers markets and locations in the ten-county area where vegetable producers have fresh produce for sale. Individuals and communities having existing farmers markets, or looking to establish farmers market outlets are encouraged to contact the RC&D office at 660-885-5567, extension 6, in Clinton, MO. More information can be found by going to the Council website- www.osagevalleyrcd.com.

Look for information about other OVRCD outreach efforts in future newsletters. They can provide guidance to producers interested in receiving NRCS technical assistance on conservation practices while opting out of financial support.

