

# VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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**LISTERIA ON CANTALOUPE - (Haley Oliver) -** The recent multi-state listeriosis outbreak associated with consumption of contaminated cantaloupe is the most deadly foodborne disease outbreak in the United States in over 10 years. According to recent CDC estimates, *Listeria monocytogenes* is the third most deadly known foodborne pathogen (preceded by *Salmonella* and *Toxoplasma gondii*, respectively). *L. monocytogenes* is an opportunistic foodborne pathogen that is described as being ubiquitous in nature-in other words it can cause disease in some people and animals under certain conditions and it can be found naturally in a multitude of environments (e.g., soil). Like *Salmonella* and shiga-toxin producing *E. coli* (STECs; O157 and non-O157) *L. monocytogenes* can be present in feces in high numbers, which can subsequently cross-contaminate soil and food products. Essentially everyone is susceptible to salmonellosis and enteric disease caused by STECs. Primarily the very young, elderly, or pregnant women and immune-compromised individuals (e.g., HIV positive) are at risk of listeriosis. Listeriosis can be prevented by thoroughly heating foods prior to consumption or by avoiding high-risk foods (i.e., those that support the growth of *L. monocytogenes* and/or are not treated prior to consumption). *L. monocytogenes* causes approximately 1600 cases of listeriosis each year in the US, of which ~260 cases result in death. In comparison to the risk of mortality from salmonellosis (0.5%), and disease caused by STECs, the risk of dying from listeriosis is significantly higher (15.9%). However, *Salmonella* and STECs (which have been the causative agent in numerous foodborne outbreaks associated with consumption of contaminated produce) cause significantly more cases of disease. For example,

*Salmonella* is estimated to cause 1.2 million cases of foodborne disease in the U.S. annually.



**Figure 1:** *Listeria monocytogenes*, as seen in this micrograph, was the bacterium responsible for the food-borne illnesses that occurred in September of this year. Magnification-5,700 times in false color. (Photo credit-A.B. Dowsett/ Science Photo Library).

Based in USDA risk assessments, listeriosis is most commonly associated with consumption of contaminated deli meat but rarely associated with produce. However, any food contaminated with sufficient amounts of viable *L. monocytogenes* and consumed by an at-risk population could potentially result in disease. A clear example is the multi-state listeriosis outbreak resulting from the consumption of cantaloupe. Prior to the 2011 outbreak, listeriosis had not been directly associated with the consumption of contaminated cantaloupe. FDA recently published a report on the factors potentially contributing to the contamination of fresh cantaloupe on the Jensen Farm in Colorado. The full FDA report is available at the following link: <http://www.fda.gov/Food/FoodSafety/CORENetwork/ucm272372.htm#report>. Briefly, the report states that:

1. *L. monocytogenes* could have been present on a truck used to haul culled cantaloupe to a cattle operation, which was subsequently parked near the packing facility or in it may have been present in low levels in the field and introduced into the packing facility during processing.
2. FDA indicated that water pooled on the packing facility floor near equipment and walkways and that the flooring material could not easily be cleaned. Similarly, packing equipment could not be easily cleaned and sanitized.
3. There was also evidence that washing and drying equipment was previously used for post-harvest handling of another raw agricultural commodity.

- Further, FDA determined that the cantaloupes were not pre-cooled prior to cold storage, which may have resulted in condensation on the melons potentially promoting the growth of *L. monocytogenes* during refrigeration and storage.

As a result of the factors that potentially contributed to the multi-state listeriosis outbreak, FDA is emphasizing the importance of good agricultural practices (GAPs) for unprocessed fruits and vegetables and good management practices (GMPs) minimally processed raw fruits and vegetables from production through transport to consumers. A letter summarizing FDA guidance for fresh cantaloupe is available at <http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/ProduceandPlanProducts/ucm278456.htm>. FDA also provides recommendations for consumers, available at <http://www.fda.gov/Food/FoodSafety/CORENetwork/ucm272372.htm#report> (and in box below and to the right).

Indiana growers can learn more about GAPs at the Food Safety session on January 17, 2012 at the Indiana Horticultural Congress. The morning program will include an update on the Food Safety Modernization Act, a review of pathogens by Haley Oliver, and a discussion of outbreaks by Amie May, epidemiologist with the Indiana State Department of Health, and Johnna Hepner, Director of Food Safety and Technology with the Produce Marketing Association. In the afternoon, 'Good Agricultural Practices from A to Z for Produce Growers' will be offered. This is an introductory workshop for growers to learn about practical approaches to minimizing risks of microbial contamination in fields, orchards, and packing sheds. Special attention will be given to recommendations for production, harvest, and post-harvest handling of greens. Participants will also learn about expectations of buyers and government agencies for documentation.

Good Agricultural Practices from A to Z for Produce Growers is also available for viewing online in a series of recorded webinars. To register, go to <http://www.hort.purdue.edu/fruitveg/fs.shtml> and follow the link to the registration form at the top of the page.

If these programs don't meet your needs, please let us know, either by contacting Liz Maynard at 219-531-4200 ext. 4206, [emaynard@purdue.edu](mailto:emaynard@purdue.edu), or through your County Extension office. We will be planning additional programs and your input will be helpful.



#### CONSUMER SAFETY INFORMATION FROM FDA:

Listeria can grow at refrigerator temperatures, about 40° Fahrenheit (4° Celsius). The longer ready-to-eat refrigerated foods are stored in the refrigerator, the more opportunity Listeria has to grow. It is very important that consumers clean their refrigerators and other food preparation surfaces. Consumers should follow these simple steps:

\*Wash hands with warm water and soap for at least 20 seconds before and after handling food.

\*Wash the inside walls and shelves of the refrigerator, cutting boards and countertops; then sanitize them with a solution of one tablespoon of chlorine bleach to one gallon of hot water; dry with a clean cloth or paper towel that has not been previously used.

\*Wipe up spills in the refrigerator immediately and clean the refrigerator regularly.

\*Always wash hands with warm water and soap following the cleaning and sanitization process.



**UPDATE ON STATUS OF 2,4-D AND DICAMBA TOLERANT AGRONOMIC CROPS - (Stephen Weller) - Roundup Ready (RR) crops revolutionized weed management and no-till practices in agronomic cropping systems by providing a system where one herbicide (glyphosate) applied post emergence during the crop season would provide excellent broad-spectrum weed control. RR soybean was first introduced in the US in 1996 followed shortly thereafter by RR cotton and RR corn. Additional crops including canola and sugar beet have also been released. Weed management in these crops has been excellent and has resulted in simplified and less expensive weed control by use of glyphosate based herbicide products with a general perception there would be a minimal need for other herbicides. However, this technology has not been perfect and due to the tremendous selection pressure of multiple applications of glyphosate within years and over years on millions of acres of RR crops. Some weeds have evolved resistance to glyphosate, first in marestail and now there are 21 weeds worldwide reported to be resistant to glyphosate. In Indiana, marestail, giant ragweed and waterhemp are 3 problem weeds where resistance has been reported and several other weeds are suspected to have developed resistance. The existence of weeds resistant to glyphosate, when they exist in a farmer's field, requires the use of additional herbicide tools and cultural practices to effectively manage the weeds. These additional practices add cost to the production system and often, effective herbicides are not easily available in some crops. The presence of glyphosate resistant weeds has imperiled the long-term sustainability of the RR system unless more integrated weed management approaches relying less on the sole use of glyphosate are put into practice.**

In response to the evolution of weed resistance and tolerance to glyphosate, agricultural chemical companies have been investigating new methods of weed control, either by developing new herbicides or through the use of genetic engineering to obtain crop plants resistant to other herbicides. Dow Agro-Sciences and Monsanto

have been the leaders in developing crops resistant to additional post-emergent herbicides. Dow Agro-Sciences is developing a technology named 'Enlist Weed Control System™' in soybean, corn and cotton where the crop contains a gene that encodes a trait for resistance to the herbicide 2,4-D. The technology depending on the specific crop will include resistance to other herbicides. Monsanto is developing technology in their 'Roundup Ready Flex System™' in corn, soybean and cotton where the crop has resistance to dicamba and other herbicides. The logic in developing these new herbicide resistant crops is to provide additional tools in the RR system that allow effective weed management while taking advantage of a herbicide management package that will control a wide spectrum of weeds without damaging the crop. Additionally, the use of multiple herbicide mechanism of action mixtures is believed to be an effective method to slow or prevent the further evolution of additional weeds resistant to widely used herbicides and maintaining sustainability of the RR weed management system.



**Figure 2:** The presence of glyphosate-resistant weeds such as the horseweed (marestail) in this soybean field has led companies to develop soybean varieties with resistance to dicamba and 2, 4-D. (Photo by Valerie Clingerman).

Many people have questions related to this new technology. Two main questions are, how will it influence weed management in agronomic systems and how might the widespread use of 2,4-D and dicamba affect non-target crops if the herbicides move away from treated fields either by drift or volatility? The question of sustainability, effectiveness and economics of these new technologies for the RR weed control system will not be discussed in this article. The evidence from over 50 plus years of use of dicamba and 2,4-D is that these herbicides will provide control of many of the broadleaf weeds that have developed resistance to glyphosate. The known problems of volatility of certain formulations of 2,4-D and dicamba are also well documented. Both companies are addressing this issue through the development of new, lower volatility chemistries. Drift is always a poten-

tial problem with any herbicide but with these two herbicides, it is an important concern due to the high sensitivity of many broadleaf plants to low concentrations of both herbicides. Again, the companies involved are working to develop improved application techniques to minimize these concerns that include improved herbicide formulations, better spray nozzle technology and overall improved application requirements.

What is the background relating to this new herbicide tolerant crop technology and when can we expect market availability? Dow Agro-Sciences is developing their technology under the name of 'Enlist Weed Control System' in corn, soybean and cotton. The Enlist™ system became possible when genes were discovered that could metabolize 2,4-D in susceptible plants and that this gene could be transformed into high acreage agronomic crops such as corn, cotton and soybean. The second necessity was to develop a better form of 2,4-D that had low to no volatility and had chemical characteristics that would minimize off-site drift. The new 2,4-D choline chemistry is called the Colex-D Technology™. 2,4-D choline is a quaternary ammonium salt, which is different from now commercially available 2,4-D amine or ester formulations as it has ultra low volatility, a minimized potential for drift, low odor and overall better handling characteristics. The Dow Agro-Sciences Enlist corn™ will also infer tolerance to "fop" type grass specific herbicides, such as Targa® or Assure®, that contain the active ingredient of quizalofop. Crop resistance to glufosinate herbicide will be included in commercial soybean and cotton seed and in selected stacked corn seed. All three crops will contain the glyphosate resistance trait. Another advantage of the 2,4-D tolerance trait is a widened window of application both after burndown (no preplant application planting restrictions) and later in the season. These crops, depending on regulatory approvals, are being targeted to release for commercial sale in 2012 - 2013 for corn, 2014 for soybean and 2015-2016 for cotton.

The dicamba tolerance technology for crops being developed by Monsanto is also possible due to the discovery of a gene that codes for a trait that metabolizes dicamba in previously sensitive crops. This gene when expressed in plants will allow for the application of glyphosate and dicamba over-the-top of tolerant crops. Extensive work is currently being done to develop soybeans, corn and cotton tolerant to dicamba herbicides into the Roundup Ready Flex system™. Cotton tolerant to glyphosate, dicamba and glufosinate herbicides is a three-way stack of herbicide-tolerant technology. As with the Enlist™ technology for 2,4-D, the logic is that this technology will reduce the risk of crop-injury often associated with pre-plant dicamba applications and allow improved control of difficult and resistant no-till weeds anytime from pre-plant through post-emergence. The technology offers growers outstanding flexibility to control weeds, use reduced tillage and help manage the risk of selecting for glyphosate-resistant weeds. Target

dates for release of the dicamba resistance technology will be dependent on regulatory approval but the latest estimates are for 2015. Monsanto in collaboration with Syngenta is addressing the potential for dicamba to injure off-target vegetation when drift or volatilization occurs. The danger for drift is an ever-present problem for any herbicide application and as with 2,4-D is a major concern for many other crops. There have been cases of dicamba drift over the past 20 years and many people have expressed concerns about off-target movement from the use of dicamba-tolerance in corn, soybean and cotton. Monsanto in cooperation with Syngenta is working to develop application programs, enhanced/improved dicamba formulations and product stewardship programs intended to minimize the risk of off-target movement similar to those programs described for Dow Agro-Sciences.

The overall weed management system with both of these technologies will be based not only on use of post-emergent herbicides. Both technologies will include the use of pre-emergent soil residual herbicides to add other effective herbicides to the system. This approach theoretically provides another method to limit weeds developing herbicide resistance while maintaining the sustainability of herbicide tolerant crop technology.

The next few years will be interesting as this technology is developed, approved for release, labeled, in regard to herbicide use, and application techniques, and how the issues related to off-sight movement are addressed. There is much work that still needs to be done to ensure that when these herbicide tolerant crop systems are commercially available they are effective and economical, manage weeds and do not result in damage to non-target plants. One program that will benefit growers as they deal with potential off-site herbicide movement is the Purdue University based DriftWatch, a voluntary "sensitive crop" reporting system that notifies other farmers and pesticide applicators about locations where spray drift may be a major concern. I am sure that more programs like DriftWatch will become more common as additional information is available concerning how best to use these crops while avoiding potential damage from herbicide use.



**FOOD FOR HUMAN HEALTH** - (Shubin K. Saha) - Currently in this age of increasing health concerns people are trying various methods to help with illnesses and general wellness. In particular dealing with obesity and associated problems such as heart disease has become of increasing concern for much of society. We are frequently told to eat fresh fruits and vegetables to help with overall health, but as scientists we are digging deeper to

find specific ways certain fruits and vegetables can be beneficial to human health.

In a recent study conducted at the University of Kentucky Saha Cardiovascular Research Center, watermelon was shown to be beneficial for cardiovascular health in animals. The animals utilized for the study were mice fed a diet to induce high cholesterol. The study was conducted over twelve weeks and the mice were broken into two different groups. One group was fed pure water with their diet while the other group was fed a solution of watermelon juice mixed with water at a concentration of 2% juice.

Findings from the study indicated that the test group of mice fed watermelon juice in their diet had a reduction in body mass, but more specifically that was attributed to loss of fat mass. Lean muscle mass was not lost in either of the test groups. Additionally it was shown through destructive sampling that there was a reduction in the fatty plaque buildup in the arteries of the mice fed watermelon juice as compared to the group fed pure water. Blood pressure was also monitored, but no differences in the two test groups were found.

At this stage of the research it is not advised to specifically use watermelon consumption for improving cardiovascular health. However this has created a foundation for future research, which may produce promising results for humans in the next few years.

*This project was conducted by Sibin P. Saha, University of Kentucky Department of Surgery; Aruna Poduri, University of Kentucky Saha Cardiovascular Research Center (UK Saha CRVC); Debra L. Rateri, UK Saha CVRC; Shubin K. Saha of Purdue University; and Alan Daugherty, director, UK Saha CVRC.*



**TOMATO BUDGET** - (Editor's note - Mickael Veldstra and Corrine Alexander of Purdue University Agricultural Economics Department are putting together a fresh market tomato budget. This information will help tomato producers to better price their products.) We would love to interview you at your earliest convenience. The interview can take place at your farm or on the phone and will last approximately one hour. We are collecting crop budget information for fresh market vegetable producers, specifically those who grow tomatoes. We will be asking for your typical costs associated with growing fresh market tomatoes in a given year. Your answers will be completely confidential. We will use your costs and the costs of other fresh market producers to obtain an average cost of producing tomatoes in Indiana. You would be able to use our results to benchmark your production costs and compare whether your costs are low or high relative to that benchmark. Contact Michael at [mveldstr@purdue.edu](mailto:mveldstr@purdue.edu).

**GETTING STARTED IN FRESH FRUIT, VEGETABLES AND OTHER SPECIALTY CROP ENTERPRISES.** - Are you interested in growing and marketing fresh fruit, vegetables or other specialty crops locally, but you're unsure how to get started? Then plan to attend a special workshop specifically designed to meet the needs of beginning farmers. Workshop participants will learn what it takes to start and manage a successful specialty crop business. Extension specialists from Purdue University and the University of Wisconsin-Madison will discuss resource assessment, goal setting, financial planning and marketing options. Growers will also be on hand to share their experiences and answer questions about starting new specialty crop enterprises using a range of different production and direct marketing strategies. A special evening screening of the documentary film, *The Greenhorns* ([www.thegreenhorns.net](http://www.thegreenhorns.net)), will highlight stories of America's young farming community – its spirit, practices and needs. This workshop is part of the Indiana Horticulture Congress, which will also include more advanced sessions featuring fruit and vegetable production, agri-tourism, high tunnel management and organics ([www.inhortcongress.org](http://www.inhortcongress.org)). Registration is required to attend. When: Tuesday, January 17<sup>th</sup>, Workshop - 9:00 a.m. to 5:30 p.m., *The Greenhorns* Documentary Film - 7:00 to 8:00 p.m., Where: Wyndham Hotel, Indianapolis, IN. For more information and registration details contact: Lori Hoagland, Specialty Crop Production Systems Specialist, Purdue University, (765) 494-1426, [lhoaglan@purdue.edu](mailto:lhoaglan@purdue.edu).



**INDIANA COUNTIES LISTED AS NATURAL DISASTERS** - The U.S. Department of Agriculture (USDA) has designated the following 10 counties in Indiana as natural disaster areas due to losses caused by excessive rain, flooding and flash flooding that occurred April 1 - July 7, 2011 (see first column of table below). Farmers and ranchers living in the Indiana counties in the second and third columns of the table also qualify for natural disaster assistance because their counties are contiguous to the others. All counties listed were designated natural disaster areas as of Oct. 12, 2011.

All qualified farm operators in the designated areas are eligible for low interest emergency (EM) loans from USDA's Farm Service Agency (FSA), provided eligibility requirements are met. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses. FSA will consider each loan application on its own merits, taking into account the extent of losses, security available and repayment ability. FSA has a variety of programs, in addition to the EM loan program, to help eligible farmers recover from adversity, including the Supplemental Revenue Assistance Program (SURE), which was approved as part of the Food, Conservation, and Energy Act of 2008; the Emergency Conservation Program; Federal Crop Insurance; and the Noninsured Crop Disaster Assistance Program. Interested farmers may contact their local USDA Service Centers for further information on eligibility requirements and application procedures for these and other programs. Additional information is also available online at <http://disaster.fsa.usda.gov>.

| Counties designated as National Disaster Areas | Counties that also qualify for assistance |             |
|--|---|-------------|
| Dearborn                                       | Adams                                     | La Porte    |
| Grant  | Allen                                     | Madison     |
| Huntington                                     | Blackford                                 | Miami       |
| Knox   | Clay                                      | Newton      |
| Lake   | Daviess                                   | Parke       |
| Ohio   | Delaware                                  | Pike        |
| Porter   | Franklin                                  | Ripley      |
| Vigo   | Fulton                                    | Starke      |
| Wabash   | Gibson                                    | Sullivan    |
| Wells  | Greene                                    | Switzerland |
|  | Howard                                    | Tipton      |
|  | Jasper                                    | Vermillion  |
|  | Jay                                       | Whitley     |
|  | Kosciusko                                 |             |

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