

PVGA Funds Vegetable and Berry Research for 2015

The Pennsylvania Vegetable Growers Association Board of Directors budgeted \$80,000 for vegetable and small fruit research in 2015 although only \$77,000 will actually be spent. This year's contributions put PVGA's funding for research over the past 27 years at \$860,000.

The research funding has been made possible solely through the profits earned at the Association's food booths at the Farm Show and Ag Progress Days. While the Association earned much less than \$77,000 at the Farm Show and Ag Progress Days booths, this amount of research grants would not be possible without these food booth profits. Surplus income from the Mid-Atlantic Convention and General Fund reserves are helping to fund the 2015 research grants. This year, PVGA will contribute \$56,000 towards vegetable research, \$10,000 to help support a tomato breeding technician at Penn State and \$11,000 for small fruit research. While \$14,000 was budgeted for small fruit research, the proposals funded will only require \$11,000.

The following twelve vegetable projects are being funded in conjunction with the Vegetable Marketing and Research Program which will contribute another \$17,000 for a total \$73,000 for vegetable research. The projects approved for funding with their objectives are listed below.

Evaluation of Select Seed and In-Furrow Treatments for the Management of Soilborne Pathogens of Snap Bean.

Beth K. Gugino, Penn State University **\$5,088**

- Evaluate several seed and in-furrow treatments for effectiveness in managing *Rhizoctonia solani* and *Fusarium solani* for several commonly grown snap bean varieties.

Is There Potential of a New Herbicide in Snap Beans?

Dwight Lingenfelter, Penn State University; Mark VanGessel, University of Delaware **\$6,000**

- Evaluate the crop safety of pyroxasulfone at different rates on three to four common snap bean varieties.
- Evaluate herbicide effectiveness when pyroxasulfone is used alone and in combination with a postemergence herbicide.
- Determine the effect of these herbicide treatments on snap bean stand, injury, and yield.

Enhancing the Fungicide-Based Management of White Mold in Snap Bean

Sarah Pethybridge, and Amara Dunn, Cornell University, and Beth K. Gugino, Penn State University **\$5,000**

- Quantify the cost-effectiveness of fungicides in different resistance groups (FRAC codes) and their optimal timing for the control of white mold in snap bean.

Evaluating the Status of Copper Resistance in Bacterial Populations in Pennsylvania Tomato Fields

Beth K. Gugino, Penn State University **\$6,000**

- Test whether pathogens which cause tomato bacterial spot, speck and canker collected from several Pennsylvania farms show genetic resistance to fixed-copper.

Characterization of Genetic Resistance to Bacterial Canker in Tomato

Timothy McNellis and Majid R. Foolad, Penn State University **\$8,000**

- Characterize genetic resistance to bacterial canker disease of tomato, caused by *Clavibacter michiganensis* subspecies *michiganensis* (Cmm).
- Initial characterization of the genetic basis of Cmm resistance in *S. pimpinellifolium* accession PLSP125
- Determine whether PLSP125 resistance to Cmm involves immunity or tolerance
- Determine whether the canker resistance trait is effective under field conditions and over the course of an entire season.

Breeding Tomatoes for Disease Resistance and Other Desirable Horticultural Characteristics for Production in Pennsylvania

Majid R. Foolad, Penn State University **\$6,000**

- Transfer of late blight resistance gene Ph-5 to PSU fresh-market and processing tomato breeding lines and field evaluation.
- Transfer of late blight resistance gene Ph-3 to PSU fresh-market and processing tomato breeding lines and field evaluation.
- Characterization of new sources of LB resistance.
- Development of experimental F1 hybrids with EB resistance and other desirable horticulture characteristics.
- Field evaluation of Penn State advanced processing and fresh-market tomato breeding lines.

High Tunnel Fresh Market Slicer Tomato Variety Trial 2015

Steven Bogash, Penn State Extension **\$7,494**

- Identify tomato cultivars that have promise as successful high tunnel varieties.
- Identify those cultivars that are both resistant and susceptible to leaf mold(s) and yellow shoulder based on an intensive tissue testing program.
- Identify cultivars that are considered superior in flavor and appearance.
- Produce saleable yield data (size, avg. weight, etc.) for the cultivars in this program in order to allow growers to select varieties that meet their marketing criteria.

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NEWS



Pennsylvania Vegetable Growers Association

An association of
commercial vegetable,
potato and berry growers.

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PVGA Funds... (continued from page 1)

- Increase local market share for fresh market tomatoes by local growers by assisting them in the selection of tomato cultivars that are considered superior by tasting panels.

Western Flower Thrips and Other Insect and Arthropod Pest Management in Field Staked Tomatoes

Steven Bogash, Penn State Extension

\$5,800

- Evaluate current insect control materials and tactics for their ability to manage insect and arthropod infestations.
- Evaluate newer 'biological' pest materials for their ability to control insects and arthropods as compared to current BMP's for control.
- Measure insect and arthropod levels in the field for 2015 in order to establish a baseline for future work.

Sweet Corn Trapping Network

Shelby J. Fleischer, Penn State University

\$2,600

- Purchase lures for corn earworm, European corn borer, and fall armyworm for the statewide trapping network.

Seedless Watermelon Variety Trial

Tanner Delvalle and Steven Bogash, Penn State Extension

\$6,975

- Evaluate current seedless watermelon varieties for yield, overall marketability, brix, hollow heart and color and update recommendations for Pennsylvania growers.
- Evaluate some varieties for susceptibility to powdery mildew and downy mildew under an IPM-based fungicide program using the 2015 Commercial Vegetable Production Recommendations Guide.

Statewide Broccoli Cultivar Trials

Elsa Sánchez and William Lamont, Penn State University; Timothy Elkner, Thomas Butzler, Steven Bogash, Lee Stivers, and Robert Pollock, Penn State Extension

\$12,000

Evaluate 24 cultivars of broccoli grown at three different locations in Pennsylvania in spring and fall for yield, marketability and quality.

Manure E coli Research Project

Dr. Jeffrey LeJeune, Ohio Agricultural Research & Development Ctr.

\$2,500

To document under field conditions on several farms the survival of E. coli in the soil to develop an interval time period guideline between manure application and harvest of produce that does not reduce the food safety of the produce.

The two small fruit research projects funded are:

Evaluation of Strawberry Cultivars and Selections for Plasticulture and Matted-Row Production

Kathleen Demchak and Richard Marini, Penn State Univ. and Timothy Elkner, Penn State Extension

\$3,000

Evaluate new varieties and advanced selections for productivity, quality and disease and insect susceptibility in the plasticulture system.

Evaluate new varieties and advanced selections for productivity, quality and disease and insect susceptibility in matted row production.

Optimizing Protected Culture Environments for Berry Crops

Kathleen Demchak, Penn State University and others at Michigan State University; Cornell University, University of Vermont and USDA

\$8,000

- Evaluate and contrast diverse types of protective structures for durability and initial and management costs through research and grower input.

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The **Pennsylvania Vegetable Growers News** is the official monthly publication of the Pennsylvania Vegetable Growers Association, Inc., 815 Middle Road, Richfield, PA 17086-9205
phone and fax - 717-694-3596, email - pvga@pvga.org website - www.pvga.org

Our Mission:

The Pennsylvania Vegetable Growers Association serves Pennsylvania's commercial vegetable, potato and berry growers through education, research, advocacy and promotion.

Our Vision:

The Pennsylvania Vegetable Growers Association will be the driving force in ensuring the future viability of the commercial vegetable, potato and berry industries in Pennsylvania.

Inquiries about membership, this publication or advertising rates should be directed to William Troxell, Executive Secretary, at the above addresses.

National News Briefs

Current Immigration Bills Don't Address Farmers' Needs

A series of immigration bills under consideration in Congress will not address the needs of America's farm families and could cause even more harm. The House is considering legislative action that focuses only on enforcement, which could prove devastating to agriculture and rural economies, according to the American Farm Bureau Federation.

A report commissioned last year by Farm Bureau showed that immigration reform which focuses only on enforcement would cause agriculture production to fall by at least \$30 billion, causing a 5 percent spike in food prices. Recently, the House Judiciary Committee passed the Legal Workforce Act, which would require employers to use an E-Verify system to check the work eligibility of all future employees. E-Verify is an Internet-based system that lets employers check an applicant's identification with the Social Security Administration records to confirm employment eligibility.

Unless Congress develops provisions that give farmers access to a legal supply of workers, the E-Verify system will be detrimental to agriculture, said Kristi Boswell, a labor specialist for the American Farm Bureau Federation. Farmers need a system that provides a legal workforce, and in a time frame that works with the cyclical nature of agriculture.

"As employers, farmers understand the important role they play in the system, but they cannot support an approach that threatens to wipe out billions of dollars a year that is helping to sustain rural communities," Boswell said.

Any mandate for using E-Verify must be based on a system that is simple and timely, and provides a defense for employers acting in good faith. The system should also allow for the status adjustments of workers not authorized prior to the law's implementation and be preceded by a full implementation of a workable agriculture immigration program. Congress is also poised to take action on several other bills related to the enforcement of immigration laws and the elimination of fraud and abuse.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

Farm Bureau Keeps Up Federal Water Rule Fight

The vigilant outreach efforts of Farm Bureau members across the nation are making a difference, with two key votes in the U.S. Senate delivering a resounding message that the proposed Waters of the U.S. rule is flawed in both substance and process.

"Senators indicated they will not tolerate outlandish regulatory actions that disregard established law, and by their action put federal regulators on notice that the rule is simply unacceptable," said AFBF President Bob Stallman. "The Senate action amplifies the spirit our farmers have conveyed over the past year of the need to ditch the egregious WOTUS rule. We thank senators for their understanding that America's farm and ranch families care deeply about clean water and their recognition that the ill-advised WOTUS rule is flawed to the core."

Sen. Pat Toomey supported Farm Bureau's position on both votes, while Sen. Bob Casey supported our position on one of the votes. AFBF is continuing a strong push in Congress to prevent the WOTUS rule from moving forward. The Environmental Protection Agency and Army Corps of Engineers have proposed a sweeping expansion of their authority under

the Clean Water Act, which could require the need for permits for common agriculture practices.

"It is impossible to know how many farmers, ranchers and forest landowners will be visited by [EPA] enforcement staff or will be sued by citizen plaintiffs' lawyers—and it is impossible to know when those inspections and lawsuits will happen," Ellen Steen, chief counsel for Farm Bureau, told a House Agriculture subcommittee.

When the Clean Water Act was enacted, farmers were given some exemptions for normal agriculture practices. But, decisions by the EPA and the courts have narrowed those agriculture exemptions. A further expansion of authority by the two agencies would all but erode all of those exemptions.

"Much of the remaining benefit of those exemptions would be eliminated by an expansive interpretation of 'waters of the United States' to cover ditches and drainage paths that run across farm and pasture lands," Steen testified.

Ditches and drainages are commonplace on farm land, frequently occurring next to crop lands—or even through growing lands—making it impossible for farmers to use fertilizers or crop protection without triggering a Clean Water Act "pollutant" discharge liability and need for a federal permit. That leaves farmers with few options, Steen said. They can either farm under a cloud of uncertainty and risk, or they can avoid farming near ditches, and drainage paths, she said.

"That is a no-win situation for farmers," she said.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

Finding Land Chief Concern for Young Farmers

Across the country, young farmers are concerned about finding enough land to sustain and grow their operations. It's a familiar refrain that young farmers have expressed over the past several years during informal surveys conducted by the American Farm Bureau Federation. Other pressing concerns include government regulations, overall profitability, taxes, urbanization and the availability of agriculture financing.

"For young people who want to begin farming or ranching or expand an established farm or ranch, securing adequate land remains their top challenge," said Jon Hegeman, AFBF's national YF&R Committee chair and a farmer from Alabama. "Another major challenge is coping with burdensome government regulations."

AFBF conducted its 23rd annual survey of young farmers online in February. Survey respondents overwhelmingly said they are more optimistic about farming than they were five years ago, although the percentage did decline as compared to last year. Most farmers surveyed said they planned on staying in production agriculture for their entire lives and 97 percent said they would like to see their children follow in their footsteps.

Farmers consider the need to communicate with consumers as part of their job description. Nearly 75 percent of young farmers are using Facebook to engage consumers, with another 23 percent having a presence on Twitter and another 14 percent post videos to YouTube.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

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State News Briefs

Proposed State Budget Calls for Tax Overhaul in Pennsylvania

Gov. Tom Wolf set an ambitious first year agenda in his proposed state budget that calls for a mixture of tax cuts, including addressing property taxes, but also increases other levies. At the same time, Gov. Wolf's budget calls for an overall increase in state spending for the Pennsylvania Department of Agriculture, but proposes flat funding for programs like Penn State Extension.

"Pennsylvania farmers appreciate the proposed \$3 million increase in funding for PDA's General Government Operations, which should help maintain staffing and resources for important programs, but we are strongly concerned that the Governor failed to increase funding for Cooperative Extension and Agriculture Research programs administered by Penn State," said PFB President Rick Ebert.

The \$29.9 billion budget is a roughly 3 percent increase from the state's current spending plan, and also seeks an additional spending of \$2 billion on public education. The Governor has proposed a severance tax on natural gas extraction to help fund education. Gov. Wolf has also called for a decrease in Pennsylvania's corporate income tax—currently one of the highest in the nation—but will seek to close loopholes that some companies' use to avoid some taxes.

Agriculture Funding - The proposed budget calls for 2 percent growth in state funding for agriculture. The Pennsylvania Department of Agriculture's General Operating Budget has been increased to \$28.2 million from its current \$25.2 million. However, some agriculture programs are facing cuts, such as agriculture research, promotion and some livestock and youth shows. Gov. Wolf has also suggested no increases in Extension and Research, a move opposed by Pennsylvania Farm Bureau. In recent years, Extension has either taken budget cuts, or seen flat funding, and has reduced programs as a result.

Taxes - Gov. Wolf's proposed budget calls for significant shifts and changes in personal, property and corporate taxes. According to the Governor, the budget will bring \$3.8 billion in property tax relief—about \$1,000 for the average homeowner. That would reduce property taxes by 50 percent, but the tax relief is targeted to homes and farmsteads and will not impact land used for farming. (See next article for more details.)

"Pennsylvania farmers have been advocating for property tax relief for decades and have cited the need for the General Assembly to address the growing pension crisis as a top priority over the past few years. We are hoping that these issues can be addressed in a way that is fair for farmers, school districts, local governments and all Pennsylvanians," Ebert said.

Gov. Wolf also seeks to reduce the state's corporate tax rate to 5.99 percent from its current 9.99 percent, and cut it again by 50 percent by 2018. He also wants to eliminate the capital stock and franchise tax, but close the so-called Delaware loophole that some companies have used to shield assets from taxation. Finally, Gov. Wolf is calling for a 5 percent severance tax on natural gas, modeled on a tax system used by West Virginia. The Governor has earmarked most of that money for education spending, but will keep some funding for communities impacted by drilling. Members of the Pennsylvania General Assembly have begun budget hearings and the negotiation process to develop a final state budget by the June 30 deadline. Pennsylvania Farm Bureau will work with lawmakers

throughout the process to achieve the necessary funding for agriculture.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

Proposed Property Tax Reduction Offers Limited Relief to Farmers

In his proposed state budget, Gov. Tom Wolf called for cutting property taxes by around 50 percent. However, the reduction in property taxes is targeted to homesteads and farmsteads, meaning it would provide limited property tax relief to farms, and cropland would still be subject to property taxes. To make up for the revenue lost by property taxes, Gov. Wolf has proposed increasing income taxes to 3.7 percent from 3.07 percent and expanding sales taxes to 6.6 percent, from its current level of 6 percent. Sales tax would also expand to cover certain services and items—generating an expected \$1.6 billion—but exemptions on food, clothing and agriculture, would remain.

Pennsylvania Farm Bureau has long called for the elimination of property taxes and supports using a variety of sources like increases in sales and income taxes to make up the difference. While Gov. Wolf's proposal puts emphasis on the need to address onerous property taxes, it does not provide the relief that farm families need.

"In order for property tax relief to work, it needs to extend to every aspect of the farm, including land used to raise crops or tend livestock," said Joel Rotz, PFB's senior director of state government affairs.

Gov. Wolf's proposed property tax reduction plan will mimic the tax rebate created through the expansion of casino gaming in Pennsylvania. Homeowners are able to receive a tax rebate—based on a formula unique to every school district—for their primary residence. Farmers can also receive the rebate on their primary residence and farm buildings located there. Crop land is still subject to full property taxes. PFB is also concerned the governor's proposal does not call for a freeze in property taxes. Without a property tax freeze, school districts could continue to raise taxes, eventually eroding any savings made by the increase in sales and income taxes.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

Deputy Secretaries Named at PDA

Russell Redding, Pennsylvania's Acting Secretary of Agriculture, has announced the appointment of four deputy secretaries in the Department. Michael Smith, of Harrisburg, was named Executive Deputy Secretary while Greg Hostetter, Hannah Smith-Brubaker, and Fred Strathmeyer Jr, will serve as deputy secretaries overseeing various bureaus in the Department.

"The strength of Pennsylvania agriculture is its diversity," said Redding. "And this team reflects that, with extensive experience in state and federal government and across the full range of agriculture. I look forward to working with Michael, Hannah, Greg and Fred to meet our core missions with public health and safety, building the agriculture workforce, and strengthening our food and agricultural economy."

Smith will manage the day-to-day operations of the Pennsylvania Department of Agriculture and will coordinate issues involving other state agencies. He previously served as

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NEWS

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communications manager for Gov. Ed Rendell.

Hostetter manages a grain and beef farm outside of Jonestown. He recently served on the U.S. Department of Agriculture's Farm Service Agency Pennsylvania state committee and several other state agriculture boards. At PDA, Hostetter will serve as deputy secretary for animal health and food safety, and will be responsible for the bureaus of Animal Health and Diagnostic Services, Food Safety and Laboratory Services and Dog Law Enforcement. Hostetter has served as vice president of Lebanon County Farm Bureau.

Smith-Brubaker owns an organic produce and pasture poultry farm in Juniata County. She was previously president of Pennsylvania Farmers Union. She will oversee the bureaus of Market Development, Farmland Preservation, Food Distribution and Farm Show for PDA.

Strathmeyer co-owns Strathmeyer Forests of York, which grows Christmas trees and nursery products. Strathmeyer will oversee the department's bureaus of Plant Industry and Ride Measurement Standards. He will also be responsible for the state Horse and Harness racing Commissions and the Hardwoods Development Council. Strathmeyer previously chaired Pennsylvania Farm Bureau's Agricultural Labor and Safety Committee.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

Fish and Wildlife Service Classify Bat Species as Threatened

The U.S. Fish and Wildlife Service has listed the northern long-eared bat as "threatened" under the federal Endangered Species Act. While the bat species is declining in population due to White Nose Syndrome, which is not caused by human activity, the listing still could pose restrictions for farmers and landowners.

In listing the northern long-eared bat, the Fish and Wildlife Service has enacted an interim rule, which will put restrictions on certain activities that could pose a harm to bats. Farm Bureau is concerned the interim rule could restrict pesticide applications in areas near bat nesting sites.

Prior to the listing under the Endangered Species Act, Pennsylvania Farm Bureau outlined its concerns over the designation to the Fish and Wildlife Service, saying it could cause undue harm to agriculture, even though human activity is not impacting bat populations.

The bat's range extends throughout most of the East Coast, including Pennsylvania. During the summer, bats usually roost in trees, or in buildings and barns. Many farms throughout the state likely have roosting sites. Under the Endangered Species Act, an activity that can disturb a nesting site of an endangered species carries a \$25,000 fine.

Besides fines, listing the northern long-eared bat could also carry other economic burdens including lost production. If, by way of illustration, a farmer had to take four acres of a corn field out of production, it would translate into a loss of \$3,440 with current corn prices, PFB said in comments.

Many agriculture lands throughout Pennsylvania are bordered by forests lands and fence rows, which will create uncertainty if a bat is found roosting next to a farmer's crop land. Pennsylvania Farm Bureau suggested the Fish and Wildlife Service follow the approach taken by the Pennsylvania Game Commission when considering the questions of how to protect bat populations. The Game Commission had considered plac-

ing the bat on the state's endangered species list, but determined that more research was needed to address the root causes of White Nose Syndrome and devise solutions that would not harm other industries.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

Advocating for Agriculture—Anytime

Pennsylvania Farm Bureau members had the chance to interact with members of Congress during the National Legislative Conference—a yearly event for members to advocate for critical agriculture issues. Visits in Washington D.C. are a valuable part of spreading the word about agriculture and advocating for the key issues farmers are facing on the national stage. But that conversation in Washington D.C. shouldn't be the only time that farmers interact with lawmakers. In fact, one of the best ways to advocate for agriculture is on social media—using platforms like Facebook and Twitter.

That was the message of Pennsylvania Farm Bureau President Rick Ebert, speaking to more than 50 farmers who came to Washington D.C. for the National Legislative Conference. Using social media to discuss agriculture's key issues will also help the public gain a broader understanding of agriculture, Ebert said.

"We can't assume that elected officials, the media, or even the public understands what we do every day," Ebert said. "They may have no idea why complex issues like immigration reform, or GMOs, matter to us, and why it matters to the general public."

Facebook and Twitter are key ways that farmers can engage with the general public and showcase the realities of modern farming. Conversations about food and farming will occur on social media, whether or not farmers are online.

Social media gives farmers a way to respond to misinformation with facts, and concrete examples of what happens on a farm, Ebert said. The technology behind farming has changed drastically in a generation, and farmers have adapted at every turn, so farmers should also be willing to embrace these new communications tools, Ebert said.

Ebert encouraged county Farm Bureaus to use Facebook and Twitter to put a positive face to agriculture.

American Farm Bureau President Bob Stallman, addressing PFB members gathered for the National Legislative Conference, said Farm Bureau will be supporting a national bill that would prevent a patchwork of state laws on GMO labelling. The Farm Bureau-supported bill would establish national science-based standards and provide the Federal Food and Drug Administration with the oversight for developing rules.

Stallman thanked Farm Bureau members for their advocacy last year on the "waters of the U.S." rule, where the Environmental Protection Agency and the Army Corps of Engineers proposed expanding their authority under the Clean Water Act. Farm Bureau will continue to need its members to speak up on this issue—including contacting their federal representatives, Stallman said.

"Members of Congress listen to their own constituents. No other organization has the reach that we have across every county, or the engaged grassroots membership that we have," Stallman said.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, April 2015.

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State News Briefs (continued from page 6)

Bill Seeks to Clarify and Broaden Inheritance Tax Exemption for Family Farm Businesses

With the strong support of Pennsylvania Farm Bureau, the General Assembly took a major step in 2012 to pass legislation exempting farm families from onerous inheritance tax burdens when passing the farm business to succeeding family members. But technical interpretations by state agencies made since the law passed have limited the opportunity for farm families to benefit from the tax exemption. The family farm exemption only applies when the farm is passed from person to person, and not when the farm is passed by or through a legal entity, such as a corporation, limited liability company or trust that the family has created to manage family succession of the farm business.

Sen. John Gordner, who is the Senate majority whip, has introduced legislation to broaden the types of farms that are eligible for the exemption, including those operated as part of an LLC, or trust. Pennsylvania Farm Bureau played a key role in drafting the legislation.

“We believe the language proposed in the legislation will more clearly identify the broader scope of family farm inheritance tax exemption intended by legislature in 2012,” said John Bell, PFB’s Government Affairs Counsel. “Families who have made real plans for succession of the family farm business should not be excluded from the exemption, just because they use some legal means like a family corporation or trust to do it. The tax burdens and consequences these families face in passing their farms to the next generation are just as challenging.”

Senate Bill 580 was assigned to the Senate Finance Committee. Pennsylvania Farm Bureau will work with lawmakers to achieve passage of the bill.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, April 2015.*

PVGA Funds... (continued from page 2)

- Describe the impact of new wavelength-selective and diffusive plastic films on a) the microclimate, including temperature, light intensity, and light quality, b) plant growth, and c) important diseases and insect pests in diverse types of protective structures using conventional and novel (patent-pending) approaches.
- Assess constraints to recycling and promote options for minimizing the negative environmental impacts of using plastic coverings.
- Determine the economic viability of use of various protective structures, plastics, and systems for commercial production.
- Develop diverse outreach vehicles to ensure that all generated information reaches stakeholders and the research and extension community.

The PVGA Board of Directors has committed to providing \$8,000 annually for five years to this \$400,000 grant from the Specialty Crops Research Initiative which required matching funds from the berry industry stakeholders. This is the first year of the project.

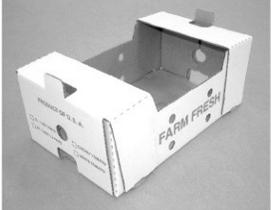
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NEWS

Deer Seasons and License Allocations Set

The Board of Game Commissioners adopted a slate of deer seasons for 2015-16, giving final approval to a split, five-day antlered deer season (Nov. 30 - Dec. 4) and seven-day concurrent season (Dec. 5 - 12) in 18 Wildlife Management Units. The list includes (WMUs) 1A, 1B, 2A, 2C, 2D, 2E, 2F, 2G, 2H, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D and 4E. The package also retains the two-week (Nov. 30 - Dec. 12) concurrent, antlered and antlerless deer season in WMUs 2B, 5A, 5B, 5C and 5D.

Hunters with Deer Management Assistance Program (DMAP) antlerless deer permits may use the permits on the lands for which they were issued during any established deer season, and will continue to be permitted to harvest antlerless deer from Nov. 30 - Dec. 12 in 1A, 1B, 2A, 2C, 2D, 2E, 2F, 2G, 2H, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D and 4E. Fees for DMAP permits are \$10.70 for residents and \$35.70 for nonresidents.

DMAP permits also may be transferred to Mentored Hunting Program participants.

The board retained antler restrictions in place for adult and senior license holders. The restrictions remain as "three-up" on one side, not counting a brow tine, for the western Wildlife Management Units of 1A, 1B, 2A, 2B and 2D, and the three points on one side in all other WMUs. Those exempt from these antler restrictions are mentored youth hunters, junior license holders, disabled hunters with a permit to use a vehicle as a blind and resident active duty military on leave.

Another deer-season change to gain final approval applies to Wildlife Management Units 2B, 5C and 5D, where the archery season has traditionally opened early, with the first weeks being open to antlerless deer hunting only.

The commissioners gave final approval to concurrent hunting of antlered and antlerless deer in WMUs 2B, 5C and 5D during all seasons, with the first segment of the archery season to run from Sept. 19 to Nov. 28 in those WMUs.

The board voted to allocate 746,500 antlerless deer licenses statewide. Allocations by Wildlife Management Unit (WMU) are as follows, with the allocation from the previous license year appearing in parentheses: WMU 1A 46,000 (47,000); WMU 1B 29,000 (30,000); WMU 2A 43,000 (46,000); WMU 2B 61,000 (60,000); WMU 2C 31,000 (38,000); WMU 2D 55,000 (61,000); WMU 2E 21,000 (21,000); WMU 2F 22,000 (27,000); WMU 2G 22,000 (22,000); WMU 2H 6,500 (5,500); WMU 3A 19,000 (18,000); WMU 3B 28,000 (33,000); WMU 3C 36,000 (32,000); WMU 3D 25,000 (25,000); WMU 4A 30,000 (28,000); WMU 4B 26,000 (26,000); WMU 4C 25,000 (25,000); WMU 4D 33,000 (33,000); WMU 4E 25,000 (21,000); WMU 5A 19,000 (19,000); WMU 5B 50,000 (49,000); WMU 5C 70,000 (95,000); and WMU 5D 24,000 (18,000).

USDA Reminds Farmers to Certify Conservation Compliance by June 1 Deadline

The U.S. Department of Agriculture (USDA) reminds farmers that the 2014 Farm Bill requires producers to file a Highly Erodible Land Conservation and Wetland Conservation Certification form (AD-1026) with their local USDA service center by June 1, 2015, in order to become or remain eligible for crop insurance premium support.

Most farmers already have a certification form on file since it's required for participation in most USDA programs such as marketing assistance loans, farm storage facility loans and disaster assistance. However farmers, such as specialty crop growers who receive federal crop insurance premium support, but may not participate in other USDA programs, also must now file a certification form to maintain their crop insurance premium support.

"USDA employees are working very hard to get the word out about this new Farm Bill provision," said Agriculture Secretary Tom Vilsack. "While many producers will not need to take action, we want to help make sure that those who are required to act do so by the June 1 deadline. We want all eligible producers to be able to maintain their ability to protect their operations with affordable insurance."

Producers should visit their local USDA service center and talk with their crop insurance agent before the June 1, 2015, deadline to ask questions, get additional information or learn more about conservation compliance procedures. Producers that file their form by the deadline will be eligible for federal crop insurance premium support during the 2016 reinsurance year, which begins July, 1, 2015. USDA will publish a rule outlining the linkage of conservation compliance with federal crop insurance premium support. Go to <http://go.usa.gov/3WY5J> to view a copy of the rule.

The Highly Erodible Land Conservation and Wetland Conservation Certification form is available at local USDA service center or online at www.fsa.usda.gov/AD1026form. When a farmer completes this form, USDA Farm Service Agency and Natural Resources Conservation Service staff will outline any additional actions that may be required for compliance with highly erodible land and wetland provisions. USDA's Risk Management Agency, through the Federal Crop Insurance Corporation, manages the federal crop insurance program that provides the modern farm safety net for America's farmers and ranchers.

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USDA Announces Record Number of Organic Producers

The U.S. Department of Agriculture (USDA) announced that the organic industry continues to show remarkable growth domestically and globally, with 19,474 certified organic operations in the United States and a total of 27,814 certified organic operations around the world.

According to data released by the Agricultural Marketing Service's (AMS) National Organic Program (NOP), the number of domestic certified organic operations increased by more than 5 percent over the last year. Since the count began in 2002, the number of domestic organic operations has increased by over 250 percent. The certified operations list is available at apps.ams.usda.gov/nop.

"As demand for organic products continues to soar, more and more producers are entering the organic market," said Agriculture Secretary Tom Vilsack. "USDA tools and resources have created opportunities for organic farmers and more options for organic consumers. Growing demand for organic goods can be especially helpful to smaller family operations. The more diverse type of operations and the more growing market sectors we have in American agriculture, the better off our country's rural economy will be."

USDA is committed to connecting organic farmers and businesses with resources to ensure the continued growth of the organic industry. Along with programs to support conservation, provide access to loans and grants, fund organic research and education, and integrated pest management, USDA administers organic certification cost share programs to offset the costs of organic certification for U.S. producers and handlers nationwide.

Now, USDA is using funding from the 2014 Farm Bill to develop the Organic Integrity Database, a modernized certified organic operations database that will provide accurate information about all certified operations that is updated on a regular basis. The modernized system will allow anyone to confirm organic certification status using the online tool, support market research and supply chain connections, allow international verification of operator status to streamline import and export certificates, and establish technology connections with certifiers to provide more accurate and timely data. The initial launch is planned for September 2015.

Additional information about USDA resources and support for the organic sector is available on the USDA Organics Resource page at www.usda.gov/organic.



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Saylor Proposes Property Tax Bill

Pennsylvania's House of Representatives is soon expected to consider legislation, providing dollar for dollar property tax relief for all home and land owners across the state. While Governor Wolf's property tax proposal only benefits homestead and farmstead properties (not the farmland itself), House Bill 860 — introduced by Representative Stan Saylor — would provide relief for all landowners.

HB 860 would reduce property taxes by increasing the personal income tax rate (by .63% to a total rate of 3.7%) and the state sales tax (by 1% to a total rate of 7%), with no expansion of items to be taxed. Also, unlike the Governor's proposal, every dollar raised by the increased sales and personal income tax rates contained in House Bill 860 will be used for property tax relief and not to fund other programs or initiatives.

Under HB 860, revenues generated by the personal income tax increase will be applied to a reduction in the millage rate of all land in the local school district. Sales tax revenues will apply to homestead and farmstead exemption rates in the local school district. And school districts would be required to reduce property tax rates equal to the revenues received through the Millage Rate Reduction Fund and Homestead/Farmstead Relief Fund established in HB 860.

Each school district would receive revenue allocations from both the Millage Rate Reduction Fund and Homestead/Farmstead Relief Fund based on the local district's comparative share of total property taxes to total assessment values (equalized millage) with other districts. Equalized millage is derived from the calculation of dividing the total local school district taxes collected by the local school district's total market value, which is then certified by the Pennsylvania State Tax Equalization Board. Again, allocations to each local school district will be made based upon the district's comparison of equalized millage rate with all others.

While the total elimination of school property taxes would be preferable, the Saylor proposal is a viable approach in advancing the state towards that goal. Legislators need to hear from growers and other voters who support this reform of the school property tax system.

Price of Food?

John Berry

Does anyone remember just a couple short years past when we were hearing so much about how the ethanol industry was causing a shortage of food? Food prices were up because farmers would rather make fuel than feed the hungry of the world was often the cry.

Have you heard anything lately about the cost of food going down? If the above logic is solid; we should.

When the alarm went up a couple years ago corn was trading at roughly \$6.00. Corn is now trading at roughly \$3.40. Wouldn't this lower corn price make the cost of food go down?

My response is; of course not. But then, I disagreed with the high-food-cost argument in the first place. The cost of food at the grocery store or your favorite restaurant has very little to do with what price the farmer is receiving. As an example, there is about 8 cents worth of wheat in a loaf of bread. How much are you paying for bread? If the cost of wheat in my bread doubled to 16 cents there would be no end to conversations on how high bread prices were going. Really? Because of 8 additional cents to a farmer?

The cost of food is more closely related to the cost of labor to transport, process, package, market and distribute than to the cost of the raw product. The cost of food is more closely related to the cost of energy to process, package and distribute throughout the food system. Taxes, regulatory compliance, insurance, so on and so on have every bit as much, if not more, to do with how much our groceries cost than what farmers get for providing the raw products in the first place.

Going back to the corn example we started with; 2012 was a drought year in the major corn growing region of the U.S. This caused a shortage of corn at a time when ethanol, China, and the U.S. was increasing demand for corn, which raised the cost of corn in the market. At the same time of supposed high food prices, the U.S. actually wasted over 45% of the food we grew. Food was wasted through damage from handling between the farm and our table and improper storage and preparation. Most importantly, we wasted this food when we threw it out because we were full or didn't like the way it looked.

Two years following the 2012 drought in the Midwest, U.S. farmers are right now in the midst of what is expected to be a

(continued on page 12)

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Reducing Risks from Animals and Manure

Tianna DuPont and Luke LaBorde

Recognize the risks associated with animals and animal manure and learn tips on how to reduce farm food safety risks.



Don't allow your pets in the produce field.

Animal manure is a significant source of human pathogens. Dangerous pathogens such as *E. coli* O157:H7, *Listeria*, and *Cryptosporidium* are found in cattle, sheep, and deer feces. Droppings from poultry, wild birds, and even pets are a potential source of Salmonella bacteria. When raw manure is not handled and applied correctly or if wild or domestic animals have access to growing areas, your produce could be contaminated.

For example, in 2011 in Oregon 15 people became ill and one died from eating strawberries grown in a field where deer feces were found. During the investigation, public health officials found the same strain of *E. coli* O157:H7 in deer feces on the suspected farm as was found in people who were sick. In the Colorado-grown cantaloupe outbreak of *Listeria* that killed 34 people, one of the possible sources of contamination was a truck parked next to the packing facility that was used to haul culled cantaloupe to a cattle feeding operation.

Wild and Domestic Animals

It is not possible to exclude all animal life from fresh produce growing areas. But it is important that you consider the risks and set up procedures to limit potential contamination.

Have a written plan and take measures to limit wild/domestic animal access to production fields.

Do not locate production areas adjacent to dairy, livestock,

Fence in livestock to exclude them from fresh produce fields.

If using working animals, confine them to lanes outside growing areas close to harvest. Have procedures in place to remove and dispose of droppings.

Make sure workers in animal holding areas check their shoes for contamination before entering fruit and vegetable fields.

Monitor for signs of animal entry such as the presence of feces, damage to the crop, or evidence of deer trails in or around fields.

(continued on page 12)

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Reducing Risks... (continued from page 11)

Have procedures in place to limit entry of animals into production areas.

If wild animal populations become excessive, consider using streamers, spinners, plastic owl and snake models, netting, chemical repellents, or air cannons to discourage them from entering fields.

Manure Storage

Many produce growers also raise livestock. Animal manure should be stored in a manner that will prevent it from contacting fresh produce.

Locate manure storage and treatment sites as far away as practical from fresh produce growing and handling areas.

Locate manure storage where wind or rain will not readily transport pathogens into produce fields, packhouses, or water sources.

Cover stock piles with tarps, use dry stack systems with concrete floors, or use properly constructed liquid manure storage to reduce and contain runoff.

Keep manure runoff out of surface waters by planting vegetative buffers or constructing soil diversion berms.

Prevent manure from leaching into groundwater systems by maintaining at least a 100-foot radius between storage sites and wells.



To limit risk from wildlife, every day before the crew arrives, one Pennsylvania farmer takes a drive on the tractor to inspect the field. He looks for signs of deer grazing or tracks, and records any signs. If he sees any animal feces or other obvious animal activity, he flags the area five feet in each direction. The crew knows from their operating procedures not to harvest in flagged areas.

Animal Manure as a Soil Supplement

Raw and composted animal manure is a valuable soil conditioner and source of nutrients. However, the shorter the time between raw manure application and harvest, the greater the risk of pathogens being present in the soil at the time of harvest.

Do not apply raw manure on fresh produce fields during or immediately preceding the growing season. Never sidedress produce crops using raw manure.

Never apply raw or farm-composted human feces to produce fields.

Maximize the time between application of manure to production areas and harvest.

If raw manure is applied, it should be incorporated at least two weeks prior to planting or a minimum of 120 days prior to harvest.

Incorporate manure into the soil as soon as possible. Soil microorganisms can reduce pathogens.

Consider treatment of manure by composting in order to reduce potential pathogens. To reduce pathogen loads, maintain compost at high temperatures with good aeration, moisture, and mixing. The pile internal temperature must be maintained at 131 to 170°F for three days using an in-vessel or static-aerated pile system, or 15 days if using a windrow. When using a windrow composting system, the materials must also be turned a minimum of five times in the 15-day period.

Properly store compost to minimize recontamination from fresh manure and bird droppings by tarping, using buffer zones, etc.

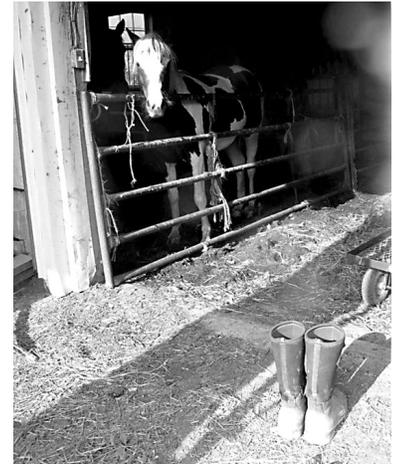
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Prepared by the Penn State Extension Farm Food Safety team; Tianna DuPont, Penn State Extension; and Luke LaBorde, Penn State Department of Food Science. Reviewed by Lee Stivers and Thomas Ford, Penn State Extension. From the Vegetable. Small Fruit and Mushroom News, Penn State Extension, <http://extension.psu.edu/vegetable-fruit>, April 20, 2015.



An example of a good practice to limit potential hazards from manure is to designate a pair of boots for use in the barn and change your shoes before going in to the field or packhouse.

Price of Food? (continued from page 10)

historical record corn harvest. The corn prices farmers are experiencing today are at such a low level, we did not even consider them possible not very long ago. Watch the cost of food!

The bottom line for me centers on the abundance of food in the U.S. food system, and the relatively low price we pay for whatever our food choices might be. Of course, some of us have the ability to pay and some of us do not. Just try to remember that on average the food we eat is the least expensive and safest of any country in the world.

Mr. Berry is with Penn State Extension in Lehigh County.

PA Preferred Member – A+ Produce

A young Avery Oprey enjoyed experiencing periodic escapes from the “city life” to his grandparents’ farm in Pitman, Pennsylvania. He initially went to college for business-to-business sales, but shortly after, realized his entrepreneurial spirit and his love for farming. This led him to seek work in the agricultural industry. He found a job at Red Earth farm, a CSA in Orwigsburg, Pennsylvania.

Avery was inspired by his grandfather’s love for farming, as well as the business structure at Red Earth Farm, and was able to incorporate what he learned into his own business. With the help of his partner, Amber, A+ Produce has been an operating farm for three years.

“The name A+ Produce is not only a play on words (Avery and Amber), but also refers to the quality of the produce,” said Avery.

All operations on the farm are done by hand and without the use of tractors.

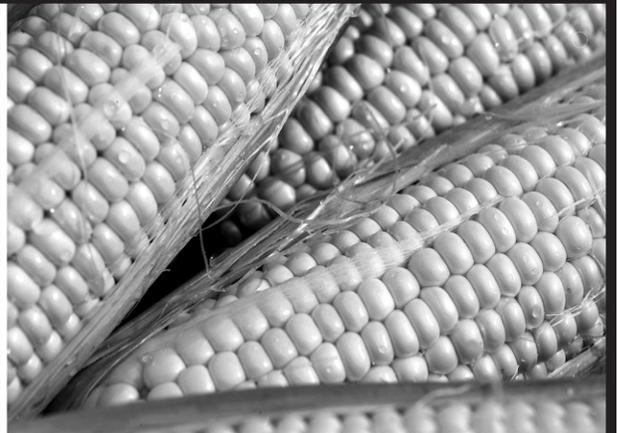
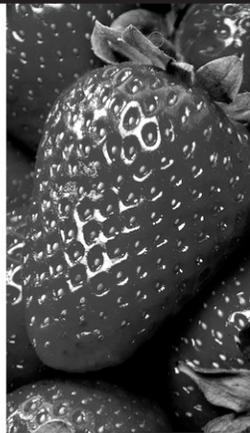
A+ Produce is a CSA farm located in Pitman, the same rural community as Avery’s grandparents’ farm. Avery and Amber enjoy being a CSA farm because it allows them to create strong relationships with consumers as well as inform them about where their food is coming from. Members of the community are also welcomed to participate in farm activities.



A+ Produce has hopes of becoming a completely self-sustainable, fully-functioning farm.

“Moving forward, we would like to keep our CSA at a manageable and personable level, never exceeding 50 members,” said Avery. “We always want to maintain a first name basis with our customers, and make them feel a connection with their farmer and food.”

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GENERAL

Who Are the High Tunnel Growers in Philadelphia?

Thomas McCann

Chapter 2 – Guildhouse West

This article is the second in our series, 'Who are the High Tunnel Growers in Philadelphia' where we focus on Guildhouse West. They are an apartment complex for low-income seniors in North Philadelphia, and are providing innovative solutions for community building, site management and hyper-local nutritious produce.



Guildhouse West High Tunnel during construction.

Guildhouse West is a low-income senior housing facility located in North Philadelphia, approximately 15 blocks from the center of town, at the corner of 12th and Fairmount Avenue. This property is the size of a city block, with a large building, parking, outdoor seating and a large amount of open lawn. They currently house approximately 170 residence in 155 units. What is amazing, however, is that while also maintaining a facility, they are also producing food.

Guildhouse West has been around for over 30 years, and their community garden started at the same time. This garden had to be relocated 15 years ago due to building expansion, but is still going strong. During 2008, a management decision was made to take the funding that HUD (Department of Housing and Urban Development) provides for property maintenance, and turn that into an in-house position. The property manager, Rania Campbell-Cobb, along with her duties of maintenance, also developed an urban farm on the site.

The urban farming area, separate to the community garden, is currently about 1/2 acre in size and consists of approximately 25 raised beds. In 2014 Penn State Extension helped Guildhouse West with the support of a 20' x 60' High Tunnel in an effort to increase their capacity and provide season extension. Guildhouse West has an on-site food pantry, and most of the produce generated from the farm currently goes into it.

Like many organizations and non-profits, partnership is key to their success. To improve their ability to produce food and provide for their residents, Guildhouse West has partnered with two organizations, Greener Partners (<http://greenerpartners.org/>) and Cloud 9. Greener Partners are a farm based non-profit located outside Philadelphia, who are looking to increase their mission of providing local produce to everyone. Cloud 9 has a similar mission, and is utilizing rooftop agriculture as a way of increasing production in urban situations.

Something very special is in progress at Guildhouse West too, that we definitely want to draw attention. They have always been interested in engaging their residents in the urban farm and the community garden, but unfortunately the two spaces

are divided by the new building extension. The other constraint is access for individuals with special needs including wheelchairs, impaired walking, and impaired vision, among other disabilities, and accommodating their needs in a safe and inclusive manor.

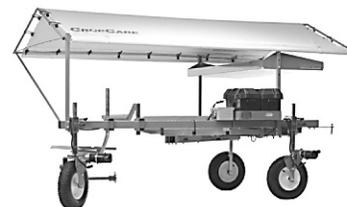
The high tunnel sponsored by Penn State Extension has just been complete, and they are in the planning process for how to best utilize the new space. A decision has been made between Guildhouse West, Greener Partners and Cloud 9 to put infrastructure in the tunnel to allow for disabled access for residents. This includes a ramp from the parking lot to the tunnel, a paved surface inside and raised beds for both wheelchair

(continued on page 31)

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Alternative Cropping Systems for High Tunnels

Steven Bogash

The controlled environment and season extension characteristics of high tunnels open up all kinds of opportunities for growers seeking to explore alternative production systems.

Growing tomatoes generates the greatest revenue per square foot and the quality of tomatoes produced in a high tunnel can be far superior to field grown fruit. However, the increasing numbers of tunnels and early tomatoes will likely reduce the current premium on early tomatoes. Growers should look at diversification to provide a wider range of product offerings and perhaps even give tunnel soils a break from tomato crop after tomato crop. Here are a few ideas that have either worked for some growers or appear to have promise.

The controlled environment and season extension characteristics of high tunnels open up all kinds of opportunities for growers seeking to explore alternative production systems. The sheer economic potential of tomatoes makes them the primary high tunnel crop for commercial growers. High tunnel tomatoes are often superior to field grown fruit and generate more revenue per square foot than field grown tomatoes.

Unfortunately, the constant production of tomatoes in high tunnels (with no rotation) has led to increased incidences of soil borne pathogens like verticillium and fusarium wilt. As a result, growers have been forced to move to grafted plants in order to maintain consistent production in these high tunnels. In addition, the ever increasing number of high tunnels and early tomatoes entering the market will likely reduce the current premium on early tomatoes. Entrepreneurial growers should look at diversification to provide a wider range of product offerings and

to perhaps even give tunnel soils a break from tomato crop after tomato crop. Here are a few ideas that have either worked for some growers or appear to have promise.

Early Tomatoes Replanted - By planting tomatoes in a heated tunnel, growers in the Mid-Atlantic can install tomato transplants by early to Mid-April (or even earlier) and be harvesting by early June or earlier. If using an early fruiting, determinate variety such as Primo Red, there is the opportunity to remove the initial planting and replant in Mid-July with a variety such as Charger or Finishline for a September, October, November harvest. Indeterminate varieties such as Big Dena work well in an all season system. However, determinate varieties are often looking pretty poor by late summer. Replacing the plants in mid-July provides for fresh plants to carry into the fall while field produced tomatoes are in good supply. Replacement transplants will need to be started in early June for this system. Due to variations in varieties sensitivity to day length, not all tomato varieties will work when mid-summer planted.

Early Tomatoes Replaced with Parthenocarpic Cucumbers - This variation on the system noted above simply replaces the early tomatoes with parthenocarpic cucumbers in mid-July. Since the cucumbers develop so quickly as compared to tomatoes, this plant flip can be delayed until late-July or early August while still yielding a substantial crop. Plants and stakes will need to be removed, but drip tape and plastic mulch can be reused. We've had excellent success with cucumbers when planted in

(continued on page 18)

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VEGETABLE PRODUCTION

Alternative Cropping... (continued from page 15)

the mid to late summer period with harvest occurring into late October in an unheated tunnel. With a bit of heat, there is the strong possibility to carry summer planted cucumbers into mid-November or later. Consider varieties such as Corinto, Lisboa, Picolino, Katrina or Socrates. Plan ahead to manage powdery mildew and botrytis. Cucumbers develop very quickly so this is a very fast turnaround crop to maintain cash flow. Direct plant cucumber seeds 6" apart and train vertically using vine clips and heavy tomato twine. By screening the tunnel with regular window screening, you can prevent cucumber beetles and have higher quality cucumbers by keeping pollinators away.

Bell Peppers - Green then colored: Two of the challenges with bell peppers are the very low prices during the summer glut of green field bells and the high losses in the field if fruit are left hanging long enough to color fully. Growing bell peppers in a high tunnel beats both of these problems. Green bells will be in full harvest 4-6 weeks prior to field bells and the typical 80-90% packing losses for bells left to color in the field can be reversed to where growers can pack 90% or better of red, yellow or orange peppers from a tunnel. Consider dividing production so that a portion of the plants are harvested as green bells as early as possible while allowing others to hang until fully colored. Then when field green bells begin to show up and prices drop, stop picking them in the tunnel and allow them to color completely. Be proactive in managing our latest bell pepper pest, Broad mites. This pest appears to be gaining ground rapidly and can decimate pepper plants and fruit.

Early Tomatoes then Greens into Fall - Take advantage of the higher prices for early season tomatoes, then flip production to produce greens when the prices for tomatoes start to dip. One of the challenges with replanting tomatoes mid-summer is that you'll probably be removing plants with lots of potentially marketable fruit. If replanting the tunnel with greens instead of tomatoes, you can delay the replant for several weeks and potentially have greens to sell all winter. Transplants can go into the same plastic that the tomatoes came out of or plant into flats filled with potting media that are installed over the beds propped up on concrete blocks for easier harvesting.

Succession Plantings of Parthenocarpic Cucumbers - The quality of cucumbers that come out of high tunnels can be extraordinary as compared to field grown. Once your markets get used to these beautiful cukes, it may be hard for them to accept field grown. Rather than planting an entire tunnel at the same time, consider planting in flights every 2-3 weeks, so that there are always young plants coming into harvest all season. So long as no soil-borne diseases crop up, there is no reason not to remove and replace plants as they senesce naturally during the season. Experience at the Penn State Southeast Agriculture Research and Extension Center (SEAREC / Landisville Farm) over the past three years has shown us that cucumber vines start to naturally senesce after 5-6 weeks of

harvesting. We grew the cucumbers in #2000 (3.6 gallon) nursery pots with two plants per pot. As the vines started to collapse, we simply removed the plant roots and all, topped off the pot with fresh potting media, direct seeded and were back in production in 40-45 days.

Day Neutral Strawberries - By tunnel growing day neutral strawberries, harvest can begin well ahead of the June field season, continue slowly all summer, then rebound in the fall. Consider planting into containers using a high percentage coir potting media or coir planting strips on stepped benches to make the best use of space and reduce stoop labor. Monitor nutrients carefully as coir planted berries will often be calcium challenged. When using any media other than soil, the system is a variation on hydroponic production, so the crop is completely dependent on proper fertigation. Scout often for Spotted Wing Drosophila (SWD) and mites.

This list is far from comprehensive, but will hopefully serve to make some high tunnel growers think about alternative high tunnel production opportunities. Before leaping into a new production system, consider all the alternatives, use the best numbers available to evaluate the potential for revenue, start small, then let me know what's worked for you.

Mr. Bogash is with Penn State Extension. From the Vegetable, Small Fruit and Mushroom News, Penn State Extension, <http://extension.psu.edu/vegetable-fruit>, April 5, 2015.



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Pollinator Declines

Tianna DuPont, Christine Grozinger and Shelby Fleischer

Domestic honey bees hives are down by 59% compared to 60 years ago with rapid declines over the last forty years. This long term decline was punctuated by recent average losses of 30% per winter since 2006. The populations of some native bee species may also be declining.



Photo by Alex Wild

Varroa mite parasitizing bee. Thought to be one of the major factors contributing to hive losses. Photo Alex Wild.

Researchers believe that long term honey bee declines are a result of a complex set of factors. The primary suspects are:

- poor nutrition
- pesticides
- pathogens/ parasites
- poor quality genetic stock

Pollinators became a hot topic when thousands of hives in the US were found strangely empty starting in 2006. Since then, nationwide surveys have found that beekeepers lose approximately one third of their colonies each winter. The losses in 2006 were attributed to "Colony Collapse Disorder," where collapsed colonies still had a queen and some young bees, but most of the adult bee population disappeared [17]. Since 2006, colonies losses have continued, but beekeepers have attributed these losses to factors other than Colony Collapse Disorder. However, the outbreak of Colony Collapse Disorder in 2006 served to bring international attention to long term, pervasive declines in honey bees and other pollinators.

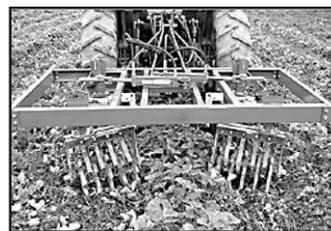
Nutrition

Poor nutrition is thought to be a major factor leading to colony losses. Poor nutrition can be due to over-crowding honey bee colonies, using bees to pollinate crops that have low nutritional value, low nutritional value of food packets commercial beekeepers use inside hives during transport, and reduced abundance of flowering plant species (the bee's only natural source of food). Poor diet can also make bees susceptible to parasites and pathogens. Bees need high quality, abundant forage from diverse flowering plants.

Not surprisingly diet is important for bees, just like it is for us. Bees get their sugars from nectar, and their protein, fats and micronutrients from pollen. In order to balance their diets, most bee species need to gather pollen and nectar from a diverse range of flowers. When bees have a simple diet of just one type of pollen and nectar, they don't get all the vitamins, amino acids, fats, and antioxidants they need. Just like carotenoids, flavanoids, and alkaloids support healthy humans, researchers are finding that diverse diets support healthier bees [18-20].

(continued on page 20)

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VEGETABLE PRODUCTION

Pollinator Declines...*(continued from page 19)*

When bees don't have sufficient forage, enough diversity, or high enough quality food sources, they are more susceptible to pathogens like *Nosema* (a gut parasite that causes dysentery), viruses and other parasites [18, 21]. When bee nutrition is low bees don't live as long. That can be a matter of life or death for the whole hive. A hive needs a sufficient number of bees to keep the hive warm all winter: when temperatures drop, the honey bees form a cluster that "shivers" to keep itself warm. If the population of winter bees is too low, they are unable to stay warm enough to survive the harsh winter months.

Parasites and Pests

Imagine having a parasite the size of a dinner plate attached to your back sucking your blood. That is a little like what honey bees are dealing with when they are attacked by the varroa mite. The small hive beetle, the parasitic phorid fly, and tracheal mites are all also attacking honey bees. These parasites directly impact honey bee health, sapping their strength. They also interfere with honey bee immune systems and 'social immunity' behaviors. One study weighing the importance of 55 risk factors possibly involved in colony collapse disorder (CCD) found that aggressive mite control (indicated by presence of coumaphos miticide added by beekeepers in the hive) was the greatest indicator of healthy hives, though many other factors were involved [22]. Several other studies showed that high varroa mite levels are the number one factor linked to winter losses of honey bee colonies, and treatments with miticides can improve survival rates[23-26].

In order to understand how parasites are impacting pollinators it is important to understand how bee immune systems work. First consider your own immune system. Humans have white blood cells and antibodies which attack foreign invaders as well as defense mechanisms including gut environments hostile to pathogens. Bees have a somewhat parallel immune response [27]. They also have 'social immunity' as they work together to keep the hive healthy. For example, bees can show "hygienic behavior", where workers will locate and remove infested or diseased larvae and pupae. Honeybees secrete antimicrobial substances reducing the growth of pathogens in the colonies and raise their young in individual cells with strongly antimicrobial food sources (e.g. royal jelly). Another social immune response is an artificial 'fever' created in response to chalkbrood fungal infections, where bees will cluster and vibrate their muscles to raise the temperature high enough to kill the chalkbrood microbes. Honey bees also groom each other removing parasites.

Parasites often disrupt these hygienic behaviors. For example, when infected with mites, bees produce less of an enzyme, glucose oxidase, they usually secrete into food to sterilize it before feeding it to larvae. As a result young brood may be exposed to higher levels of microbes. Parts of the bee's individual immune systems also start to break down. Mite infected bees may produce less of the enzymes used to kill foreign invaders (think white blood cell like reactions) [28]. Mites can transmit viruses and immunosuppress bees, so mite-infected bees often have incredibly high levels of viruses.

Pathogens

Honey bees are battling a number of new and common pathogens. American foulbrood bacteria is notorious and easily recognized by the slimy goo that strings out of the cells when

beekeepers disturb a cell while checking the hive. This bacterium spreads quickly through the hive, infecting larvae. European foulbrood bacteria, chalkbrood fungi and *Nosema* gut parasites all attack our bees, possibly including some new species or strains of *Nosema*. Finally, bees have more than 20 types of viruses that have been identified so far.

Many of the major problematic viruses that affect bees are the ssRNA viruses, distant relatives of polio and foot and mouth disease. After Varroa, viruses are the second factor that has been linked to colony losses in the winter [25, 29]. Viruses can cause muscle spasms, impair learning, and lead to early death. Also, these honey bee viruses can get transmitted to other bee species that forage on the same plants. We still don't fully know how these viruses affect other bee species, but there have been some studies with solitary bees. Solitary bees generally go into a hibernation-like state called diapause where their reduced metabolism helps them live through the winter. However, RNA virus infected bees don't go into diapause. Their metabolism stays normal and they don't live through the winter.

The interaction of viruses and other stressors including nutrition and immune compromise from pesticide toxin exposure may be multiplying the severity of the problem. Penn State's Dr. Cox-Foster explains how this happens with the analogous example of polio on the human population. When polio was widespread, only 1.5% of the infected population actually had the severe symptoms of the disease. Symptomatic individuals often had low nutrition. Similarly, bees might only show severe symptoms and death from ssRNA viruses when their immune systems are compromised due to low nutrition.

Poor Quality Genetic Stock

Honey bee stocks can vary greatly. Some colonies are more aggressive than others, some are better at performing hygienic behavior, and some have lower levels of Varroa mites. There has long been an interest by beekeepers and researchers to try to "breed a better bee" that is more resistant to diseases and more productive. Several lines of bees that are more resistant to Varroa are commercially available, including the "Varroa Sensitive Hygiene" stock bred by the USDA,

(continued on page 25)



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2015 Selected Vegetable Fungicide Updates

Kate Everts

The following is a brief overview of some of the changes and updates to the Commercial Vegetable Recommendation Guide (CVRG) by the extension plant pathology team for 2015. Some additions to CVRG represent newly registered products and others were added because recent trial data indicated that they were effective. This summary is not comprehensive, please review the CVRG for additional recommendations. Also there are many other products that have been in the CVRG for many years and are still effective. Remember to follow all label safety guidelines, rates, resistance management guidelines, and tank mix incompatibilities

Beans (snap and lima)

Ranman and Omega are included in the CVRG for lima bean downy mildew.

Ranman has been added for cottony leak.

Quilt Xcel and Azoxystrobin are recommended for anthracnose, web blight, and common snap bean rust.

Azoxystrobin is recommended for root rot and Southern blight.

Blocker 4F is recommended for Alternaria root/stem rot.

Cucurbits (squash, muskmelon, pumpkin, watermelon, cucumber)

Fontelis is recommended for gummy stem blight, powdery mildew, Sclerotinia stem rot.

Luna Experience and Proline are recommended for gummy stem blight and powdery mildew on watermelon.

Proline has been added to the recommendation to manage Fusarium wilt in muskmelon and watermelon.

Uniform is recommended for damping off on all above listed cucurbits.

Forum is recommended for downy mildew on pumpkin.

Tomato

Inspire Super is included in the recommendations for foliar pathogens (Septoria leaf spot, early blight) and fruit rots (early blight, anthracnose).

Inspire Super was added for control of powdery mildew.

Blocker 4F is now recommended for Southern blight.

Lettuce

Fontelis and Merivon are recommended for leaf spots (Septoria, Cercospora and anthracnose.)

Merivon is added for suppression of gray mold.

Sweet Corn

Prosaro, and Aproach are recommended for leaf spots and blights plus rust.

Pepper

Azoxystrobin is recommended for Southern blight and damping-off.

Blocker 4F is recommended for Southern blight.

Spinach

Pristine and Merivon are now recommended for leaf spot and anthracnose.

Dr. Everts is the Vegetable Pathologist at the Univ. of Delaware and the Univ. of Maryland. From the Weekly Crop Update, Univ. of Delaware, Vol. 23, No. 1, March 6, 2015.

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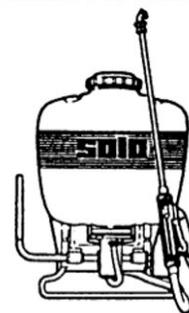
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VEGETABLE PRODUCTION

Soil Health and Vegetable Production

Gordon Johnson

With the current emphasis on soil health, the NRCS soil health initiative and the continuing interest in soil health from vegetable growers, the following is a reprint of a 2009 Weekly Crop Update article on the subject.

Experienced growers and crop advisors know that one of the keys to vegetable productivity is a healthy soil. According to the Cornell Soil Health Group, "Soil health describes the capacity of a soil to be used productively without adversely affecting its future productivity, the ecosystem or the environment." "Soil health emphasizes the integration of biological with chemical and physical measures of soil quality that affect farmers' profits and the environment."

From a biological standpoint, soil health relates directly to the root environment and organisms that inhabit the soil. A healthy soil for vegetables will be one that has few limits to root growth; supports high numbers of beneficial soil organisms, such as earthworms; supports a diverse microbial community with high levels of beneficial bacteria, fungi, Actinomycetes, protozoa, and nematodes and low levels of plant pathogens (such as root rot fungi, bacterial and fungal wilt organisms, soft rot bacteria, and plant parasitic nematodes). In a healthy soil, vegetable crop root systems explore a large portion of the soil volume, crops are under reduced stress, and pest problems are minimal. A healthy soil will also support mineralization of organic matter by soil microorganisms at levels appropriate to the climate.

From a chemical standpoint, healthy vegetable soils will be at a proper pH (6.0-6.8 in most soils); have a high cation exchange capacity; have optimal levels of calcium, magnesium, and potassium held on exchange sites; contain optimal but not excessive levels of other mineral nutrients needed by crops, have high levels of organic matter in various levels of decomposition and high levels of stable humus; support aerobic mineralization processes; and be free of toxic minerals from natural sources (such as high free aluminum levels) or from toxic chemical contaminants.

From a physical standpoint, healthy soils will have high levels of stable aggregates in the topsoil (creating a stable granular structure); an optimal mix of pore sizes (macropores and micropores) so that it is well aerated in the root zone, well drained, but also has a high available water holding capacity; and a low bulk density relative to the soil texture. They will be free of compaction, which limits root growth. Healthy soils are highly permeable to water and not prone to crusting.

From a management standpoint, vegetable growers have several tools at their disposal to maintain and improve soil health including:

Crop Rotations - It is critical to choose crop rotations that minimize soil borne diseases and at the same time can help to improve or maintain good soil physical and chemical characteristics. Mixing in deep rooted crops, crops with extensive root systems, and crops with high residue in the rotation will add organic matter, leave root channels which benefit future crops, break up compaction, and recycle nutrients from deeper in the soil. Crops that have similar pest profiles should not be planted consecutively, especially those vegetable and field crops that are susceptible to the same soil borne diseases. Crop diversity in rotations is a key to maintaining or improving soil health.

Cover Crops and Green Manures - These are crops that are specifically used to recycle nutrients and to add organic matter to the soil. They occupy land and time periods in the rotation when food (vegetable), grain, and feed crops are not being grown. It is important to always have something growing on the land, even when not in production, to maintain soil health. Including cover crops and green manures in rotations increases crop diversity and provides the benefits associated with that diversity. For example, certain cover crops and green manure crops have been found to have benefits in reducing soil borne diseases.

Reduced Tillage - It is important to reduce the levels of tillage in soils to maintain soil health. The more that soils are tilled the more soil aggregates are broken down and the more quickly soil organic matter is oxidized (decomposed). Soils that are excessively tilled generally have lower organic matter levels and often have poor physical characteristics. While some vegetables and vegetable cropping systems are not well adapted to no-till planting, there have been some great successes with vegetable no-till, such as with no-till pumpkins. Reduced tillage tools may be appropriate for other vegetable cropping systems. Zone tillage, vertical tillage, and soil aeration are all examples of approaches that may be used successfully in vegetables. Other field crops in the rotation should be planted using no-till or reduced tillage tools as much as possible and attempts should be made to conserve crop residue (as long as it does not interfere with the vegetable portion of the rotation).

Compost, Manure, and Other Organic Matter Additions - Compost, manure, and other organic matter sources can be added to vegetable soils to improve soil health. This approach is most appropriate where heavy tillage must be used, such as in plasticulture. By adding these organic matter sources you can counteract the effect of the heavy tillage and maintain soil health. These materials offer all of the benefits associated with increased organic matter in the soil: increased microbial diversity, reduced disease pressure, increased nutrient holding capacity, slow release of mineral nutrients, increased water holding capacity, improved aeration, and reduced bulk density.

(continued on page 23)

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Getting the Most from Overwintered Rapeseed Cover Crop

Gordon Johnson

Rapeseed (*Brassica napus*) has been planted on many acres in Delmarva as an overwintered cover crop, particularly for vegetable rotations. It has a deep root system, is good at reducing surface compaction, scavenges significant soil nitrogen, and suppresses weeds.

In addition, rapeseed is in the mustard family and produce chemicals called glucosinolates in plant tissue (roots and foliage). These glucosinolates are released from plant tissue when it is cut or chopped and then are further broken down by enzymes to form chemicals that behave like fumigants. The most common of these breakdown products are isothiocyanates. These are the same chemicals that are released from metam-sodium and metam-potassium, commonly used as chemical fumigants.

While rapeseed has shown some promise as a biofumigant, results in Delaware have been inconsistent, often with minimal benefits. It is important to note that success with biofumigant crops depends on a number of factors. The following are some suggestions to achieve the best results:

Produce as much biomass of the biofumigant rapeseed crop as possible. This requires that you have a good stand, fertility, and sufficient growing time. The more biomass that is produced and that is incorporated, the more chemical is released. However, as plants mature, they will reach a point where levels of these active chemicals will decline and you should not let the plants go past full flower.

Plant material must be thoroughly damaged so that enzymes can convert glucosinolates into isothiocyanates. This means that you need to chop the material as much as possible and work it into the soil as quickly as possible so as to not lose the active compounds to the air. A delay of several hours can cause significant reductions in biofumigant activity. The finer the chop, the more biofumigant is released. A flail mower is the best tool for achieving this.

The chopped material should be incorporated immediately after chopping. Tillage operations should be performed immediately behind the flail mower.

The chopped material should be incorporated as thoroughly as practical to release the biofumigant chemical throughout the root zone of the area that is to be later planted to vegetables. Poor distribution of the biofumigant crop pieces in the soil will lead to reduced effectiveness. A tractor mounted rotary tiller or power spader is the best tool for this.

Sealing with water (irrigating) after incorporation will improve the efficacy by reducing gas loss from the decomposing rapeseed (the active fumigant released). Soil conditions should not be overly dry or excessively wet. Packing the soil will also help this sealing process.

A major limitation to the use of rapeseed as a biofumigant crop use is the fact that you cannot deliver high enough levels of the active chemicals to do a complete fumigation job and the biofumigation effectiveness is also limited by the depth of incorporation. However, you are adding organic matter and do get the benefits associated with that addition.

The bottom line: the use of rapeseed as a biofumigant crop can suppress soil borne pests but should not be considered replacement for chemical fumigants, nor is it a substitute for adequate rotations. However, using rapeseed in combination with disease tolerant vegetable varieties can allow for a greater chance of success in tight rotation situations.

Dr. Johnson is Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the Weekly Crop Update, Univ. of Delaware, Vol. 23, No. 3, April 10, 2015.

Soil Health... (continued from page 22)

Traffic Management - Managing traffic in vegetable crops is another soil health key. By reducing trips across a field with heavy equipment and trucks, soil compaction is reduced and soil health is maintained. Limiting traffic to designated areas, driveways, drive lines, or tram lines is another way to achieve this because areas in between are conserved and remain uncompacted. These heavy traffic areas can then be targeted with a subsoiler or other tillage equipment to break up compaction. Growing forage radishes in high compaction areas has also been successful. While it is not always possible, reducing trips across vegetable fields when wet is also important. One pass by heavy equipment over wet soils can reduce the productivity of that area for a long period of time.

Dr. Johnson is Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the Weekly Crop Update, Univ. of Delaware, Vol. 23, No. 2, April 3, 2015.

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VEGETABLE PRODUCTION

Cool Soils and Fresh Organic Matter Favor Seedcorn Maggots

Ruth Hazzard

Seedcorn maggot (*Delia platura*) larvae feed on the seeds and young seedlings of a wide variety of vegetable crops. The first plantings of large-seeded crops such as corn, beans, and peas are often attacked, as well as early seedlings of spinach, onions, brassicas, tomato, cucurbits, and others. The first symptoms are usually poor germination or wilting of transplants that have lost their roots to feeding larvae. Symptoms can be difficult to distinguish from other problems, such as damping off due to *Pythium* and other soilborne fungi, or wireworm feeding. Symptoms may also be similar to damage caused by the cabbage or onion maggot, but seedcorn maggot becomes active two or more weeks earlier in the spring than do the other maggot flies. Prevention is key in managing this pest. By the time you see damage, it is too late to control the problem using either cultural or chemical methods.

If seedcorn maggots are the culprit, maggots can usually be found in the soil around and inside seedlings and seeds. The seedcorn maggot is yellow-white, up to 1/4 inch long, legless, and has a wedge-shaped head. Pupae are oblong, brown, and about 4-5mm long. The adults look like small, delicate houseflies with a slightly hump-backed shape. Seedcorn maggots overwinter as pupae in the soil where they had fed and developed the previous fall. In early spring, the adults emerge and lay eggs on the soil surface. They are attracted to volatiles released from freshly tilled soil, as well as to buried cover crop residues, rotting manure, compost, organic surface residues (as is found in reduced till), and other organic amendments such as fish, soybean or cottonseed meal.

Previously injured or diseased plants may also attract egg-laying. The eggs hatch within 2-4 days at soil temperatures of 60°F, and 7-9 days at 41-45°F. Soil temperatures at the Agronomy and Vegetable Research Farm in South Deerfield are now 45°F. Maggots burrow downward in search of food and penetrate seeds as the seed coat splits open.

One reason for the early activity of maggot flies is their ability to develop at a lower threshold, or base temperature, compared to many other insects—39°F (4°C) instead of the usual 50-55°F (10-13°C). Like other insects, they develop faster at higher temperatures, with optimal growth around 70°F (21°C). Emergence can be estimated using cumulative growing degree days, starting January 1st. Degree days can be calculated on a daily basis by using the formula: $[(Max\ temp - Min\ temp)/2] - base\ temperature$. To use GDD accurately, it is important to keep track of whether you are in Fahrenheit or Celsius, and to use a base temperature suited to the insect (or plant) of interest. Scientists have determined the accumulated GDD required for seedcorn maggot to reach peak adult emergence for first, second and third generation flies. This model is based on GDD accumulated since January 1st at base 40°F/4°C.

	First Generation	Second Generation	Third Generation
Fahrenheit Degree Days	360	1,080	1,800
Celsius Degree Days (CDD)	200	600	1,000

Currently no locations in Massachusetts have reached 360 FDD but at the same time last year, most locations were at least 30 FDD ahead of this year. Growing Degree Days and soil tem-

Accumulated Growing Degree Days (Base 40°F) January 1 st -April 14 th		
	2015	2014
Ashfield	56.2	88.0
Bolton	82.5	152.7
Dracut	80.9	142.0
Seekonk	92.7	277.6
Sharon	91.3	169.6
South Deerfield	60.6	135.5
Westfield	77.0	299.0

perature maps may be tracked at the Network for Environmental and Weather Applications (NEWA): <http://newa.cornell.edu>

The second and third generation peaks may be variable for a number of reasons, including the ability of larvae to enter dormancy when it gets too hot. Thus it may not be

easy to track the successive generations, but it is the first generation that causes the most damage. Crops that are planted in wet soil, or soil that is too cool to support quick germination and seedling growth, are especially susceptible to damage. Seedlings are sometimes able to compensate and recover from seedcorn maggot injury, depending on: the number of larvae per plant, the crop (eg. cantaloupe is less able to recover than bean or corn), seedling size, and growth conditions. Conditions that favor crop emergence and growth help seeds and seedlings escape or recover from injury.

Management Strategies:

Avoid seeding fields (especially wet fields) too early. Seeds germinate more quickly and are less vulnerable in warmer soils. Be patient! Check soil temperatures and use forecasts to determine likely soil conditions for emergence.

Disk and incorporate organic matter (such as a cover crop) at least 4 weeks before seeding to give it time to break down and make the field less attractive to the flies for egg-laying.

Avoid applying manure or unfinished compost in late fall or early spring to heavy soils that you might want to plant early. Lighter, well-drained, sandy soils are less likely to have problems (because they warm up faster than others).

Row covers can help – but only if the maggot flies are coming from elsewhere. Damage can occur if the flies have overwintered in the soil and thus end up underneath the row covers. Avoid covering seedlings that were planted into recently incorporated, lush cover crops.

If you need to replant, wait at least 5 days if maggots that you find are a quarter inch long; if they are smaller than that, wait at least 10 days to make sure they have pupated and will not damage the new seeds.

Preventive chemical treatments include commercially applied seed treatments (such as thiamethoxam) and in-furrow applications of pyrethroid, carbamate or organophosphate insecticides. For details, see crop/insect sections of the New England Vegetable Management Guide for corn, beans or other crops.

Ms. Hazzard is with the Univ. of Massachusetts Extension.

*Adapted from and with thanks to the following sources: E. Sidemann, Technical Advisor, Maine Organic Farmers and Gardeners Association; Ellen Cullen, University of Wisconsin Extension Entomologist (http://agwx.soils.wisc.edu/uwex_agwx/thermal_models/scm); J. Capinera, Handbook of Vegetable Pests. From the **Vegetable Notes for Vegetable Farmers in Massachusetts**, Univ. of Massachusetts Extension, Vol. 27, No. 4, April 16, 2015.*

Garlic Problems

Gerald Brust

Before 2010 I think I would get one call a year from a garlic grower with a problem, now it seems I get 10X the number of calls about garlic problems. Most of the problems are from bulb mites or garlic bloat nematodes. Bulb mites are extremely tiny and are a problem of garlic and sometimes of onion that usually goes unrecognized—until too late. These pests can reduce stands, slow plant vigor, and increase post-harvest diseases by their feeding on the bulb, roots and the stem plate (Fig. 1). Bulb mites have a very wide host range, but cause most of their damage to onions and garlic. These mite pests prefer crawling into the crevices between the roots and stem plate where they feed.

The best way to determine whether these mites are present is to carefully dissect the region where the roots and bulb come together. The mites also could be under one or two layers of scales at the lower end of the bulb. There are often other mites present, but with a hand lens the bulb mites usually can be identified from other mites.

The mite is bulb shaped with its legs moved forward and a bulbous rear end and many long fine hairs. The mouthparts and legs are purplish-brown while the main body is creamy white. These mites have been described as looking like tiny pearls with legs. The mites are extremely small (from 0.02 to 0.04 inches) and usually are slow moving. They are usually found in clusters underneath scales and at the base of the roots.

It is not just the direct feeding of these mites on garlic and onions that causes problems, but also that their feeding allows pathogens to enter through the wounds they create. These wounds are very good entry points for pathogens like *Fusarium* spp., *Sclerotium cepivorum* (causes the disease white rot), and various soft-rotting bacteria. The white rot fungus does best in cool temperatures, and symptoms include white fungal growth on the stem or bulb with small, dark structures called sclerotia in the decayed tissue. Early in the growing season, bulb mites can cause poor plant stands and stunted growth as they feed on the plants. Infested plants easily can be pulled out of the soil because of the poor root growth. Later in the season, higher than normal amounts of soft rot and *Fusarium* dry rot may be seen because of the wounds caused by these mites.

Bulb mites survive in the soil on organic matter left behind from the previous crop. **As long as there is decaying allium vegetable matter in the soil, bulb mites can survive in the field.** The best way to control bulb mites is to allow the vegetation from the previous crop to breakdown before any new crop, especially garlic or onions are planted again. These mites may also come into a clean field on infested garlic cloves. The use of clean garlic clove seed or seed that has been hot water treated will control these pests. Hot water treatment of bulbs prior to planting can reduce mite populations, but effective temperatures also reduce germination. Effective times and temperatures were 130 ° F for 10-20 min, or 140 ° F for 10-15 min. It is also possible to get good control when soaking affected cloves for 24 h in 2% soap (not detergent) and 2% mineral oil.

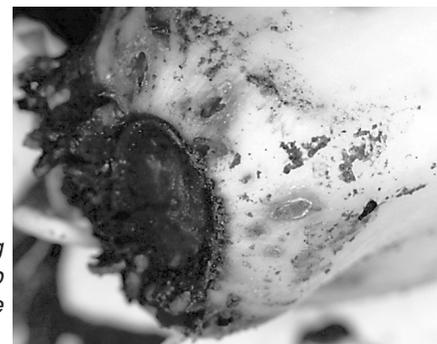


Figure 1. Feeding damage by bulb mites, notice the absence of roots.

Dr. Brust is with the Univ. of Maryland. From the **Weekly Crop Update**, Univ. of Delaware, Vol. 23, No. 4, April 17, 2015.

Pollinator Declines...

(continued from page 20)

“Minnesota Hygienic” stock bred by Marla Spivak (University of Minnesota), and the “Russian” stock.

Honey bee queens typically mate with 10-20 males! This means that the offspring the queen produces is very genetically diverse. Genetically diverse colonies are more productive and healthier. Beekeepers are becoming increasingly concerned that their queens are low quality and not well-mated, which would lead to unhealthy colonies. Also, if a queen is low quality, she will die faster, leaving the colony without a queen. In surveys of commercial colonies, a “queen event” - where the queen was lost and/or replaced by a new queen - was linked with colony death [30]. There is a lot of interest in local queen breeding efforts, to improve the genetic stocks and the quality of the queens. Pennsylvania currently has a state-wide effort to breed better queens, led by Jeff Berta.

Pesticides

Honey bees across North America are exposed to multiple pesticides. The interactions between pesticides and long term effects can be difficult to predict. We will delve into recent information on pesticides and pollinators in our next issue.

(continued on page 26)



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VEGETABLE PRODUCTION

Manage Weeds and Balance Soils in Organic Tomatoes through Latest Focus on Tomato Webcast

Weed control for tomatoes can be a major problem for many organic vegetable farmers. It can involve different kinds of mulches, flaming, or organic herbicides. What's more, organic weed control can have an effect on the quality of soils.

The latest *Focus on Tomato* webcast, titled "Weed Control Considerations for Organic Tomato Production" explores the links between soil quality and organic weed control, including how good soil management may create an environment less favorable to weed growth. To view the webcast, go to http://www.plantmanagementnetwork.org/edcenter/seminars/To_mato/WeedControlConsiderations/.

In this talk, Doug Doohan, Professor and State Horticulture & Crop Science Specialist at The Ohio State University, particularly explains:

What is meant by 'soil balancing', and the science behind the theory of the 'basic cation saturation ratio approach' to soil management.

- Why balanced soil may create an optimum environment for crops to compete with weeds.
- How the judicious use of limestone and gypsum can improve soil quality.
- The facts about soil balancing as well as the pseudo-science that is so commonly encountered on this subject.

Check the pH Before You Lay Plastic Mulch

Gordon Johnson

Each year we see problems with low bed pH under plastic mulch. This can result in a range of problems including poor growth, manganese toxicities, calcium and magnesium deficiencies, poor fruit quality, increased water stress, and increased blossom end rot.

If whole field pHs are below 5.8 there is a high likelihood that areas in the field have a pH of 5.2 or below. If fields are in the third year from a lime application, the risk of low pH areas in the field also increases.

At pHs below 5.2, there is an increase in exchangeable aluminum (Al^{3+}) which is toxic to plant roots. This free aluminum will cause roots to stop growing. Roots will be short, thickened, and stubby and will be brown in color and there will be few fine roots. Poor root growth will lead to increased plant stress, reduced nutrient uptake, reduced water uptake, and poor aboveground growth. In addition, exchangeable aluminum competes with cation nutrients such as calcium (Ca^{2+}) and magnesium (Mg^{2+}) on soil exchange sites. Excess aluminum reduces phosphorus and sulfur availability by complexing with those nutrients, rendering them unavailable for plants.

Another issue at low pH is that certain minerals become more available and may increase to toxic levels. This is what happens with manganese in some low pH soils. Sensitive crops such as muskmelons can be injured when available manganese increases to toxic levels

Another issue is with the use of nitrogen fertilizers with ammonium or urea which are acid forming. Ammonium is found in ammonium sulfate, ammonium nitrate, mono and di-ammonium phosphate, and urea ammonium nitrate solutions. Urea is found in UAN and as straight urea. Urea has the short-term effect of increasing pH, but once ammonium is released in the soil from the reaction of the urea, the long-term effect will be to reduce pH.

All manures and organic nitrogen sources release ammoni-

- Other proven techniques that will keep weeds under control, whether farming organically, or conventionally.

This 42-minute presentation is open access through June 30, 2015. Users can view other recent webcasts in the Focus on Tomato resource at <http://www.plantmanagementnetwork.org/fot>.

Webcasts on a variety of other crops can be found in PMN's Education Center at <http://www.plantmanagementnetwork.org/edcenter/>

To take advantage of PMN's full line of resources, please sign up for the PMN Update online newsletter at <http://www.plantmanagementnetwork.org/update/current/>.

The Plant Management Network (www.plantmanagementnetwork.org) is a nonprofit online publisher whose mission is to enhance the health, management, and production of agricultural and horticultural crops. It achieves this mission through applied, science-based resources, like Focus on Tomato. To help achieve its nonprofit publishing mission, PMN partners with more than 80 organizations, which include universities, nonprofits, and agribusinesses.

um upon mineralization. Depending on the organic source, the pH may decrease. Poultry manures tend to maintain pH and many composts have lime added so pH is not affected but other organic nitrogen sources will often lower the pH.

In plasticulture beds, the use of these acid forming fertilizers or soil amendments during bed formation or with fertigation through the drip tape will lower soil pH: if the bed pH is marginal to begin with (5.3-5.6) it can be lowered over the season to below the critical pH of 5.2 and cause problems with the growing crop.

Once plastic is laid, there are few solutions to correct the pH of the soil. The key is to apply needed lime before the mulch is applied.

*Dr. Johnson is Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware, Vol. 23, No. 5, April 24, 2015.*

Pollinator Declines...

(continued from page 25)

References

For references see online version at <http://extension.psu.edu/vegetable-fruit>, or contact PVGA at 717-694-3596.

*This article is part of a five part series describing pollinators, pollinator threats and on-farm conservation strategies as part of a collaboration between Penn State's Center for Pollinator Research and Penn State Extension Vegetable and Small Fruit Team. Ms. DuPont is with Penn State Extension in Lehigh and Northampton Counties. Dr. Grozinger and Dr. Fleischer are with the Department of Entomology at Penn State Univ. From the **Vegetable, Small Fruit and Mushroom News**, Penn State Extension, <http://extension.psu.edu/vegetable-fruit>, April 20, 2015.*

Radishes

Gordon Johnson

Radishes (*Raphanus sativus* L.) are a diverse crop grown for their edible storage taproots and sometimes for their edible leaves which are used as cooked greens, the shoots, when grown as a microgreen, and in the case of the rat-tail radish, the edible fruit. Some types are also grown as forage crops for livestock and as cover crops for soil improvement. Other types are grown for the oil contained in the seed which is used for industrial purposes (radish oil is not an edible oil). They are true root crops and the harvested portion is the swollen upper part of the tap root. They are grown as annual plants but most are biennial in nature and will flower and produce a seed stalk after exposure to low temperature conditions. Radishes are a quick crop that fit well in rotations for market growers.

Radishes can be divided into groups based on their origin; size, shape, and color of the root; utilization; as well as season of adaptation. Three main groups are the small salad radishes of European origin, larger Asian radishes (often referred to as Daikon radishes), and black or Spanish hot radishes.

European salad radishes can be further divided into groups according to their size, shape, and skin color. White root interiors predominate but there are also types with pink, purple, green, and yellow flesh. Skin color is most commonly red, white, or a mixture (there are yellow and green skin forms). There are three main root shapes: globe or flattened globe, cylindrical elongated, and tapered.

Salad radishes mature very quickly (21-28 days commonly) and are easy to grow. Salad radishes are commonly grown in the spring (they are often called spring radishes) but can be grown throughout the year in frost free periods. Best quality roots are produced when temperatures are between 50°F and 70°F under shorter daylengths. Higher temperatures, dry soil conditions, and longer daylengths (summer months) can cause radishes to bolt and can cause roots to be tough, pithy, and of greater pungency. Salad radishes are harvested, washed, and then either bunched with the tops on or topped and bagged. Shelf life for bunched radishes is 10-14 days when stored at a temperature of 0-2° C and at a relative humidity of 95-100%. Radish greens are edible and can be used as cooked greens.

Asian, Daikon, Japanese or Chinese radishes are most commonly found as long white cylindrical radishes with an extremely strong tap root. They are adapted to a wide range of soil conditions and can penetrate compacted soils and are often used as winter-killed cover crops in this region. Some types can grow to over 2 feet in length, 4 inches in diameter, and weight over 40 lbs. While the most common form is long and cylindrical leading to a tapered root tip, there are also stubby, barrel shaped forms, globe (turnip) shapes, and tapered (carrot) shapes. Skin color is most commonly white but there are also green, pink, and purple forms. Flesh is commonly white but with cream, green, pink, red, and purple colors also found. Most forms are mildly pungent, but there are also more strongly pungent types.

Asian radishes mature in 45-60 days and are becoming more popular in the West as cooks become familiar with their use. They are also very easy to grow. Of course, they are an important ingredient in Asian cuisine and found in Asian markets throughout the country. Asian radishes are best adapted to cooler temperatures and shorter daylengths and are commonly grown in the late summer or fall. However, they can be grown in the spring and summer using adapted varieties that are slow

bolting. Asian radishes have a longer storage potential than salad radishes and larger roots can be kept for several months stored near freezing under high humidity if the roots are intact. Asian radishes are also used for producing sprouts and microgreens where the shoot is eaten.

Black, Spanish or winter radishes are group of high pungency, hot radishes. They commonly have black skins and white flesh and may be shaped as globes, flattened globes, elongated cylinders, or tapered roots. They vary in size but some types can be larger than one foot in length. Other than black, skin color can be white, pink, red, brown, and purple. Growing conditions are similar to Asian radishes and they have long storage potential.

All root radishes are grown in seasons where they will not bolt (produce a flower stalk). The storage reserves in the root will be used up in the flowering process.

Another radish variant is the rat-tail or Madras radish (*Raphanus sativus* var. mougri or *Raphanus sativus* var. caudatus) which is grown for its edible fruit, which botanically is a silique but is commonly called a "pod". While all radish pods can be eaten, these types have been selected specifically for their edible pods. They are allowed to flower and pods are harvested in the immature stage and eaten raw or cooked. These radish pod crops are most commonly found Indian and Southeast Asian cuisine. This is an interesting crop for growers looking for specialty products to offer consumers.

Seed salad radishes as early in the spring as soil can be worked, then at 8 to 10 day intervals through September (or through November in high tunnels). Fall adapted Asian radishes are planted from mid-July through September. Space rows 8 to 15 inches apart and 1 inch between plants in the row for salad radishes or 2-3 inches apart in the row for larger Asian radishes. Radishes are often planted in 4' wide raised beds, 6 rows per bed. Nitrogen requirements are modest with 50 lbs/a N recommended for smaller radish types and 60-75 lbs/a N for more robust Asian types.

Recommended varieties for our region are as follows:

Red globe; white interior radishes: Saxa, Rover*, Cherriette*, Perfecto, Rudolf (Crack tolerant), Cherry Belle, Pink Beauty (organic), Champion, Crimson Giant (large globe)

Specialty Radishes, Spanish Radishes, and Asian Radishes: Watermelon (white flesh, red interior, globe), Shumkyo Semi Long (Red flesh, white interior, elongated), White icicle (white flesh, white interior, elongated). Minowase (daikon), Mihashige (daikon), China Rose (red flesh, white interior, elongated), Chinese Winter (daikon), Discovery* (daikon), Round Black Spanish (heirloom, dark flesh, white interior, large globe), April Cross* (daikon), Sakurajima Mammoth (white flesh, white interior, large globe)

*F1 hybrid variety

*Dr. Johnson is Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware, Vol. 23, No. 3, April 10, 2015.*

BERRY PRODUCTION

Strawberry Fruit Rots

Cassandra Swett

The strawberry bloom has begun and it's time for fruit rot protection. Our two main targets for bloom time protection of strawberries are gray mold / Botrytis fruit rot (*Botrytis cinerea*), and, if you are growing susceptible varieties like Chandler, anthracnose fruit rot (*Colletotrichum acutatum*).

Most fungicides are labeled for both pathogens, but if your main target is gray mold, you need to consider that the fungus has become resistant to several fungicides. If you use fungicides that the pathogen is resistant to, you will have no protection—it's essentially like missing a spray. Based on the fungicide resistance tests that Guido Schnabel conducted with *Botrytis* from Maryland, Topsin M is ineffective and at some sites, Scala is also ineffective.



Spray Guide

Here's a strawberry spray guide that manages fungicide resistance, when your main objective is gray mold (*Botrytis*) protection:

1. Pre-bloom (crown rot protection)
Spray every 7-10 days
Rotating: Captan 50 WG or 80 WDG (group M)
With: Rovral 50 WG (Group 2) —this compound can only be applied once, and only pre-bloom
2. Early Bloom (10%) to fruit set:
Spray every 7-10 days
Rotating: Elevate 50 WDG (group 17), CaptEstate (group M + 17), Switch 62.5 WG (group 9 + 12), Fontelis (group 7), Scala (group 12) and Pristine WG (group 7 + 11)
With: Captan, Thiram 24/7 or Thiram Granuflo (both group M)
An example: Captan+Fontelis → Switch→Captan→ Pristine → Thiram → Elevate →Captan
3. After fruit set: Spray every 7-10 days
Rotating: Captan and Thiram (both group M)
With: CaptEstate (group M + 17), Elevate (group 17), or Fontelis (group 7) -each applied only once during this interval.

Rates. For every compound, there is a range in the rate you can apply. For fungicides at risk of resistance (Switch, Pristine, Rovral, Scala), the lower rate is always recommended. For

fungicides that are not at a high chance of resistance (Elevate, Fontelis, Captan, Thiram), the amount you apply should be adjusted, in part, based on how high disease pressure is. If it rained at least once since your last spray, and temperatures are between 65 and 75 °F, you will want to use the higher concentration. If, in contrast, it's been cooler than 65, warmer than 75 and / or dry, use the lower rate.

Timing. The same goes for how often you spray. We get a lot of rain this time of year, and every time it rains the fungus has a chance to infect plants. So long as it's raining about every week, plan to spray every 7-10 days.

Tips: Control is improved when you rotate between Fontelis and Switch and when you tank mix Fontelis with Captan.

One of the compounds in Pristine is the same FRAC group as Fontelis, so don't use these sequentially.

Switch and Pristine are both highly effective, but are at high risk of resistance if they are used too often. Because of this, it is recommended that they are only used ONCE each year.

What about non-synthetic chemicals? There is some interest in using non-synthetic chemicals for fruit rot control, as a rotation with synthetic chemicals, especially in post bloom control, and for organic management. One such compound is Regalia, a plant extract labeled for use on gray mold and anthracnose fruit rot in strawberry. Trials are lacking for strawberries, but in grape Regalia can be as effective as Pristine against *Colletotrichum*, and is moderately effective against *Botrytis*. In trials in California, disease control with Regalia is best when rotated with conventional compounds. We will be doing work on strawberry starting this year to evaluate Regalia and other bio-pesticides / biologicals, so we should have more information on this in future years.



Some Helpful Resources:

Fungicide Resistance Management Guidelines for Vegetable Crops Grown in the mid-Atlantic region -2015 (This guide includes strawberries). <http://extension.psu.edu/plants/vegetable-fruit/production-guides/2011%20FRAC%20Guide.pdf>

2015 Southeast Regional Strawberry Integrated Pest Management Guide. Louws et al. <http://www.smallfruits.org/SmallFruitsRegGuide/Guides/2015/2015StrawberryIPMGuide.pdf>

Dr. Swett is the Grape and Small Fruit Pathologist at the Univ. of Maryland, <https://www.psla.umd.edu/research/research-lab-pages/swett-lab-berry-pathology>.

Cassandra Swett is New Berry Pathologist for Maryland and Pennsylvania

Dr. Cassandra Swett started at University of Maryland at College Park as the new grape and small fruit pathologist in May 2014, with a split research and extension appointment. Her primary functions are to develop basic and applied information that improves management of grape and small fruit diseases, provide a resource to extension specialists and agents, and communicate information on disease management to producers. Although based in Maryland, as part of a mid-Atlantic Fruit Consortium hiring agreement between University of Maryland and Penn State, Dr. Swett's extension and research activities also extend to Pennsylvania.



Dr. Swett received her MS in tropical plant pathology at the University of Hawaii at Manoa and did her PhD and postdoc in the Plant Pathology Department at the University of California at Davis. Her expertise lies in biology, ecology and management of fungal plant pathogens. Her postdoctoral work with Dr. Doug Gubler focused on biology and management of fruit rots in table grapes; she has also worked on strawberries, orchids, and papaya, as well as native plants, including Monterey pine, Monterey cypress, and Koa.

The overall goal of the Berry Pathology program is to develop multi-state collaborations aimed at improving the economic and environmental sustainability of fruit production in the mid-Atlantic region. The primary research efforts of Berry Pathology are focused on improving management of fruit rots in all crops, root rot in blueberries, and canker pathogens in blueberry and grapes. Current projects are aimed at: (1) reducing fungicide resistance development through use of risk-based spray programs and improved primary inoculum management, (2) reducing disease losses by identifying insects which transmit fruit rot pathogens, and evaluating threshold irrigation strategies and varietal resistance management for root rot diseases, and (3) providing resources which enhance the viability of organic and minimal-spray production, and improve soil quality. Learn more about the program by visiting the Berry Pathology website at: <https://www.psla.umd.edu/research/research-lab-pages/swett-lab-berry-pathology>, and visit our Twitter site: @Berry_Pathology for real time disease updates for the region.

Announcing the Mid-Atlantic Berry Pathology Twitter site

Cassandra Swett

To provide Mid-Atlantic berry growers with real time disease updates as a complement to the Penn State Tree Fruit pathology Twitter site (<https://twitter.com/drtreefruit>), we have initiated a pilot run of a Berry Pathology Twitter page. You can follow online at: https://twitter.com/berry_pathology, or on your smart phone: @Berry_Pathology. Postings are sent out on an as-needed basis to provide notification of high disease pressure, control considerations, and links to other helpful resources. This site will provide a complement to timely articles in newsletters (printed and online).

Dr. Swett is the Grape and Small Fruit Pathologist at the Univ. of Maryland, <https://www.psla.umd.edu/research/research-lab-pages/swett-lab-berry-pathology>

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GREENHOUSE PRODUCTION

Vegetable Transplant Height Control

Gordon Johnson

One of the most important considerations for transplant production is managing “stretch” or height of transplants. The goal is to produce a transplant of a size that it can be handled by mechanical transplanters without damage and that are tolerant to wind.

Most growth regulators that are used for bedding plants are not registered for vegetable transplants. One exception is Sumagic® registered for use as a foliar spray on tomato, pepper, eggplant, groundcherry, pepino and tomatillo transplants (no other crops are registered at present). The recommended label rate is 0.52 to 2.60 fluid oz per gallon (2 to 10 ppm) and one gallon should be sprayed so it covers 200 sq ft of transplant trays (2 quarts per 100 sq ft). The first application can be made when transplants have 2-4 true leaves. One additional application may be made at the low rate, 0.52 fluid oz per gallon (2 ppm), 7-14 days later, but you cannot exceed 2.60 fluid oz of total product (per 100 sq ft) for a season. Growers are advised to perform small-scale trials on a portion of their transplants under their growing conditions before large scale adoption.

For other crops alternative methods for height control must be used. One such method that is successful is the use of temperature differential or DIF; the difference between day and night temperatures in the greenhouse. In most heating programs, a greenhouse will be much warmer during the day than the night. The critical period during a day for height control is the first 2 to 3 hours following sunrise. By lowering the temperature during this 3-hour period, plant height in many vegetables can be modulated. Drop air temperature to 50° – 55°F for 2-3 hours starting just before dawn, and then return to 60° – 70°F. Vegetables vary in their response to DIF. For example, tomatoes are very responsive, while squash is much less respon-

sive.

Mechanical movement can also reduce transplant height. This may be accomplished by brushing over the tops of transplants twice daily for with a pipe or wand made of soft or smooth material. Crops responding to mechanical height control include tomatoes, eggplant, and cucumbers. Peppers are damaged with this method.

Managing water can also be a tool to control stretch in some vegetables. After plants have reached sufficient size, expose them to stress cycles, allowing plants to approach the wilting point before watering again. Be careful not to stress plants so much that they are damaged.

Managing greenhouse fertilizer programs is yet another method for controlling transplant height. Most greenhouse growing media come with a starter nutrient charge, good for about 2 weeks after seedling emergence. After that, you need to apply fertilizers, usually with a liquid feed program. Greenhouse fertilizers that are high in ammonium forms of nitrogen will induce more stretch than those with high relative proportions of nitrate nitrogen sources. Fertilizers that are high in phosphorus may also promote stretch.

Exposing plants to outside conditions is used for the hardening off process prior to transplanting. You can also use this for transplant height control during the production period. Roll out benches that can be moved outside of the greenhouse for a portion of the day or wagons that can be moved into and out of the greenhouse can be used for this purpose

*Dr. Johnson is Extension Vegetable and Fruit Specialist at the Univ. of Delaware. From the **Weekly Crop Update**, Univ. of Delaware, Vol. 23, No. 4, April 17, 2015*

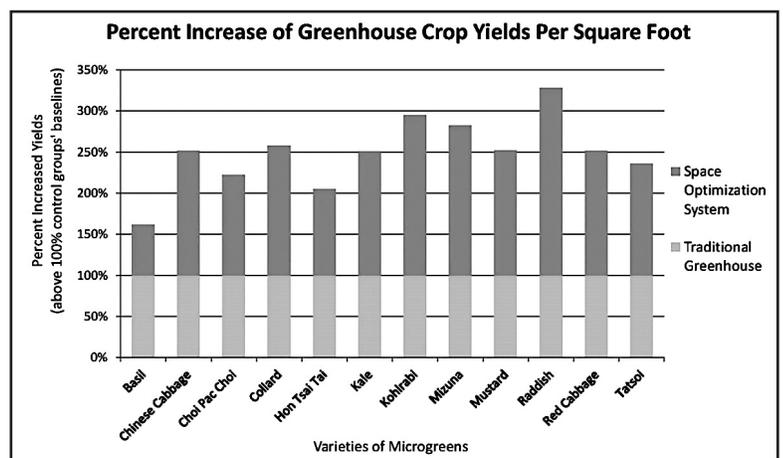
GreenTowers Space Optimization System Increases Microgreen Yields Per Square Foot by 2.5X.

This average of 250% microgreen yields increase has been confirmed through data gathered across eight separate experimental trials, conducted from June-December 2014 at the Pennsylvania State University's College of Agricultural Sciences greenhouses. During this time, various microgreen varieties were grown in the Space Optimization System experimental groups, scaled to six feet in height, as well as in horizontally grown control groups, analogous to standard bench-top greenhouse production.

Our patent pending greenhouse optimization technique is also applicable in the production of leafy greens, and can be used in the propagation phase for many larger crops and ornamental plants. By rotating throughout the day, shadowing effects commonly found in vertical growing systems are mitigated. Furthermore, the vertical growing plane allows for extended growing seasons due to the lower solar angle of incidence.

Summary of Experimental Method

The yields increase per square foot was calculated by dividing the total mass of microgreens harvested from the Space Optimization System by the physical footprint of the unit (4.66 square feet). This was then compared to the total mass of microgreens grown in the horizontal control groups, divided by the footprint of the controls.



Percent increases illustrate direct comparisons of grams per square foot grown in the Space Optimization System experimental groups, versus 100% baselines of microgreen yields calculated across individual horizontal control groups. Research was conducted in conjunction with a Master's thesis study performed at the Pennsylvania State University's College of Agriculture by GreenTowers cofounder Jonathan Gumble.

(continued on page 31)

GREENHOUSE PRODUCTION

CLASSIFIED

GreenTowers Space... *(continued from page 30)*

GreenTowers is actively seeking greenhouse producers to participate in commercial trials beginning Spring, 2015. Their contact information is as follows:

GreenTowers, LLC
 Phone: +1 (814) 954-0084
 Email: Team@GreenTowersUSA.com
 www.GreenTowersUSA.com



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GENERAL

Who Are the... *(continued from page 14)*

accessibility, and working from a standing position for those who have difficulty stooping. Space within the 60' long structure is also been allocated for demonstration and teaching so classes can be held for residents inside.

Ronia Campbell-Cobb is the farmer for Guildhouse West, and has organized the partnerships between Cloud 9 and Greener Partners. She is dedicated to supporting her residents with hyper-locally nutritious foods. Ronia is also the one who has spearheaded the concept for an accessible tunnel and we are proud to support her efforts where and when we are able. We expect to see amazing things developing at Guildhouse West over the upcoming season. Well done Ronia!

Mr. McCann is with Penn State Extension. From the Vegetable, Small Fruit and Mushroom News, Penn State Extension, <http://extension.psu.edu/vegetable-fruit>, April 30, 2015.



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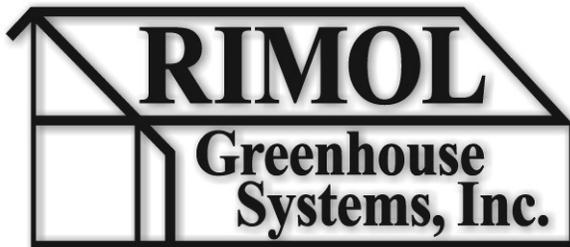
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