UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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MUSTARD AS A BIOFUMIGANT COVER CROP

--Katie Campbell-Nelson, Susan Scheufele, Lisa Mckeag, Ruth Hazzard and Neal Woodard

Rationale: In recent years, brassica cover crops have begun to be used to "biofumigate" soil, a process that can assist in managing weeds, and can reduce populations of nematodes and soil borne pathogens such as *Pythium, Rhizoctonia* and *Phytophthora* (including *P. capsici*). Brassica plant tissues, especially the leaf tissues, contain glucosinolates which when broken down produce volatile, biocidal compounds called isothiocyanates, which are similar to the active ingredient in the commercial fumigant Vapam. Brassicas vary in the amount and types of glucosinolates they contain, and cover crop varieties have been bred and selected to improve their biofumigant effects. One such cover crop is "Caliente" brown mustard (*Brassica juncea)* and several Massachusetts growers are using Caliente as a cover crop in fields where they have had *P. capsici* or would like to biofumigate their soils for other reasons. Biofumigation is not a silver bullet, and must be used as part of an integrated program, so growers continue to manage their fields in other ways including using fungicide applications on susceptible crops and using herbicides or cultivation for weed control. Caliente can be grown successfully as a spring cover crop prior to seeding fall squash and pumpkins, or as a short season summer cover crop in a fallow field to prepare an area for the following year's crop such as strawberries. In this trial, we hoped to learn how to manage this cover crop for maximum biofumigation effects and to share our experiences with growers who might want to implement biofumigation on their farms.

Caliente growing at the UMass Crop Research & Education Farm in S.Deerfield, MA.

Materials and Methods

By growing Caliente and oat cover crops side by side in a field at the UMass Crop Research and Education Farm in South Deerfield, we were able to compare the effects of a biofumigant cover crop (Caliente) with a non-fumigant cover crop (oat) in suppressing *P. capsici*. Since we could not introduce the pathogen into an field with no history of Phytophthora blight, we conducted greenhouse bio-assays to test the effect of the fumigant on a susceptible host (pepper) in biofumigated and non-fumigated soil from the same field. We repeated this trial twice, once in the spring, and once in the summer to see if the suppression of *P. capsici* could be replicated in a greenhouse assay, and to improve our experience with managing this cover crop throughout the season.

Figure 1. Symptoms of Phytophthora blight on pepper include water-soaked stem lesions at the soil line.

Fertilization: 50 lb. nitrogen/acre in the form of urea and 20 lb. sulfur/acre in the form of gypsum were broadcast immediately prior to planting. Sulfur fertilizer is recommended to increase production of isothiocyanates by the mustard, so gypsum was added to increase sulfur without changing the soil pH. No other soil amendments were needed based on soil test results.

Seeding: (4/28/14 and 7/11/14) We used a no-till grain drill to seed Caliente at a rate of 10 lb/acre, 0.25-0.75" deep, in rows 6-8" apart and oats at a rate of 110 lb./acre, 0.5-1" deep, in rows 6-8" apart. Seeding mustard with a no-till grain drill was not highly effective because the seed is very light and did not get very good soil to seed contact; many of the seeds germinated on the soil surface. Rita Thibodeau of NRCS recommends adding kitty litter to the hopper to improve seeding and germination. Broadcasting the seed or using a cone-seeder is also an effective alternative to the grain drill. Germination was observed 3 days after seeding, on 5/1/14 and 7/14/14.

Chopping and incorporating: (6/24/14 and 9/17/14). Caliente and oats were allowed to grow until the Caliente was at maximum flowering (56 days) in the first trial, and 68 days in the second trial, when oat hulls and mustard seed pods were beginning to form. In both trials we flail mowed the field with a rotary mower and immediately incorporated the residue. To incorporate the residues we used a chisel plow followed by discing in the first trial and a disc only in the second trial. A plow is recommended for turning under residues so that the volatile isothiocyanates are trapped within the soil. We also learned that the disc alone did not handle the older, woody plant material well in the second trial and a lot of residue was left near the surface. In both trials, the soil surface was sealed immediately after incorporation with a heavy board, roller, or culti-packer to seal in the volatile compounds.

Greenhouse bioassay (6/26/14 – 7/14/14 and 9/18/14 – 10/17/14): We collected soil from the top 6" in Caliente and oat plots one day after incorporation. This soil was used to pot five pepper plants into each of 4 replicate containers for each treatment in the greenhouse bioassay. Replicates of sterilized non-fumigated field soil were included as a control. Pots were treated with a suspension of mycelia and sporangia of 3 local *P. capsici* isolates cultured at the UMass Diagnostic Lab. Pots were kept flooded to encourage disease development. Treatments were as follows: Caliente soil not inoculated, oat soil not inoculated, sterile field soil not inoculated, Caliente soil inoculated, oat soil inoculated, and sterile field soil inoculated. Each pot was rated daily for incidence of Phytophthora blight (number of plants affected out of 5) on pepper plants (Fig. 1). Vigor ratings per plot were also made periodically on a scale of 0 -100%, taking into account number of plants, plant size, color, and canopy thickness. Incidence data was used to calculate area under the incidence progress curve (AUIPC), a measure of disease development over time. All data were analyzed for statistical differences using a generalized linear model and means were separated using Fisher's least significant difference at $\alpha = 0.05$.

Results and Discussion

We observed that peppers grown in Caliente-biofumigated soil inoculated with *P. capsici* developed symptoms more slowly than peppers grown in oat or sterilized soil, and symptoms were not as severe in the Caliente-grown peppers, though this observation was not significant. The same trend was observed in both trials, with the lowest incidence of *P. capsici* found in the pots containing Caliente, and the highest incidence of disease in the pots with sterile soil (Fig. 2). In the first trial, peppers grown in the Caliente-treated soil were significantly more vigorous than those grown in sterilized soil (Fig. 3) and in the second trial the same trends were observed, but the differences were not significant. All non-inoculated treatments were free of *P. capsici,* but differences in vigor were observed among these treatments in the second trial, though not in the first trial (Fig. 4 and 5). In the second trial plants were older and woodier at the time of incorporation than in the first trial. Also, we did not use the chisel plow and cover crop residues were not as well broken down as a result. This undecomposed plant material may have robbed fertility from the pepper plants, causing the observed differences in vigor. Tilling Caliente under and packing the soil surface within 50-60 days after seeding is best for garnering the most benefit this cover crop has to offer towards weed and disease suppression as well as providing nutrient benefits to subsequent crops.

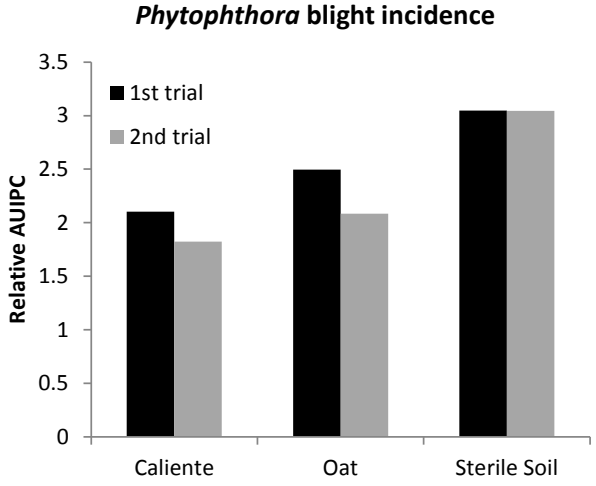

Figure 2. The area under incidence progress curve (AUIPC) is a quantitative summary of disease intensity over a month long period after pots were inoculated with P. capsici. There were no significant differences among the treatments in either trial.

For more information please contact Katie Campbell-Nelson (kcampbel@umass.edu)

Funding for this project was provided by a grant from USDA NIFA.

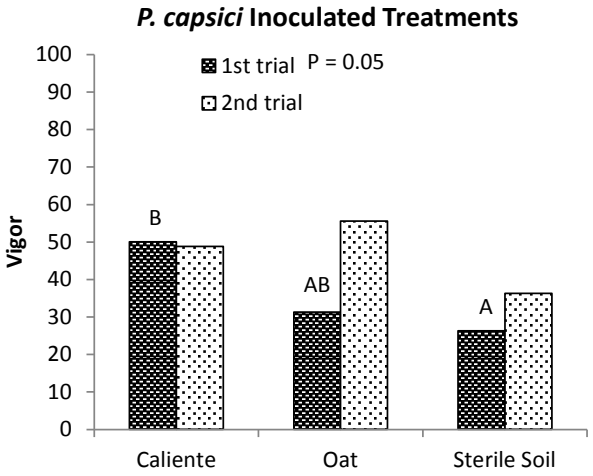

Figure 3. Vigor differences were observed 12 days after inoculation with P. capsici in both trials, but significant differences were only observed in the first trial.

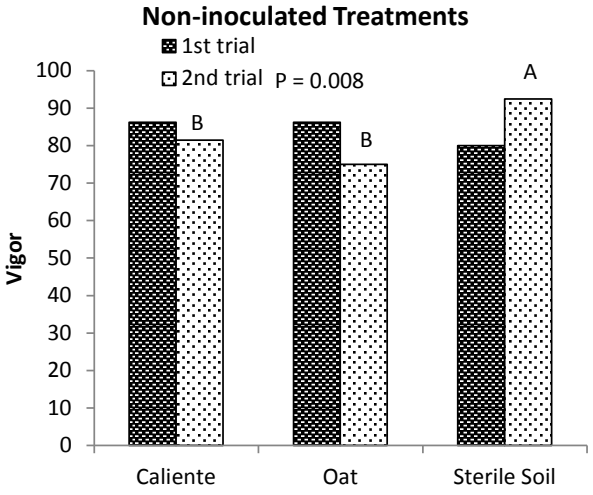

Figure 4. Significant differences in vigor were observed among non-inoculated treatments in the second trial but not in the first trial.

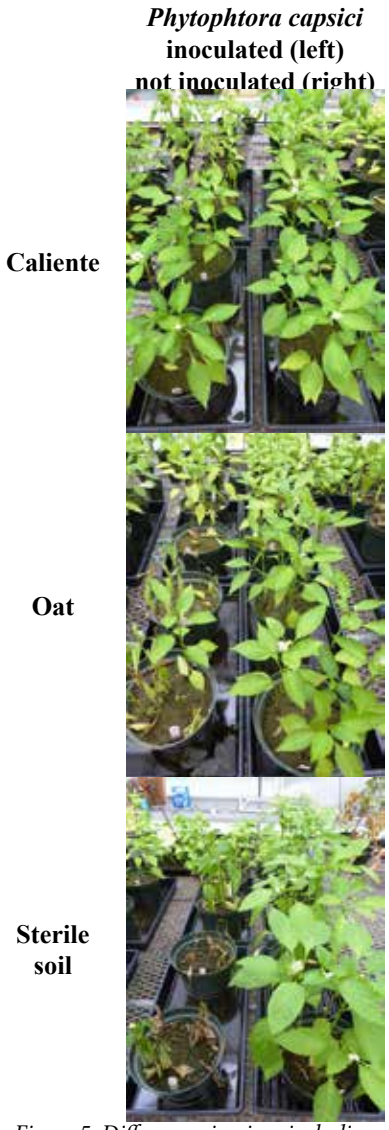

Figure 5. Differences in vigor including canopy coverage and plant color were observed among treatments. This photo was taken 26 days after inoculation in the second trial.

THOUGHTS ON USING ORGANIC FERTILIZERS FOR GREENHOUSE PLANTS

For a number of years I've studied the use of organic fertilizers for growing commercial greenhouse crops. To start I chose to evaluate fertilizers that could be mixed and applied using methods familiar to growers using traditional water-soluble or granular slow-release chemical fertilizers.

Right now I recommend Nature's Source 3-1-1 liquid fertilizer and Sustane 8-4-4 granular slow-release fertilizer. Both of these are readily available, cost effective, OMRI-certified, and have good label directions for greenhouses. I've also evaluated or am currently trialing other organic fertilizers and these are listed with comments in the table accompanying this article. Two liquid fertilizers which may have promise one day are Bombardier 8-0-0 and Espartan 2.0-3.03-2.6 manufactured by Kimitec in Spain. At this time these have limited availability, are rather expensive, and the labels are not written for greenhouses. Nature's Source, Bombardier, and Espartan are plant extract fertilizers and Sustane is made from

poultry wastes.

My work has led me to recommend using different organic fertilizers in combination rather than relying on one fertilizer. I suggest using Nature's Source and Sustane together to take advantages of each fertilizer's strengths. This would be done by incorporating Sustane in the growing medium at planting and then fertilizing on a regular basis with Nature's Source starting about 4 weeks after planting. Combinations should be considered regardless of what brands or types of organic fertilizer are being used.

Here are some more important specific recommendations on how to use organic fertilizers to grow greenhouse plants.

1. **Mixing and application.** The fish fertilizers and plant extract fertilizers are sold as concentrates and they must be diluted in water to be safe for plants. Nature's Source, Bombardier, and Espartan have a pleasant "beery" aroma as concentrates, but within 7 days of being mixed with water they "spoil" and develop very unpleasant odors. The odor, however, is not as bad as fish fertilizer. The nutrient value of spoiled fertilizer is unknown and the colonies of bacteria which develop may plug irrigation lines, so diluted fertilizer solution should be used as soon as possible after mixing.

   Fish fertilizer has the thickest and least consistent solution and should be agitated before mixing with water. Bombardier and Espartan concentrates are "syrupy" but mix well with water. Nature's Source is the thinnest concentrate and it mixes well with water and can pass fertilizer injectors.

   Sustane is a granular fertilizer which would be mixed with the growing medium before planting. It is the easiest organic nutrient source to use in combination with the liquid types.

2. **Fertilizer analysis.** Some organic fertilizers supply only one or two of the NPK elements; an example is Bombardier which is 8-0-0. So a grower using Bombardier would have to use other fertilizer(s) to supply P and K. I recommend Sustane which has an 8-4-4 analysis or some other complete NPK granular organic fertilizer.

3. **Nutrient disorders.** Plants may develop an overall light green or yellowed color caused by a general nutrient deficiency or, more likely, just N deficiency. For example, if Sustane is used alone the symptoms might occur about 45 days after planting, the end of its release time. This can be prevented by applying an organic liquid fertilizer supplement about 30 days after planting.

   Interveinal chlorosis sometimes occurs about halfway through cropping time if plants are fertilized with some liquid organic fertilizers alone starting at planting. This chlorosis is most likely caused by an accumulation of too much ammonium-nitrogen in the plant, so-called "ammonium toxicity". Most greenhouse crops do best with a combination of ammonium and nitrate nitrogen. Unfortunately organic fertilizers generally don't contain nitrate-nitrogen. The best approach is to rely on Sustane as the sole source of nutrients for the first month after planting and then start applying Nature's Source or another liquid organic fertilizer.

4. **Organic fertilizer effects on growth medium soluble salts (EC).** Sustane is a slow-release fertilizer and its use results in low EC, and potentially a deficient level after 45 days. As for the liquid organics, at the same N level the lowest EC results from Nature's Source (similar to chemical fertilizer) and then Bombardier. Espartan results in an EC significantly higher than the other liquid organic fertilizers which might be an aggravating factor in ammonium toxicity. In short, from the standpoint of EC, Nature's Source is the best.

5. **Overcome reduced size caused by organic fertilizers.** Many growers who have used organic fertilizers have observed size reductions compared to what they are used to with chemical fertilizers. Some growers say "raise the rate (ppm)" of organics to compensate. If you have done this and it works, carry-on! Otherwise give it a try starting with increases of 20% at a time. Increasing the rate in 20% increments is likely to be partially successful, but because of a nutrient imbalance, ammonium toxicity, or some unknown factor results may be disappointing or worse.

6. **Plant species-specific responses.** It seems that plants may respond differently to organic fertilizers. For example, marigolds and petunia grow as well fertilized with a combination of liquids and Sustane as they do with chemical fertilizer, but seed geraniums do not and are very prone to chlorosis from too much ammonium. At this point in the development of organic fertilizers for commercial greenhouse use, use them with caution on plants you know have exacting nutrient requirements or those prone to foliar chlorosis. Fertilizers should always be tried first on a small number of plants.

7. **Best uses.** The fertilizers discussed in this fact sheet are probably best for short-term crops of less than 6 weeks duration when environmental conditions are most favorable for plant growth (e.g., April-September). Bedding plants,

herbs, and vegetable transplants are good candidates for trying organics. Assuming the plants are of good quality and color, reduce or stop using the fertilizer within a week or two of planned marketing. This practice will reduce the chance of ammonium toxicity symptoms.

--Douglas Cox, Stockbridge School of Agriculture, UMass

Fertilizer	**Type**	**Analysis**	**Comments**
Neptune's Harvest Organic Fish fertilizer	Liquid emulsion	3-1-5	Fish fertilizer has been widely used organic fertilizer for many years. The emulsion needs to be well mixed to give a consistent material for dilution and application. Once mixed with water it spoils and develops a bad odor. Mix fresh and use immediately. Leaf chlorosis, probably due to ammonium toxicity, is common. OMRI listed.
Plant Natural alfalfa pellets		5-1-2	Alfalfa is a legume and therefore is rich in nitrogen. The pellets are often used as animal feed and are similar in size and shape to wood pellets used in pellet stoves. Ppellets supported the plants for about 40 days and then are exhausted of nutrients. Also, they swell when water is added greatly increasing the volume of medium in a pot. Limited potential for this fertilizer.
Kimitec Bombardier	Liquid	8-0-0	Bombardier is a plant extract fertilizer made from fermented sugar beet molasses. It works well with Sustane which supplies the absent P and K. Some plants develop interveinal chlorosis due to ammonium toxicity. Chlorosis is lessened or eliminated by combining with Sustane. Dilute solutions spoil within 10 days. Quite expensive and limited availability. USDA/NOP approved.
Kimitec Espartan	Liquid	2.0-3.03-2.6	Espartan is a plant extract fertilizer made from fermented sugar beet molasses. Some plants develop interveinal chlorosis due to ammonium toxicity and growth medium EC is rather high. Chlorosis and EC are lessened or eliminated by combining with Sustane. Dilute solutions spoil within 10 days.Quite expensive and limited availability. USDA/NOP approved.
Sustane	Granular	8-4-4	Granular slow-release fertilizer made from turkey litter, feather meal, and potassium sulfate. Release time is 45 days, but nutrients may run out a little sooner. Excellent fertilizer to combine with liquid organics especially those with no phosphorus or potassium. OMRI listed.
Nature's Source	Liquid	3-1-1	Despite the low nutrient analysis Nature's Source is currently the best liquid organic fertilizer. It is made from oilseed extract. Container has dilution rates expressed in familiar terms for greenhouse growers. I have seen no foliar chlorosis yet with this fertilizer. Nature's Source is widely available and a great improvement over its predecessor Pinnacle. OMRI listed.
Verdanta EcoVita	Granular	7-5-10	I am currently testing this granular slow-release fertilizer. It has a release rate of 100 days. The granules are composed of bone meal, soybean meal, cocoa shell meal, feather meal, and fermented sugar cane and sugar beet molasses. I see potential for this one and it's available from Griffin. OMRI listed.
Verdanta PL-2	Liquid	2-0-6	I am currently testing this fertilizer made from fermented sugar cane and sugar beet molasses. It should be agood supplement to use in combination with other organic fertilizers low in N or K. Available from Griffin. OMRI listed.
Ferti-Nitro Plus	Powder	13.6-0-0	I am currently testing this fertilizer as a supplement to use in combination with other organic fertilizers low in N. It is made from hydrolyzed soybean protein and is soluble. Google this one on the web. OMRI listed.

GETTING STARTED USING NATURAL ENEMIES IN GREENHOUSES

Many growers in Massachusetts and Connecticut are successfully using natural enemies (beneficial insects, mites, nematodes and other organisms) as an alternative to pesticides to manage pests in greenhouses. If you are considering using natural enemies for the first time on your spring crops, now is the time to prepare.

A thorough scouting program should be in place including weekly crop monitoring, use of sticky cards and recordkeeping. It is also important to phase out the use of pest control materials that may be harmful to beneficials. For information on the compatibility of pest control materials with natural enemies refer to on-line databases, such as Koppert, Inc., (www.koppert.com) or Biobest (www.biobest.be). Check under "Side Effects." Biobest also has a free smart phone app for pesticide side effects. Information is available on their website. If you plan to use banker plants to rear and distribute natural enemies, they need to be started early.

Beneficials should not be released onto plants previously treated with incompatible pesticides because residue will be toxic to the natural enemies. In addition to your own pesticide use, ask you plant supplier about the history of pesticide use on seedlings, plugs and other plants you purchase for finishing. Plan to release beneficial predators and parasitoids early in the crop before pests build to outbreak levels. Read up on using biologicals from the list of fact sheets (some with videos) on the UMass and UConn Extension websites: http://ipm.uconn.edu/pa_greenhouse/ and http://extension.umass.edu/floriculture/fact-sheets/pest-management. Our greenhouse pest guide web-based app is another good resource with options for biological control. See: http://greenhousepestguide.umass.edu/.

Contact suppliers/distributors of biological control agents early, before the spring growing season. Most companies offer assistance either over the phone or through a regional technical representative to get you started and will help with release rates. Other considerations include having someone available when shipments arrive and checking shipments for viability (remember they are living organisms).

Here is a partial list of suppliers or distributors of natural enemies used by greenhouse growers in CT and MA:

IPM Laboratories, Inc., Lock NY, www.ipmlabs.com
Contact: ipminfo@ipmlabs.com
ph. 315.497.2063

Syngenta Bioline, CA, www.syngentabioline.com
Contact: info@syngentabioline.com
ph: 805-986-8265 or 978-851-4346 (Griffin Greenhouse Supply)

Koppert Inc. MI, www.koppert.com
Contact: info@koppertonline.com, 1800-928-8827

Biobest Biological Systems. www.biobest.be
Contact: info@biobest.ca or info@biobest-usa.com
ph: 519-322-2178, or 855-224-6237.

Beneficial Insectary, CA, www.insectary.com, www.greenmethods.com
Contact: info@insectary.com, ph 1-800-447-3715

Applied Bionomics, BC Canada, www.appliedbio-nomics.com
Contact: brianabl@telus.net, ph 250-656-2123

--Leanne Pundt, UConn Extension and Tina Smith, UMass Extension

ABOUT THE FSMA PROPOSED SUPPLEMENTAL RULE FOR PRODUCE SAFETY

SUBMIT YOUR COMMENTS BY DECEMBER 15, 2014!

On January 16, 2013, the United States Food and Drug Administration issued proposed rules regulating produce safety in the Food Safety Modernization Act. Several public meetings and over fifteen thousand comments received on the proposed rules prompted the issuing of a supplement to the proposed rules regarding produce safety. These proposed changes in the supplement address the application of raw manure, agricultural water quality and testing, impact on animal and wildlife habitats, withdrawal of qualified exemptions, specifics regarding farms excluded from the proposed rules and the packing and holding of raw agricultural commodities (RACs). Below is a *brief* summary outlining the revised proposed produce rule. **Please note: We encourage all stakeholders to review the updated revisions and make comments to the FDA before the comment period closes. The deadline is Monday, December 15, 2014!**

The initial proposed rules for **raw manure** application required a nine month waiting period between the application of raw manure on a field and harvesting of produce. Comments received on the proposed rules included the risk of a disruption of soil ecology and economic activity for farmers. The new proposed rules do not stipulate an appropriate time interval between raw manure application and harvest. The FDA is deferring a decision on this interval until scientific evidence and risk assessments can support an appropriate waiting period. The new proposed rules state: "At this time, the FDA does not intend to take exception to farmers complying with the USDA's National Organic Program standards, which call for a 120-day interval between the application of raw manure for crops in contact with the soil and 90 days for crops not in contact with the soil". The new proposed rules also eliminates the 45 day waiting period for compost applications due to compost being identified as a less risky practice than raw manure application.

The initial proposed rules allowed no more than a geometric mean of 126 CFU/ 100 ml of generic *E. coli* in **agricultural water** used for irrigation and crop protection. The initial rules also allowed no more than 235 CFU generic *E. coli* per 100 mL sample of agricultural water. The new proposed rules keep the geometric mean of 126 CFU/ 100 mL standard, however the 235 CFU in any single sample has been removed. The new rules state that a statistical threshold value (STV) of 90% cannot exceed 410 CFU of generic *E. coli* per 100 mL sample. This means that no more than 10% of samples taken can exceed 410 CFU of generic *E. coli*. The new proposed rules also offer alternative options when agricultural water does not meet these standards. A "die-off" time interval between last irrigation and harvest must be used before the produce can be harvested. A die-off time of 0.5 log reduction per day was proposed but allows for other "appropriate reduction rates". This time interval can also be applied to the time between harvest and the end of storage of the produce.

Testing standards in the initial proposed rules required that untreated and unprotected **surface water** be tested every seven days for microbial quality. Untreated ground water was require to be tested at the beginning of every growing seasons and periodically every three months during the season. Many comments received stated that these testing procedures would be excessively costly and that the water quality of surface water can be variable. The new proposed rules use a tiered approach to agricultural water quality testing by establishing a water quality profile. For untreated and unprotected surface water, the water quality profile is to be established near the harvesting period covering two years. An annual verification survey will be conducted to verify that water quality profile. The baseline established in the initial water quality profile must be re-established at least every ten years or sooner if required. For untreated ground water, the water quality profile baseline will be established by testing four times during the growing season. Annual testing will be conducted following the establishment of a baseline to verify the quality profile.

Standards regulating **domestic and wild animals** around produce were initially proposed to evaluate whether or not produce which has been intruded upon by animals can be harvested. It was also proposed that all possible measures should be taken to identify and not harvest any produce which may have been contaminated by animals. The new proposed rules add a provision stating that the "Regulation does not authorize 'taking' of endangered or threatened species…; or require measures to destroy animal habitat or exclude animals from outdoor growing areas". This provision addresses concerns that the prosed rules may have negatively impacted wildlife, especially endangered species.

The initial proposed rules outlined that there would be procedures for the **withdrawal of qualified exemptions** from the proposed rules. The new proposed rules clarify that before exemption is withdrawn, that other steps will be considered such as corrective actions taken by the farm or warning letters issued before exemption is withdrawn. The new proposed rules also provide notification to farms facing exemption and time to respond before exemption is withdrawn. A procedure

for having exemption reinstated is also included in the new proposed rules.

The new proposed rules change **which farms can be excluded from coverage by the proposed rules**. The previous version stated that farms with an average annual value of *food* sales of $25,000 or less would be excluded from the proposed rules. The supplement to these proposed rules changes this to say that an average annual value of *produce* sales of $25,000 or less will exclude the farm from these rules.

In the initial proposed rules, different requirements were outlined for **when a farm packs and holds its *own* raw agricultural commodities (RACs)** than when RACs are packed or held off the farm. The new rules acknowledge that holding and packing of RACs is a farming activity and extends its definition of farming activities to include packing and holding. This causes packing and holding of RACs off-farm to fall under the produce safety rules proposed therefore keeping the requirements the same for on-farm and off-farm packing and holding of RACs.

For more information:

- The Cornell Produce Safety Alliance hosted a one-hour webinar and teleconference with the FDA to discuss these changes, which included detailed information on the new proposed rules and was followed by a Q & A. Listen to an audio recording of this presentation at the Cornell PSA website.
- FDA Q&A regarding updated proposed produce rule: FDA Produce Rule Guidance Regulation
- Explanations of the key revisions at the FDA's FSMA website: FSMA Proposed Rules for Produce Safety.
- Vern Grubinger of University of Vermont Extension addresses his concerns with the new supplemental proposed rules in his fact sheet: Four Flaws of the FSMA Draft Rules for Produce Growers.
- The Massachusetts Farm Bureau Federation has issued this Action Alert: Keep Small Farmers and Food Producers in Business. It outlines their major concerns and includes a sample comment letter, and instructions for submitting comments on-line.

NOTE: Submit your comments in TWO places – on the Produce Safety Rule for farms and on the HARPC Rule for facilities. This is important because many of these issues affect both rules.
a) Produce Rule: http://bit.ly/produce-rule
b) HARPC Rule: http://bit.ly/facilities-rule (also known as the Preventative Controls Rule)

--by Joseph Habib, Amanda Kinchla, and Lisa McKeag, UMass Extension

News

From MA Ag Commissioner Gregory Watson in MDAR's October/ November Farm and Market Report:

> I learned that a number of Massachusetts farmers operate older tractors that lack protective structures. After consulting with staff and others I decided that we should join New York, New Hampshire, Vermont, Pennsylvania and Wisconsin and establish a ROPS Rebate Program. The ROPS Rebate Program will rebate 70% of the cost of purchasing and installing the ROPS (Rollover Protective Structure) up to $865 maximum rebate. This includes the cost of the ROPS (rollbar, ROPS with Awning or ROPS cab), shipping, and installation charges. ROPS Rebate Program staff will research the type of equipment needed, provide estimated costs as well as sources for purchasing ROPS and send this information to you. While we usually base the value of a particular program on the number of people who we anticipate will be impacted by it. If our involvement in the ROPS Rebate Program prevents even one serious injury it will be well worth the investment in my estimation.
>
> We hope to have the Massachusetts ROPS Rebate Program up and running and accepting applications as soon as we iron out final details. We will issue an e-Blast when we are able to accept applications. Meanwhile, please check the ROPS Program website for more details: www.nycamhoutreach.com/ropsr4u/

Upcoming events

UConn Extension: Growing Container-Grown Greenhouse Vegetables

When: Tuesday, December 16, 2014 from 9:00 am to 4:00 pm
Where: Litchfield County Extension Office, 843 University Drive, Torrington CT 06790

Sponsor: UConn Extension

Topics will include growing greenhouse tomatoes, cucumbers and greens, **Connecticut grown labeling**, food safety and grower to grower panel.
Contact Leanne Pundt, University of Connecticut at 860.626.6855 or leanne.pundt@uconn.edu for more information.

NOFA-MA Winter Conference

When: Saturday, January 10, 2015
Where: Worcester State University, 486 Chandler St, Worcester, MA 01602

Sponsor: NOFA-MA

The Northeast Organic Farming Association, Massachusetts Chapter (NOFA/Mass) invites you to its 28th Annual Conference, featuring over 60 workshops, exhibits, an all-day seminar and keynote by Greg Judy, rotational grazier and carbon sequestration advocate.

Including presentations by UMass Extension personnel:
Vegetable Diseases: 2014 Year in Review – Susan Scheufele, Vegetable Program
Organic Pesticide Safety & Use – Lisa McKeag, Vegetable Program; Natalia Clifton, Pesticide Education
Assessing and Managing Agricultural Risks on Your Farm – Paul Russell &Tom Smiarowski, Risk Management

Harmonized Good Agricultural Practices (GAP) Training Program

When: Tuesday, January 27, 2015 - 10:00am to 4:00pm

Where: Massachusetts Farm Bureau Federation Office

Sponsor: UMass Extension

At the training, you will learn more about: the costs and impact of diseases and outbreaks caused by food-borne pathogens; strategies for controlling potential microbial food safety hazards before planting and throughout all phases of production - planting, production, harvesting and postharvest handling; changes to the USDA GAP Program to reflect the Harmonized Audit; the Third Party Audit process; the MA Commonwealth Quality Program; the status of FDA draft regulations to implement the Food Modernization Act of 2010

You will also: receive a manual filled with GAP resources; receive a memory stick loaded with the GAP Manual and templates needed to maintain records to verify USDA GAP that can be customized for your farm; and receive a certificate of participation through UMass Extension. The key presenter for the training is A. Richard Bonanno, Ph.D., Extension Educator with UMass Extension. Registration cost is $50.00 for the first person, and additional employees are $10.00. Additional employees' cost includes the presentation and lunch, but not the GAP manual or memory stick. Space is limited. **Registration deadline: Tuesday, January 20.** For registration info please visit this website or contact Doreen York at 413-545-2254 or at dyork@umext.umass.edu.

Advanced Farm Management

When: Wednesdays January 28, February 4, February 11, and February 18, 2015 from 11:00am to 3:00pm

Where: Granite State College, Concord, NH

When: Thursdays March 19, March 26, April 2, and April 9, 2015 from 11:00am to 3:00pm

Where: Brigham Hill Community Farm, North Grafton, MA

Sponsor: UNH Extension

This workshop is for mid-career producers who are serious about building their financial management and strategic marketing skills. Participants will evaluate their businesses' overall financial condition and examine the costs and profitability of individual enterprises. With a handle on production costs, participants will be able to assess their marketing plans and options, revise their product mix, and project next year's profits and cash flow. Each location is limited to 25 participants to facilitate in-depth learning. We encourage multiple people from a farm to attend together.

This workshop series is for those serious about acquiring new skills they can apply immediately in their own farm operations. Participants will need to commit to attending the four sessions, completing homework assignments between sessions, and applying what they learn to their farm operations. To get the most value from this workshop series, participants will need to have a Profit and Loss Statement and a Balance Sheet for their farm. In addition to the four classes, there will be a weekly webinar for people to gain clarity and help with concepts from the previous class.

To apply for this program, please fill out the short questionnaire located at: http://tinyurl.com/nbh6nmk

Pre-registration cost: Application and $25 per farm

Pre-registration Deadline: Two weeks prior to start of session or until session fills (25 people).

Plant Nutrition and Organic Certification for Greenhouse Crops

When: Thursday, February 26, 2015 from 10:00 am to 1:30 pm
Where: D&D Farms Inc., 32 Hudson Rd., Stow, MA 01775

Sponsor: UMass Extens and the MA Flower Growers' Association

Cost: $30 (Includes Lunch); **Mail-in Registration:** Printable Program and Registration Form

For more information contact:
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Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and monthly during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.