The Produce Pages

Serving the fruit and vegetable growers of Eastern New York

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Evaluation of Exclusion and Mass Trapping as Cultural Controls of Spotted Wing Drosophila in Organic Blueberry Production

By Laura McDermott

This project, supported by a NESARE Farmer grant, investigated the use of exclusion netting and mass trapping as cultural techniques to mitigate the damage caused by Spotted Wing Drosophila (SWD). SWD proved to be unusually damaging to 2012 berry crops in the Northeast. Despite the fact that the planting in question is quite young, farmer Lawrie Nickerson decided to be proactive and investigate netting as a control method. Research

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The Produce Pages

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Contents

On the cover: Exclusionary netting on blueberries as part of a SARE funded research project led by Laura McDermott.

Image: Laura McDermott

Serving the educational and research needs of the commercial small fruit, vegetable and tree fruit industries in Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Montgomery, Orange, Rensselaer, Saratoga, Schoharie, Schenectady, Ulster, Warren and Washington Counties

Exclusion and Mass Trapping as SWD Cultural Controls in Organic Blueberry Production, continued from cover

papers translated from Japanese by Cornell graduate student Masanori Seto provided the necessary incentive.[1]

Unlike native species, SWD uses its saw-like ovipositor to deposit eggs in ripening fruit resulting in larval development inside the berry. Activity of the fruit fly corresponds to the ripening of blueberries, raspberries, day neutral strawberries and a variety of other cultivated and wild hosts. In 2012, levels of infestation reported state and region-wide ranged from 80-100% of fruit examined with individual fruit infested with as many as 25 larvae.

Traditional IPM, which relies on scouting to determine an economic threshold before pesticides are applied, has been temporarily abandoned. While monitoring for pest presence is still recommended, a 3-7 day insecticide spray schedule is currently the recommended management strategy. Organic berry growers are not inclined nor prepared to use insecticides at this frequency, and their customers are particularly concerned about pesticide use. There are very few organically approved pesticides available, making it difficult to properly rotate chemicals. This project evaluated the merits and costs of netting to exclude SWD from a blueberry planting, and attempted to evaluate mass trapping as an additional means of reducing SWD effects.

Protek insect netting 1.00mm x .85mm was used in the trial. This netting is 80% porous and has 83% light transmission capabilities. The suggested life of the net is 7 years but if stored well it may last several additional seasons. The net was hung over 1 row of 50 plants that is intersected midway with an aisle for a total of 300 linear feet. To separate the treatment replications within this row we used extra netting material fastened with pig rings. The treatments were netted after bloom and before berries began to color. The exclusion netting was hung over wires placed at a height of 6' to accommodate pickers. The wires, anchored to 2 H-braces at rows' ends, were supported by posts set strategically along the row. The net was weighted down with construction grade water hose. This may have been more than was needed since the net itself is fairly heavy, but this method prevented inadvertent ripping.

Netting and trellis system. ***Image: Laura McDermott***

Five year old 'Bluecrop' plants comprised the randomized treatments which were replicated three times. We evaluated exclusion alone and in combination with two different types of traps – unbaited red solo cups covered with tanglefoot and a yeast baited trap that uses vinegar as a drowning solution. The treatments were 1) netted 2) netted with sticky traps 3) netted with vinegar traps and 4) netted with weed mat. Lumite 994GC woven fabric ground cover made of UV stabilized polypropylene allows passage of water, nutrients and air while suppressing weeds. This treatment was added as an afterthought and not part of the original proposal. The netted treatment was replicated 3 times, the control portion was only replicated once.

The final treatment was the # 5) non-netted control with vinegar traps. Each treatment was composed of 3 plants and fruit data was hand harvested twice weekly from the middle plant in the group for three weeks during peak production. The harvested berries were examined for % SWD infestation, individual fruit quality and yield. The insect traps were checked and changed weekly and numbers of SWD and other insects were recorded. Light intensity and temperature under the nets was taken and compared to the untreated control on a weekly basis. Shoot regrowth in the netted, fabric mulch and control treatments will be evaluated during the spring of 2014.

The plants were treated consistently throughout the experiment. No sprays were used during the 2013

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Exclusion and Mass Trapping as SWD Cultural Controls in Organic Blueberry Production , continued from previous page

growing season except for a Neem application to control scale in the spring. All other cultural inputs were identical across all treatments and the control including pest control, fertilization, and irrigation. No frost control was necessary. Bird netting and deer fencing were in place for all treatments.

2014 prices for the 80 gr weight of 0.85mm x 1.00mm ProTek netting in the largest size possible of 13' x 328' is $665.00. Growers will need to sew the panels together in order to adequately net multiple rows.

SWD pressure was non-existent to very-low with only 3 females found in one control trap. As shown in Figure 1, the sticky traps and vinegar traps showed that the netting effectively excluded many other insects of similar and larger size. The sticky traps attracted a higher percentage of ants and crawling insects apparently not attracted to the yeast bait in the vinegar traps. Native drosophila were found in the control traps in very low numbers. No drosophilids were found in the traps in the netted treatments. Due to the low SWD pressure, we were unable to make any determination on the efficacy of mass trapping for SWD.

Fruit yield was not negatively impacted by netting or fabric mulch (Figure 2). Overall yield was slightly higher in some of the netted treatments.

Fruit quality was not negatively impacted by the netting. Fruit size was measured by using a caliper on 10 randomly selected fruit from each replication at each picking date. Those same berries were individually examined under a microscope for evidence of SWD oviposition and then they were crushed together for a % Brix reading using a hand held refractometer. As shown in Figures 3 and 4, % Brix was slightly higher in the netted treatments, but individual berry size was larger in the controls. There was no evidence of SWD oviposition in any of the berries examined throughout the trial.

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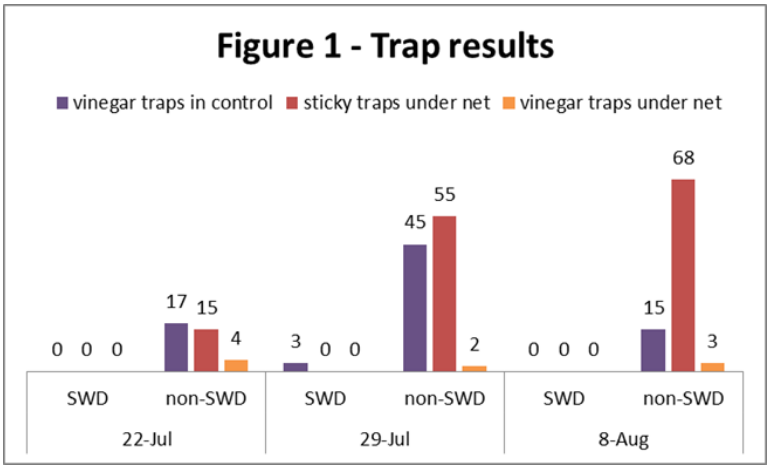

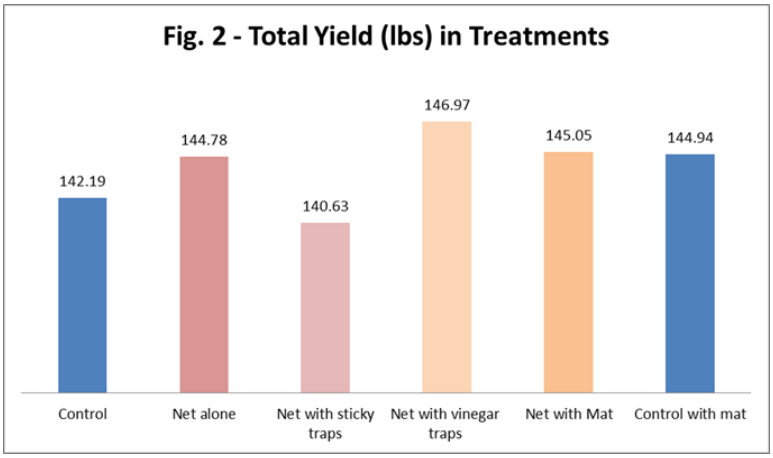

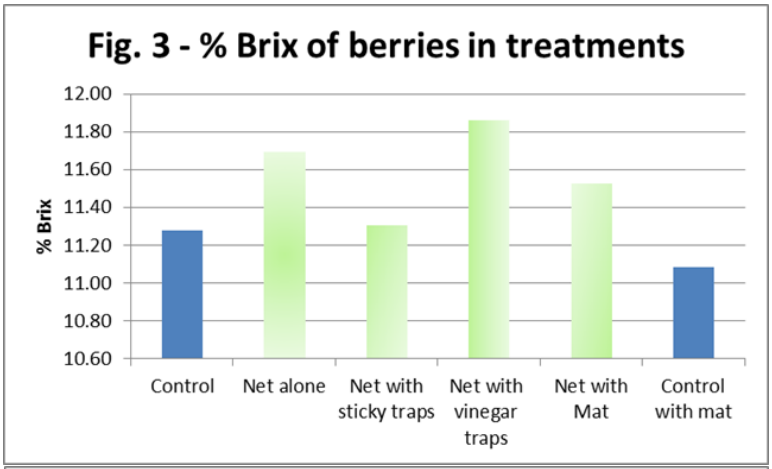

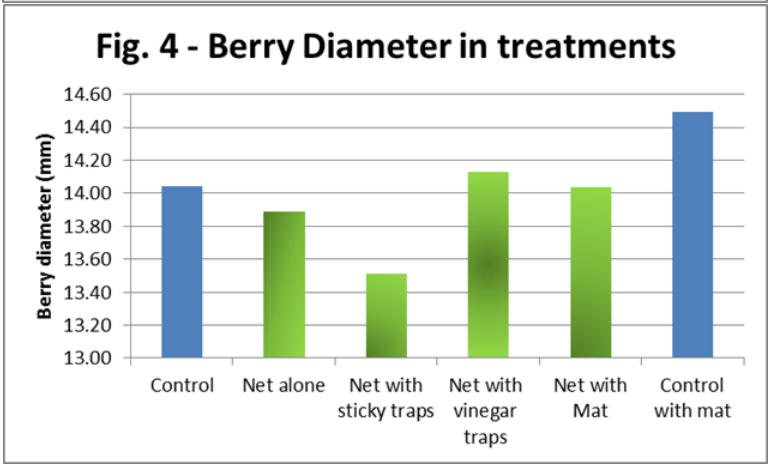

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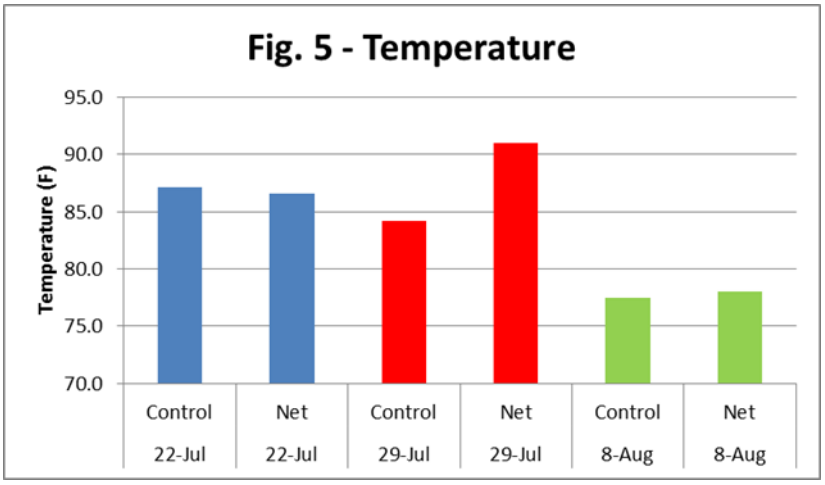
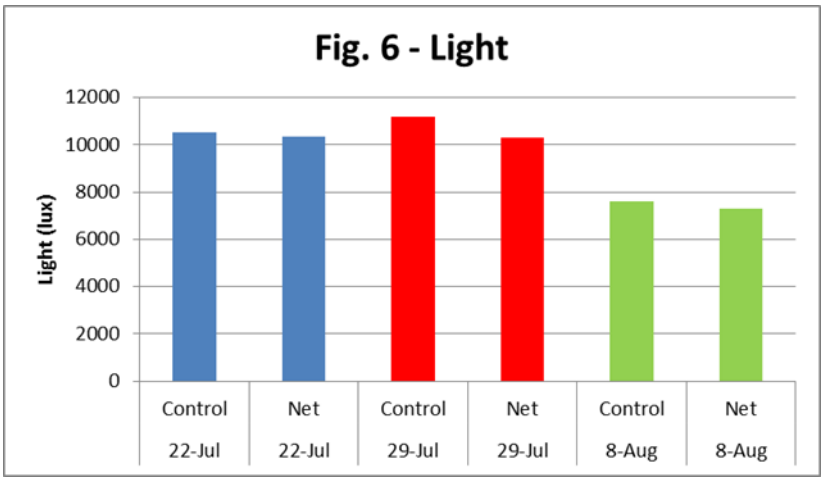
We were concerned about the effect of the net on light and temperature in the netted treatments. Temperatures were recorded weekly through the trial in each of the replications of the control and the netted treatment with no traps or weed mat. The temperature is slightly higher on two of the dates measured (Fig. 5) and the light is slightly lower in all three of the dates measured (Fig. 6). These differences do not correlate with fruit quality and appear from this one season of observation to be insignificant. Light under the net – despite the 85% transmission rating – was still good most likely because the white color allowed it to get reflected throughout the netted area. This characteristic might be reduced as the netting ages. An observation made by pickers was that the netted treatments, especially the netted treatment with weed mat, ripened earlier by a few days than did the control.





No measurements have been made yet on shoot regrowth although visual observation does not indicate any difference in habit.

The weed mat did not have much impact on the data, although shoot regrowth over time will have to be monitored. One aspect that the grower really liked was that dropped berries could be very easily removed from planting simply with a broom and dustpan unlike the more problematic bark mulch. The grower is also hoping that fabric mulch will reduce the humidity caused by weeds thus discouraging SWD.

The cost of covering an acre of blueberries with insect netting would likely range from $7000 to $9000 depending on the support system used. The life of the net is 7 years, so the amortized cost of an $8000 investment would be $1143/year, not including labor. Given that estimates for annual increases in cost of production per acre to control SWD range from $36 to $290 [2], netting blueberries may be a viable strategy for organic or small acreage plantings. Those growers that do not have bird netting in place might want to track the reduction in bird damage as a result of having insect netting installed. The yield improvement realized from reducing bird damage might be enough to encourage netting as a sustainable option for SWD management.

[1] Netting control of *Drosophila suzukii* by Chiba Prefectural Agriculture Research Center & Chiba Industrial Technology Research Institute - Translated by Masanori Seto.

[2] Spotted wing drosophila impacts in the eastern United States. Developed by the eFly: Spotted Wing Drosophila Working Group. http://www.sripmc.org/WorkingGroups/eFly/Impacts%20of%20SWD%20in%20the%20Eastern%20US%202012.pdf

Advanced Lines from the Cornell Potato Breeding Program

By Walter DeJong, Cornell, 12/3/14 (edited by Carol MacNeil, CCE, Cornell Vegetable Program)

(This is a summary of info presented by Walter DeJong, Cornell potato breeder, at the Dec. 3 Cornell Potato Variety/Line Show & Tell in Ithaca. Some NY potato certified seed growers may have seed, or very small quantities may be available from Cornell on request. Contact Chuck Bornt at 518-859-6213 or email cdb13@cornell.edu). For the New York Certified Seed Potato 2014 Crop Directory, Grower Info and Varieties Grown, go to: http://rvpadmin.cce.cornell.edu/uploads/doc_49.pdf The info below is based on research trials conducted at Cornell farms, and in growers' fields, by Walter DeJong and Don Halseth, Cornell. When trying a new variety always do so on a small scale!)

NY140 *(NY121 x NY115, 1998)*. Late season; dual purpose chip and tablestock. High yields of large tubers; lightly textured skin. Susceptible to common scab, comparable to Katahdin.

- Tuber dormancy about 6 weeks longer than Atlantic. Specific gravity has averaged 0.012 less than Atlantic, which will limit where it can be grown for chips. Chip quality has generally been somewhat better than Snowden. Good resistance to blackspot bruise. Some internal necrosis and hollow heart.
- Resistant to races Ro1 and Ro2 of the golden nematode. Moderate resistance to late blight as well as early blight in PA trials in 2007 - 2009.

Image courtesy of Carol MacNeil, CCE Cornell Vegetable Program

NY141 *(R6-4 x NY115, 1998)*. Early to mid-season tablestock, large, tubers not as bright white as some.

- Tompkins County marketable yields over 12 years have averaged 99% of Atlantic.
- Wayne County (muck) yield over four years averaged 99% of Atlantic.
- Typically 2 to 3% knobs. Sets about 7 tubers per ft, with an average weight of 6.1 ounces. Tuber dormancy - 2 weeks longer than Atlantic. Very good resistance to blackspot bruise.
- Good resistance to common scab. Resistant to race Ro1 of the golden nematode.

NY148 *(NY128 x Marcy, 2003)*. Late season, high gravity chipstock, quite susceptible to blackspot bruise

- Tompkins County yields over seven years, 16 trials, averaged 112% of Atlantic.
- Wyoming and Steuben County yields over five years averaged 96% of Atlantic.
- Tuber size similar to Snowden. In 2010 in one trial, two-thirds of tubers exhibited internal necrosis. Scurfy skin. Tuber dormancy comparable to Atlantic. Chip color from 44°F storage not quite as good as Snowden.
- Good resistance to common scab to date. Resistant to potato virus Y. Some resistance to early and late blight in PA in 2012. Resistant to race Ro1 of the golden nematode.

NY150 *(NY121 x Salem, 2005)*. Niche market, early season tablestock. Produces many small tubers with bright white skin. Need closer chains to harvest.

- In 13 Tompkins County trials yields, tubers 1 – 1.9" averaged 171 cwt/acre; between 1.9 – 2.5" averaged 152 cwt/acre. Only 17 cwt/acre over 2.5".
- Wayne County in 2014, tubers 1 – 2.5" yielded 309 cwt/acre.
- Few internal or external defects, and retain appearance after long storage. Specific gravity averaged 0.010 less than Atlantic.
- Intermediate reaction to scab. Resistant to potato virus Y. Some resistance to late blight in PA in 2012

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Advanced Lines from Cornell Potato Breeding Program, continued from p. 6

and 2013. Resistant to race Ro1 of the golden nematode.

NY151 *(NY121 x Salem, 2005).* Late season, white tablestock with good yield and relatively smooth skin.

- Tompkins County marketable yields over five years averaged 106% of Atlantic.
- Low levels of defects, but 23% brown center in one trial out of ten in 2014. Specific gravity is low. Tubers do not darken or slough appreciably after boiling. Tuber dormancy comparable to Atlantic.
- Moderate resistance to common scab. Resistant to race Ro1 of the golden nematode. Moderate resistance to late and early blight.

NY154 *(B38-14 x Marcy).* Late season chipstock, good chip color, better than Snowden, good yield, few defects. Specific gravity 0.007 less than Atlantic. Good resistance to scab. **Susceptible to race Ro1 of the golden nematode.**

What is it with Nectria Twig Blight this Year?

By Dan Donahue, CCE ENYCHP

Nectria Twig Blight has been a common find in orchards this year. While not as initially devastating as fire blight, *Nectria cinnabarina,* the fungal cause of this disease, can severely debilitate a tree if infections are allowed to spread over time. It is important branches infected with either of these diseases be pruned out of the tree, and removed from the orchard whenever possible.

This disease is considered to be a parasite of wounded plant tissue. An apple stem that remains attached to the tree after the apple is harvested is the most common site of an infection. However, winter-injured tissue is also very susceptible to infection. The classic shepherds-crook appearance of an infected twig is indicative of both Nectria Twig Blight (NTB) and Fire Blight (FB), but in the case of NTB the infection will have started at the base of the twig and have progressed toward the tip. Bright orange/pink/coral fruiting bodies may be observed at this basal infection site.

Lenticels which seem to be enlarged, even scale-like in appearance, are symptoms of a particularly severe infection. A suspicious-looking twig or branch, when placed in a plastic bag in the refrigerator for 24 hours, may express reproductive structures called conidia, giving the lenticels a velvety appearance under a low-power microscope or hand lens.

NTB is commonly associated with the Rome variety. However, other varieties are susceptible under the right conditions, including Empire and McIntosh. The 2014 growing season was just that sort of year. However, there is more to the Nectria story. Since the fungus infects via damaged tree tissue, it may not have been the 2014 "growing" season that was the problem so much as the 2014 "dormant" season. Last winter was bitterly cold at times, and saw some instances of significant temperature variability, extreme highs quickly followed by extreme lows. Many suspected that a fair amount of winter injury to tree tissue had occurred, how this injury is expressed is not always clear. Frost damaged blossoms will strike you like a punch in the nose, leaving no doubt in your mind what just happened. On the other hand, winter damage to plant tissue is much more subtle. Perhaps the widespread occurrence of NTB this past growing season, and that we have seen infections in varieties other than Rome, is an indirect indicator of widespread cold weather injury in our Hudson Valley orchards.

The orange fruiting bodies of severe Nectria Twig Blight *Nectria cinnabarina.*
Photo by Dan Donahue

It is interesting to speculate on what really happened with NTB this past year, but that is all it is. In fact, we really don't know all that many facts about this disease. It is clear that given the right conditions of extensive inoculum and severe environmental conditions, apple trees can be severely damaged over time.

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What is it with Nectria Twig Blight this Year? continued from previous page

Unfortunately, there isn't an easy fix here. There are no chemical controls that have been shown to effectively control the disease. Removal of infected shoots and cankers 12" below the last visible expression of the disease is the general recommendation. These pruning's must be removed from the orchard.

This tree is expressing symptoms of a severe Nectria infection.

Since this fungus finds its infection sites in damaged plant tissue, it would be logical to avoid further damaging the plant tissue of infected trees, or susceptible varieties. Directing harvest labor to avoid allowing stems to remain attached to the tree is one step to take. Tissue damage can also occur if a tree is pruned too early in the winter season, before there has been sufficient cold weather to properly "harden off" the tree. Slight tissue growth in response to a fresh pruning cut will increase the risk of injury later in the winter. A brief review of average temperatures this November through mid-December indicates that our daily average temperatures have been a running 5.2 degrees warmer for December when compared to 2013 (albeit a similar amount colder than 2011 and 2012). Caution is recommended when choosing which blocks to prune when. Save your Romes and any other blocks where you observed Nectria infections for later during the pruning season so as to avoid creating more opportunities for the NTB fungus to infect.

Eastern NY Winter Fruit Schools

The ENY fruit team will be offering four days of winter meetings covering the most recent information on research, horticultural practices, business, new products, and industry topics. Speakers will include Cornell faculty, industry representatives, and other specialists. This will also be an opportunity to earn DEC credits.

Monday February 9th – Lake George **Tuesday-Thursday, February 10-12th – Hudson Valley**

More information, including event registration, is available on our website at http://enych.cce.cornell.edu/.

For additional questions or to register please contact
Marcie Vohnoutka 518-272-4210 or email mmp74@cornell.edu.

Thoughts on Using Organic Fertilizers for Greenhouse Plants

By Douglas Cox, Stockbridge School of Agriculture, UMass
published in UMASS Vegetable Notes, Volume 26, No. 25 12/11/14

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 watersoluble 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

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Using Organic Fertilizers for Greenhouse Plants, continued from previous page

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.

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Thoughts on Using Organic Fertilizers for Greenhouse Plants, continued from previous page

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.
Verdante 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 Greenhouse Supply. 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 a good supplement to use in combination with other organic fertilizers low in N or K. Available from Griffin Greenhouse Supply. 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. OMRI listed.

Mustard as a Biofumigant Cover Crop

By Katie Campbell-Nelson, Susan Scheufele, Lisa Mckeag, Ruth Hazzard and Neal Woodard. Published in UMASS Vegetable Notes, Volume 26, Number 25 December 11, 2014)

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

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.

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

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.

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

continued on next page

Mustard as a Biofumigant Cover Crop, continued from previous page

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

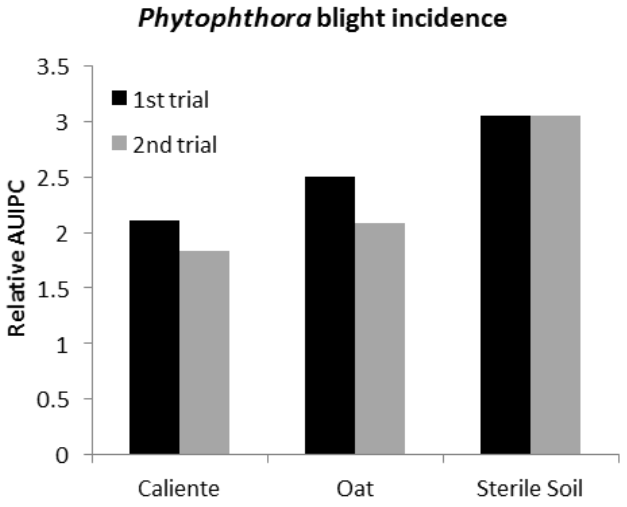

Figure 2. The area under incidence progress curve (AUIPC) is a quantitative summary of disease intensity over a month long period after pots were inoculated with *P. capsici*. There were no significant differences among the treatments in either trial.

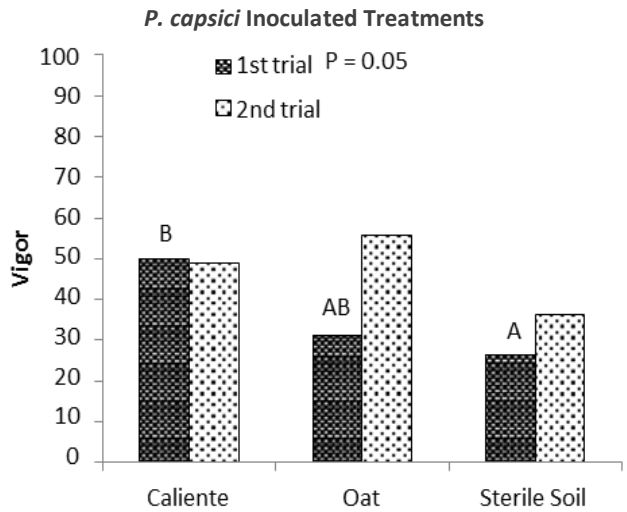

Figure 3. Vigor differences were observed 12 days after inoculation with *P. capsici* in both trials, but significant differences were only observed in the first trial.

Mustard as a Biofumigant Cover Crop, continued from previous page

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.

For more information please contact Katie Campbell-Nelson (kcampbel@umass.edu). Funding for this project was provided by a grant from USDA NIFA.

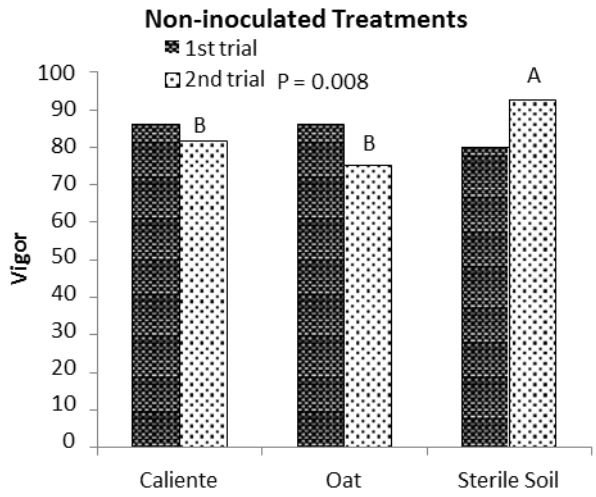

Figure 4. Significant differences in vigor were observed among non-inoculated treatments in the second trial but not in the first trial.

Eastern NY Commercial Horticulture Website

For event announcements, previous issues of our newsletters and more, please visit the ENYCHP team's website: http://enych.cce.cornell.edu/.

We hope you bookmark it on your computer and use it as your 'go to' website for production and marketing information.

Contact any of the educators with questions or comments on the website – we want to make it work for YOU!

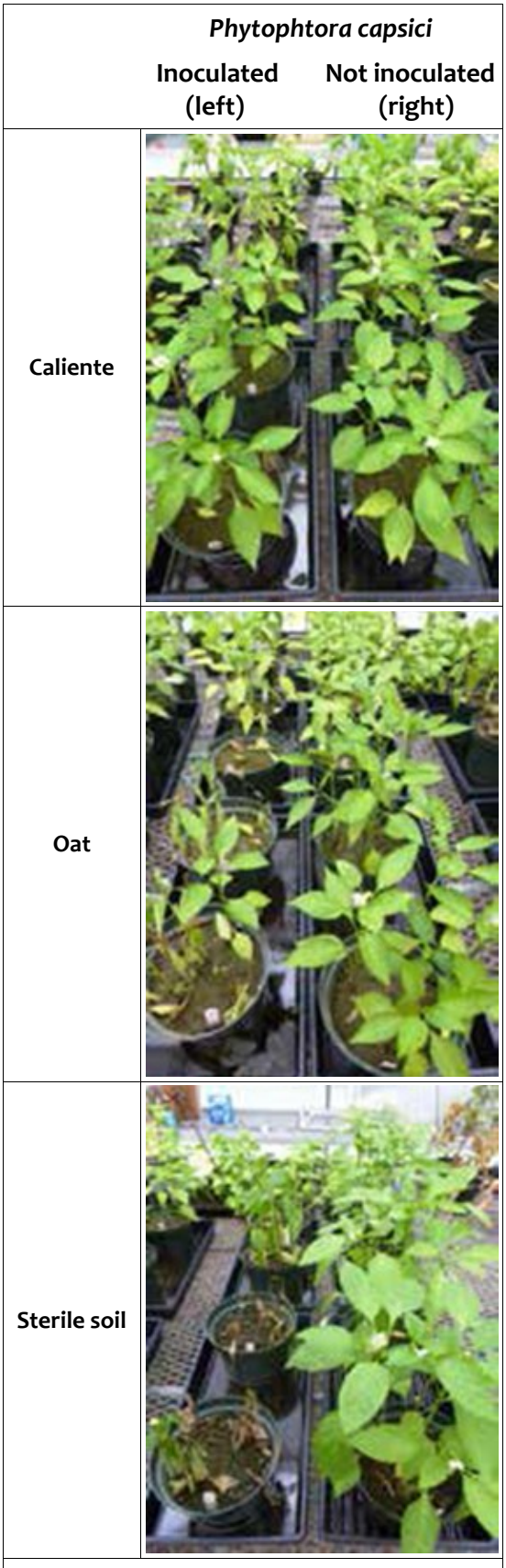

Figure 5. Differences in vigor including canopy coverage and plant color were observed among treatments. This photo was taken 26 days after inoculation in the second trial.

Invasive Bug Prompts Quarantine In Pennsylvania Townships

By Bill Chappell, NPR, in Capital District Growing Trends, November 2014, Volume 18, Issue 11

The spotted lanternfly has officially arrived in the U.S., and leaders in Pennsylvania are hoping it won't be staying long. The invasive pest poses a threat to fruit orchards and grape vines, along with forests and the timber industry. It was detected in Berks County, northwest of Philadelphia.

"Berks County is the front line in the war against Spotted Lanternfly," Agriculture Secretary George Greig said in a news release. "We are taking every measure possible to learn more, educate the public and ourselves and eliminate this threat to agriculture."

The spotted lanternfly, or Lycorma delicatula, is native to parts of China and eastern Asia. It attacks trees by feeding on sap and harms them further by excreting large amounts of a fluid that coats leaves and stems and encourages the growth of mold, according to researchers.

Pennsylvania announced both the insect's discovery and a quarantine to contain it in a bulletin Saturday, saying that in the U.S., the spotted lanternfly "has the potential to greatly impact the grape, fruit tree and logging industries." The agriculture agency added that along with pines and stone fruit trees (such as peaches), the pest attacks "more than 70 additional species."

When officials declared a quarantine for the Pike and District townships in Berks County, they also urged citizens to help look for both mature insects and egg clusters. Adult spotted lanternflies begin to lay their eggs around September; nymphs emerge in the spring.

The state explains what its action entails: Greig said, "We know we're asking a lot, but we know Pennsylvanians will assist us and help save our fruit trees, grapes and forests."

An adult spotted lanternfly is seen, its wings spread to show a colorful hind wing. The invasive pest has sparked a quarantine in Pennsylvania. *Holly Raguza/PA Dept of Agriculture*

A research paper about the bug's spread in Korea explains why it can be tough to control: "Furthermore, no natural enemy of L. delicatula seems to exist in Korea. Thus, farmers use pesticides to control them in vineyards (Park et al. 2009). However, the use of pesticides kills natural enemies of other grape pests and L. delicatula can repopulate pesticide-sprayed areas from nearby forested areas, which contain suitable host species."

The study's authors recommended using sticky traps at the base of trees that can host the insects. Here are some of the plants the bug particularly likes, according to the researchers: *Ailanthus altissima* (tree of heaven), *Evodia danielii* (Korean evodia), *Parthenocissus quinquefolia* (Virginia creeper), *Juglans mandshurica* (Manchurian walnut) and *Vitis vinifera* (the common grapevine).

Expanded Protection for Specialty Crops

By Anna Wallis, adapted from USDA FSA News Release No. 0269.14, Dec. 12, 2014

The Non-insured Crop Disaster Assistance Program (NAP), a program provided by the USDA under the Farm Bill, traditionally covers commodity crops—i.e. corn and soy. In a press release today, USDA announced coverage will expand to include many fruit, vegetable, and other specialty crops.

In the event of a natural disaster causing crop damage expected to exceed half of expected production, farmers growing eligible crops could apply for coverage at 55% of the average market price for crop. The new protections also offer expanded coverage options: up to 65% expected production at full market value.

Tom Vilsack, Agriculture Secretary, made the announcement Dec 15th. "These new protections will help ensure that farm families growing crops for food, fiber or livestock consumption will be better able to withstand losses due to natural disasters," said Vilsack. "For years, commodity crop farmers have had the ability to purchase insurance to keep their crops protected, and it only makes sense that fruit and vegetable, and other specialty crop growers, should be able to purchase similar levels of protection."

Farmers also have access to a new online tool to help understand NAP and their coverage options. The tool was developed by the USDA in partnership with Michigan State University and University of Illinois. By providing some basic information on your location, crop, and farming practices, the tool quickly returns information on eligibility, premium, and payments.

The tool can be accessed from the FSA Disaster Assistance Website: http://www.fsa.usda.gov/FSA/webapp?area=home&subject=diap&topic=nap.

USDA to Gauge Farmland Ownership and Farm Economics

Press Release of December 17, 2014 from USDA National Agricultural Statistics Service

The U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) will begin surveying farmland owners to measure financial impacts and challenges of land ownership. Landowners will begin receiving forms for the survey, called Tenure, Ownership, and Transition of Agricultural Land (TOTAL), by the end of December.

"The recent Census of Agriculture counted more than 6.5 million acres of land that were rented or leased in the Northeast Region, but it has been more than a decade since NASS spoke to landowners themselves," said King Whetstone, director of the NASS Northeastern Regional Field Office. "I hope all who receive TOTAL surveys will respond to help update landownership information. The data will ensure that all decisions impacting the Northeast Regional farmland is based on accurate information that comes directly from the source."

TOTAL is a part of the Census of Agriculture program, which means response to this survey is mandatory. The TOTAL survey program will collect data from both farm operators and landlords who are not farm operators to create a complete picture of farm costs, land ownership, demographics about farm operators and landlords, and improvements made to farmland and buildings, among other characteristics. More than 80,000 farmland owners and producers across the United States will receive TOTAL forms, including 5,380 in the Northeast Region.

"This survey is lengthy and we realize some producers and landowners may have questions or need clarification," explained Whetstone. "In February, our interviewers will begin reaching out to those producers and landowners who have not yet responded to answer any questions they may have and help them fill out their questionnaires."

In addition to accurate data, NASS is strongly committed to confidentiality. Information provided by respondents is confidential by law. The agency safeguards the confidentiality of all responses, ensuring no individual respondent or operation can be identified.

NASS will publish results of the TOTAL survey in its Quick Stats database in August 2015. Quick Stats is available online at http://www.nass.usda.gov/Quick_Stats. NASS will also publish the economic data gathered in the annual *Farm Production Expenditures* report on August 4, 2015. All NASS reports are available online at www.nass.usda.gov.

Are You Applying the Proper Water Volume with your Herbicides?

By Kristen Callow, Weed Management Program Lead - Horticulture, OMAFRA

Why is water volume so important when you apply herbicides? Inadequate spray volumes will result in poor coverage of the herbicide on the weed surface. Herbicide coverage is critical because the spray solution acts as the carrier of the herbicide active ingredients that are absorbed by the weeds causing death. Weed density, environmental conditions, and growth stage of the weeds should be determined prior to making applications.

Higher water volumes are usually required for contact herbicides (Group 6, 10, 14, 22 and 27), particularly when:

- spraying a pre-seed burn off when weeds are small
- spraying through a dense canopy
- spraying later in the day or evening when weed leaves may not be as horizontal to intercept the herbicide

Follow label directions to maximize herbicide performance.

Table 1. Water Volumes for the Best Herbicide Results

Herbicide Group	Site of Action	Herbicide Example	Water Volume** for Best Results (Imp. gallon/ac)
1	Inhibitors of acetyl CoA carboxylase **(ACCase):**	Assure II, Excel, Poast Ultra, Select, Venture	10.7 – 42.8
2	Inhibitors of acetolactate synthase **(ALS)** and also called acetohydroxyacid synthase **(AHAS)**	Prism, Pursuit	10.7 – 42.8
3	Microtubule assembly inhibitors	Prowl H_2O	21.4
		Treflan	10.7
4	Synthetic auxins	2,4-D, Dicamba, MCPA	10.7 – 48.2
5	Inhibitors of photosynthesis at photosystem II, Site A	Princep Nine-T	32.1
		Sencor, Sinbar	16 – 32.1
6	Inhibitors of photosynthesis at photosystem II, Site B	Basagran	10.7 – 42.8
7	Inhibitors of photosynthesis at photosystem II, Site B (alternate binding site)	Lorox	10.7 – 74.9
9	Inhibitors of 5-enolpyruvylshikimimate-3-phosphate synthase (EPSP)	Round-up (glyphosate)	5.3 – 53.5
10	Inhibitors of carotenoid biosynthesis	Ignite	18.2 – 117.7
13	Diterpene synthesis inhibitor	Command	10.2 – 40.1
14	Inhibitors of protoporphyrinogen oxidase (Protox)	Aim, Chateau, Goal 2XL	10.7 – 53.5
15	Conjugation of acetyl co-enzyme A	Dual II Magnum	16 – 42.8
20	Inhibits cell wall synthesis Site A	Casoron	Non specified
22	Photo system I – electron diverters	Gramoxone	20 – 117.6
29	Inhibitors of cellulose biosynthesis	Alion	Minimum 9.95

*Conversion factor: Multiply gal/ac by 9.35 to get L/ha

**Volumes on herbicide labels vary based on crop type, crop growth stage, weed type and weed growth stage

Pesticide Registrations and Updates

From Mike Helms, Extension Support Specialist/Managing Editor, Pesticide Management Education Program (PMEP), Cornell University

The NYS Department of Environmental Conservation has recently approved the following pesticide product registrations:

- Protexio Fungicide (EPA Reg. No. 59639-179) which contains the active ingredient fenpyrazamine. This is the first product registered in New York State with this active ingredient. A group 17 fungicide, it is labeled for use on almonds, bushberries, caneberries, ginseng, lettuce (head and leaf), low growing berries, pistachios, and vine climbing small fruit (except kiwi) to control diseases caused by Monilinia, Botrytis, and Sclerotinia.
- DuPont Aproach Fungicide (EPA Reg. No. 352-840) which contains the active ingredient picoxystrobin. This is the first product registered in New York State with this active ingredient. This group 11 fungicide is labeled as a broad spectrum fungicide for the control of foliar and soil-borne plant diseases with preventative, curative, and systemic activity in canola, cereal grains (except rice), sorghum, corn, legumes, dried shelled beans, peas, and soybeans. Aproach is a restricted-use pesticide in New York State, is not for use in Nassau and Suffolk Counties, and requires a 100 foot set-back from aquatic habitats when applying with aircraft.
- Cidetrak DA MEC (EPA Reg. No. 51934-12) which contains the active ingredient 2, 4-decadienoic acid, ethyl ester, (E,Z). This product is labeled as an enhancement for mixing with insecticides or codling moth pheromone formulations applied to apple, pear, and walnut orchards for control of codling moth.

Copies of the approved labels for Protexio and Aproach are currently available on PIMS. The CideTrak DA MEC label should be available shortly.

In Memoriam

We wanted to recognize the passing of our friends and members of Cornell Cooperative Extension, Cathy Heidenreich and Roy Ellerbrock, as well as the passing of leader of the grape industry in Northeastern New York, Rob McDowell. Many of us experienced the loss of friends and family this year, and we extend our sympathies for the losses and our appreciation for the many ways these people have touched our lives.
-Crystal Stewart, CCE ENYCHP

Rob McDowell – North Country Grape Industry Pioneer

By Anna Wallis, CCE ENYCHP

A sad event occurred in the grape community this month. On Saturday, Dec. 13th, Rob McDowell, one of the founders of the grape and wine industry in the North Country, passed away. Rob was a visionary man who was instrumental in pioneering the industry. His death comes after a yearlong battle with cancer.

Rob was the former chairman of the Lake Champlain Grape Growers Association and had been growing several of the cold-hardy grape varieties in his own vineyard. Along with Tim Martinson, Anita Deming, Will and Kathy Reinhardt, Kevin Iungerman, and Richard Lamoy, among others, Rob was very involved in the establishment of the variety trial and research vineyard planted at the Willsboro Research Farm (formerly Baker Farm), in Clinton County.

From his obituary:

"Rob was a patient teacher who could concisely explain the essentials of how things work, and his family benefitted from his love and understanding of cooking, conservation, boats, agriculture, and all things mechanical.

A celebration of Rob's life will be held in the spring with a date to be announced. Donations in his memory may be made to the Elmore SPCA in Peru, NY." Rob will be deeply missed by the community. Our thoughts go out to his family and friends.

Mary Catherine (Cathy) Heidenreich - May 30, 1958 – December 16, 2014

Cathy Heidenreich was born in Camden, NY to the late Ralph and Mary Oyer Matteson. She died from injuries sustained from an automobile accident.

She received her Bachelors from the University of Rochester as a French Language honors scholar, and Masters from SUNY College of Environmental Science and Forestry in Syracuse. She was employed since 1986 by Cornell University in Geneva and Ithaca as an Extension Support Specialist in the Agriculture and Life Sciences Departments' of Horticulture and Plant Pathology. Cathy was very humble, but took great pride and joy in her work with berry growers and Extension agents throughout the state and region. She was an integral developer of the Cornell Berry Website and the on-line Berry Diagnostic Tool. She wrote for and edited the NYS Berry Newsletter which was delivered electronically to several thousand subscribers across the country. She worked on research projects that covered every facet of berry production – from her favorite topic, berry diseases – to those topics that she found more challenging including berry nutrition and business management. She truly enjoyed helping others, both professionally and personally, and was one of the kindest people you could ever meet. She was always there in a heartbeat to help with projects, offer an ear, or provide moral support. In her own words, she expresses what's important to her:

"Is plant pathology my life? An integral part, of course, but not the be all and end all by any means. I have a heavenly Father who meets my every need, a wonderful husband who is the light of my life, a loving family, a wonderful church and three ornery cats who make every day interesting, to say the least. What do I do when I'm not at work? Pray, spend time with my husband, read, watch birds, garden, quilt, hike, camp, bicycle, walk, play the recorder, and enjoy life to the fullest!"

Cathy is survived by her husband Gregg of Lyons, NY and brother, David and his family of Camden, NY along with many aunts, uncles, nieces and nephews. She is also survived by many colleagues and growers who truly enjoyed knowing and working with her.

Remembering Roy Ellerbrock

LeRoy August Ellerbrock, 72, Associate Professor at Cornell's Department of Horticulture for many years, passed away unexpectedly at his home on December 12, 2014 after a brief illness. Roy grew up on his parents' family farm in New Cleveland, OH. There he did the usual chores, helped to tend his father's large truck garden, and organized baseball games with neighbor boys in nearby fields. Roy went on to graduate from Miller City High School where he was captain of the basketball team and president of the Class of 1960. Roy studied Russian and botany at The Ohio State University, graduating Phi Beta Kappa. His studies were interrupted by service in the US Air Force, stationed at Fliegerhorst Army Air field near Hanau, Germany. Roy received his PhD in Plant Pathology from Cornell University. He worked in Chicago as a plant pathologist for the USDA and Santa Fe Railway before returning to Ithaca to teach in the Department of Vegetable Crops at Cornell. His long career included research and extension work with onion growers across New York, as well as teaching classes in vegetable crop production. He retired in 2003 and devoted his time to his many passions.

Roy was the Cornell liaison to the NYS Vegetable Growers for many years and was a key part of the establishment and growth of the statewide Vegetable Growers Meeting starting in the 1980's. Roy had a passion for teaching and remembered not only student's names years later, but could describe their personalities and interests. He certainly fostered a love of gardening and vegetable production in an entire generation of students.

Roy is survived by his wife of 32 years, Eileen Bach; his beloved children, Tanya (Jacob) Bitterman of Rockville, MD; Robyn Ellerbrock of Urbana, IL; Bryan Ellerbrock of Ithaca, NY; and his adored granddaughter, Leah Bitterman;. In lieu of flowers, memorial contributions may be made to Cornell Plantations.

2015 Garlic Schools: Two locations to choose from

Wednesday, February 11th from 10am-3pm
CCE Saratoga, 50 W. High St, Ballston Spa, NY 12020

Thursday, February 12th from 10 am-3 pm
Hudson Valley Lab, 3357 US 9W, Highland, NY 12528

This year's garlic schools will have a broad focus on disease, insect and weed pests that growers are already dealing with or that may show up in New York from other parts of the country. Cornell pathologists and growers will discuss the latest research on Aster Yellows, a disease which has devastated the garlic industry in the Midwest, and the soil-borne diseases such as Fusarium. The latest fertility and weed control research will also be presented.

For additional questions or to register please contact Marcie Vohnoutka 518-272-4210 or email mmp74@cornell.edu.

B.E.V. NY 2015: Business, Viticulture, Enology

February 26 - February 28
RIT Inn & Conference Center
5257 West Henrietta Road, Henrietta, NY 14467

Last year the New York Wine Industry Workshop and the Finger Lake Grape Grower Conference joined forces to become B.E.V. NY. This event is focused on providing the New York grape and wine industry with the most current and relevant evidence-based information. Presentations will be given by Cornell scientists and other regional experts.

For more details and registration information go to http://flgp.cce.cornell.edu/event.php?id=162 or call Karen Gavette at 315-536-5134.

1st Annual Hudson Valley Value-Added Grain School

February 6, 2015 from 10am-3pm

Anthony's Banquet Hall
746 Route 23B in Leeds, NY

Join CCE Ulster County and the Capital Area Agriculture and Horticulture Program for this event in Leeds, just off the Catskill exit on the NYS Thruway (centrally located between Orange and Washington Counties).

Featured speakers will be grain drying and storage specialist Dr. Kenneth Hellevang of North Dakota State University, and farmer Thor Oechsner of Oechsner Farms, a 1,200-acre certified organic operation in Newfield, NY producing 8 different grains for local markets in a 6-7 year crop rotation. Extension Educators Justin O'Dea and Aaron Gabriel will also discuss considerations for getting into grain production, grain physiology and crop growth stages. The school will provide a networking opportunity for stakeholders, and target helping current and aspiring grain growers produce quality grain for a bourgeoning market of artesian bakers, craft beer brewers and distillers, and chefs hungry for locally grown grain.

Cost: Registration for Grain School is $40 per person. Catered lunch is included.

Trade Show: There is a $25 vendor fee for a table – vendors must also pay event registration fee.

Trade show and check-in begins at 9:15 AM. For more info. and to register go to http://tinyurl.com/GrainsSchool or contact Carrie at 845-340-3990 ext. 311 or cad266@cornell.edu. Sorry-no refunds.
Registration deadline 2/2/15. Register early as space is limited, and we need a head count.

The Cooperative Extension Association
of Rensselaer County
Agriculture and Life Sciences Building
61 State Street, Troy, NY 12180

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Permit #937

UPCOMING EVENTS

February 6 in Leeds, NY **1st Annual Hudson Valley Value-Added Grain School** *See page 5 for details.*

February 9 in Lake George, and February 10-12 in the Hudson Valley **Eastern NY Winter Fruit Schools** Research, horticultural practices, business, new products, and industry topics. *See page 8 for details.*

February 11 and 12 **Garlic School** Feb. 11 at CCE Saratoga, and Feb. 12 at the Hudson Valley Lab in Highland. Broad focus on disease, insect and weed pests *See page 19 for details.*

February 26 - February 28 in Henrittea, NY **B.E.V. NY 2015: Business, Viticulture, Enology** Providing the New York grape and wine industry with the most current and relevant evidence-based information. *See page 19 for details.*