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Quote for Thought from Pete Ferretti

Calorie: basic amount of measure for rationalization offered by the average individual prior to taking a second helping of a particular food.

~The Lion, March 2007

Spray Adjuvants for Insecticides and Fungicides

Steve Bogash, Regional Horticulture Educator, Penn State Cooperative Extension

Adjuvants are chemicals that are added to a liquid spray in order to make it work better. They can be roughly grouped as materials that aid in compatibility with other chemicals, wetting agents, spreaders, stickers and penetration enhancers. Many commercial adjuvants do multiple duties as they carry out several tasks. All pesticides benefit from using the proper adjuvants. Many liquid formulations come with adjuvants included while wettable powders seldom include any adjuvants.

Compatability agents often adjust the pH of the spray solution in order to reduce alkaline hydrolysis or act as emulsifiers so an oil-based pesticide can be dispersed in water for application. Wetting agents reduce the surface tension of spray droplets on the leaf surface so as to improve coverage. Spreaders are close relatives of wetting agents as they help to build a deposit of the spray solution and improve weather-fastness. Stickers or Spray-Stickers improve the weatherability of pesticides by dispersing the active ingredients in a resin-like film thus holding the chemical on the leaf surface better (think Bravo Weather Stik).

Because of the wide variability of various spray materials and adjuvants, it is extremely important to read each material's label for specific instructions. While substantial research and articles are readily available on herbicide adjuvants, there is relatively very little on adjuvants for fungicides and insecticides.

Below are some specific suggestions from what literature is available (this information came from pesticide labels and an excellent article from the Journal of Plant Disease 2003: "Effect of Commercial Adjuvants on Vegetable Crop Fungicide Coverage, Absorption and Efficacy"):

-Bravo Weather Stik can cause phytotoxic reactions if tank mixed with some fertilizers, other pesticides and surfactants. This is directly off of the Bravo label which states: "Do not combine Bravo Weather Stik with Dipel, Latron B-1956 or Latron AG-98 as phytotoxicity may result…." Most of us use Bravo, but have you read the label thoroughly?

-Rainfastness of maneb and mancozeb can be significantly improved through the use of spreader/stickers as recommended on their labels.

-Wettable powder formulations benefit substantially with the use of the proper adjuvants versus liquid suspensions. Liquids usually already contain considerable amounts of surfactants and the powders do not. As more pesticides become available off-patent, be sure to read the new label carefully as one method manufacturers may use to reduce costs is to eliminate some or all adjuvants from the package.

-Adjuvants have been indicated as improving the control of: powdery mildew in many species, and leaf spotting diseases with several commonly used fungicides.

-Organosilicone surfactants such as Silwet L-77 (there are several others on the market) may significantly enhance the fungicidal activity of sulfur and provide some curative activity.

-One study indicated that as much as 16 times as much fungicide was required in mixes with no adjuvant in order to get the same level of activity as mixes using the right adjuvants.

-Azoxystrobin (Quadris, Amistar…) absorption was significantly enhanced by using Silwet L-77, Latron AG-98, Bond and other organisilicone and nonionic surfactants.

-Some research has indicated that systemic fungicides such as those in the strobilurin class should benefit even more than protectants due to enhanced absorption / penetration of active ingredient.

-It is very important to know the best pH for each pesticide you are using. Captan and Sevin (carbaryl) both break down very quickly in solutions with pH above 5.5 due to alkaline hydrolysis. Most coppers and spinosad (Spintor) are negatively impacted when added to solutions using adjuvants that buffer the pH to create an acidic spray solution. In order to get the best activity out of copper and spinosad pesticides avoid tank mixes with most fertilizers as they tend to create acidic solutions.

Selecting the proper adjuvant for a specific pesticide is an important part of a growers decision making process. The interaction between fungicide, insecticide, adjuvant and pathogen is very complicated. There is significant potential for growers to increase their pest control, manage pest management costs and reduce pesticide applications through the careful selection of spray adjuvants.

Phytophthora Blight of Cucurbits

Margaret Tuttle McGrath, Plant Pathology, Cornell University

Phytophthora blight (aka Phytophthora fruit and stem or crown rot) is a disease that should be a concern to all cucurbit growers. It has been described as the 'most destructive disease of cucurbits' because 'nothing causes greater loss'. Total crop loss has occurred in some fields. Prevention is very important because Phytophthora blight is difficult to control once it starts, and after it has occurred on a farm it is challenging to continue growing susceptible crops without Phytophthora blight occurring, even in fields with no previous history. While all cucurbits are susceptible, squash, cucumber and pumpkin seem to be affected more commonly than cantaloupe. It has been increasing in importance in the U.S. Fruit rot was first reported in Colorado and California in the late 1930's. The disease was found sporadically in most of the U.S. until the 1980's, except in California, where it occurred more regularly; then incidence increased notably in Florida, Georgia, North Carolina, New Jersey, Michigan, and the northeastern states. The increase followed a hurricane in some areas. Phytophthora blight also commonly affects pepper, and less commonly affects eggplant, tomato. New hosts are lima and snap beans. While Phytophthora blight has not been reported affecting beans outside of the mid-west, growers elsewhere need to be aware that recent research in Michigan, where beans have been plagued since 2003, demonstrated that all 12 types of beans tested were susceptible to strains of the pathogen that were also able to infect cucumber.

Symptoms and Signs

The pathogen, *Phytophthora capsici*, causes seedling damping-off, leaf spots, foliar blight, root and crown rot, stem lesions, and fruit rot. Leaf spots are dark brown and usually large (up to 5 cm in diameter). Crown rot causes the entire plant to completely collapse and die in a short period of time. Summer squash often die back from the growing tip. Vines as well as growing tips can be affected in other cucurbit crop types. Affected vine tissue is brown, appears water-soaked, and often collapses.

Phytophthora fruit rot typically starts on the underside of the fruit that is in contact with the ground. Initial symptoms can appear on the upper surface as a result of pathogen dispersal in splashing water. These can be a water-soaked spots that may have visible fungal growth or, less commonly, depressed spots. Lesions are soft and easily punctured when handled. Symptoms can also begin around the stem due to systemic infection from the vine. Fruit can become completely affected and collapse. Fruit symptoms also can develop rapidly after harvest. The pathogen produces a white yeast-like growth that contains many sporangia, especially under moist conditions. Sporangia are lemon-shaped fungal structures that cause new infections when they are spread to healthy fruit, leaves, or vines. Sporangia either germinate and grow into these tissues, or several zoospores form inside each sporangium. Sporangia and zoospores are asexual spores, which mean they are produced by an individual. Zoospores are released from sporangia in water and are able to swim for hours using their two flagella. They are capable of directional movement to a host based on chemical attraction.

Two diseases that can be confused with Phytophthora fruit rot are Pythium fruit rot, which is characterized by white fluffy growth resembling fine cotton (when new) or shaving cream (when old), and Sclerotinia white mold, which is characterized by white dense cottony growth with black, hard, pea-like structures.

Photographs of symptoms can be found at the Vegetable MDOnline web site:
http://vegetablemdonline.ppath.cornell.edu/factsheets/Cucurbit_Phytoph2.htm.

Disease Cycle

Phytophthora capsici survives in soil between crops for more than two years. The pathogen can survive longer if thick-walled oospores are produced. Oospores are formed when mycelia of two individuals of opposite mating type (similar to male and female) grow together. Both mating types have been found in some fields, including fields in the northeastern U.S. Since oospores are the product of sexual reproduction (genetic recombination), they are the main source of new races or biotypes, including fungicide resistant biotypes.

Soil moisture conditions are important for disease initiation. Sporangia form when soil is at field capacity (within 24 hours under controlled conditions) and they release zoospores when soil is saturated (5 to 6 hours under controlled conditions). Further disease development in a crop can occur rapidly because sporangia are produced abundantly on affected fruit and they are dispersed under a wider range of conditions than zoospores. Ideal conditions for infection are wet soils above 65°F and air temperatures in the 75 to 85°F range.

Management Practices

Current recommendations center on preventing the pathogen from being moved into a new field and managing soil moisture to avoid saturated conditions which favor disease onset. It is important to use an integrated program with as many of the following practices as possible. Years of research and observations have revealed that Phytophthora blight is challenging to manage and sometimes unpredictable.

1. Select fields where Phytophthora blight has never occurred when possible. The pathogen affecting cucurbits can also cause blight in pepper, fruit rot in eggplant, buckeye rot in tomato, pod blight in lima bean, and blight in snap beans. Buckeye rot can also be caused by *Phytophthora parasitica*. Late blight of potato and tomato is caused by a different pathogen (*P. infestans*); therefore, previous occurrence of late blight is not a concern in field selection. Selected fields should be isolated from fields where Phytophthora blight has occurred recently to avoid the potential of the pathogen being moved (in run-off or on farm equipment) from the infested field into the cucurbit crop.

2. Rotation, while still considered valuable, has proven less effective than hoped. The pathogen appears to be able to move more easily into new fields than anticipated and survives longer in the absence of known crop hosts, perhaps as oospores and on roots of some weeds (e.g. purslane). Use as long a rotation period as fits in the production system. Rotation will be more successful where only one mating type occurs, and thus oospores cannot form, which is more likely to be the case in recently infested fields. Both mating types of the pathogen have commonly been found in fields where examined.

On the other hand, blight has declined when cucurbits were grown continuously in a few research and u-pick fields, suggesting that biological control could be a management option for this disease. However, efforts to increase biological activity by amending soil with compost did not affect blight occurrence in experiments conducted on Long Island that included applying compost over two years when non-host crops were grown.

3. Select well-drained fields.

4. Make sure water will be able to drain out of the field. Use a land plane to level the field as much as possible. If water does not normally drain out of the field, then make a trench between beds or rows at their ends, make a ditch or waterway across the end of the field for water coming out of the field in the trenches, and continually grade soil at the end to allow water to leave.

5. Physically separate plantings of susceptible crops (cucurbits, pepper, eggplant, and tomato). Plantings should be located such that there is no opportunity for water to move from one planting to another. The pathogen can also be dispersed in rain splash during storms. Therefore it is prudent to consider prevailing wind direction when deciding where to locate multiple plantings of susceptible crops on a farm.

6. Select pumpkin cultivars producing hard, gourd-like rinds (shells). Mature fruit of such varieties are substantially less susceptible than varieties with conventional rinds which are softer. While not suitable for carving, these fruit are good for painting. Varieties now available produce small fruit (1-4 lb). ‘Apprentice’ and ‘Iron Man’ are also resistant to powdery mildew; ‘Lil' Ironsides’ is not. Medium and large fruited varieties are being developed by Harris Moran.

7. Minimize hardpans and plowpans by subsoiling or chisel plowing before planting.

8. Do not plant the crop in areas of the field that do not drain well. Plant a cover crop in place of the crop in these areas.

9. Prepare raised dome-shaped beds for summer squash and other bush-type crops. Ideally beds should be a minimum of 9 inches high. Use a bed shaper to provide more lasting beds as opposed to a simple ridge. Use a transplanter that doesn't leave a depression around the base of the plant. Fill in any depressions.

Make drainage ditches or waterways to allow excessive water to leave the field during heavy rains. Make a trench between beds at the ends of rows to allow water to enter waterways and leave the field during rainfalls. The trench must be big enough to ensure water drains out promptly without backing up into the field.

Raised beds are not recommended for vining crops as some fruit will develop in the low area between beds where conditions will be favorable for Phytophthora blight.

10. Minimize hardpans and plowpans by not driving through wet fields.

11. Clean farm equipment, shoes, etc. of soil between fields. Movement in soil on equipment and shoes probably is an important means by which *Phytophthora* has been spread between fields on farms and may account for the occurrence of Phytophthora blight in fields with no previous history of susceptible crops.

12. Subsoil between rows after planting and before vining to improve drainage. Subsoil again as needed after rain. Good drainage is also important for driveways in fields, as symptoms have been observed first on plants next to the compacted soil of driveways; therefore, subsoiling along the edge of driveways is also needed. It is preferable to plan driveways before seeding leaving ample space, instead of seeding the entire field and then driving over plants. Consider planting driveways to clover or grass.

13. Avoid over irrigating. Normal irrigation practices usually do not encourage Phytophthora blight except when leaks and puddles occur. Do not irrigate at night time when temperatures are above 70°F.

14. Do not irrigate from a pond or creek that could contain water that drained from an infested field.

15. Fungicides are not considered sufficiently effective to be relied on as the sole management tool. Soil-borne diseases are difficult to manage with fungicides. Phytophthora blight is especially difficult to manage partly because of how quickly the pathogen can move through a field. Fortunately several fungicides were registered recently that have performed well in university fungicide evaluation experiments. They are still recommended as a component of an integrated program. A preventive spray program is expected to be more effective than waiting until symptoms occur. See the following section for additional information.

16. Scout fields for symptoms routinely, especially after major rain storms. Include any areas where water did not drain well and near the end of irrigation pipe.

17. When symptoms are localized in a small area of a field, disking the area is worthwhile. Begin with a border of healthy-appearing crop around the affected area.

18. Do not discard cull fruit in the field, including fruit that are healthy but over-sized or over-ripe.

19. Fruit that look healthy should be removed from infested fields as soon as possible and checked routinely for symptom development so that fruit developing symptoms after harvest can be discarded before the pathogen spreads further. Asymptomatic affected fruit should develop symptoms within a week. It is especially important to harvest before rain. Growers have asked about disinfectants. None are registered for this use. Furthermore, applying a disinfectant to fruit will only kill *Phytophthora* spores on the fruit at the time; it will not stop the pathogen if it has already started to infect the fruit and it will not affect spores that land on the fruit after treatment.

20. Do not display pumpkin fruit for sale in a field where Phytophthora blight developed in previous years: healthy fruit have developed fruit rot in these situations.

21. Do not save seed from a field where Phytophthora blight occurred.

Other practices that will improve water management will help control Phytophthora blight.

Phytophthora blight has been unpredictable in several ways. Blight does not always start to develop in the lowest area of a field where water drainage appears worst. Symptoms typically have been first seen in the northeast on established plants, especially with cucurbits, which suggested that conditions are not favorable in this region when plants are young (soil temperature perhaps too low), in contrast with Indiana where damping-off of pumpkins due to *P. capsici* can be sufficiently severe to necessitate re-planting. However, young pumpkin seedlings were killed in 2006 after an unusually rainy period on Long Island. Extremely large variation in blight severity (e.g. none versus total loss) can occur among similar fields with no obvious explanation.

Fungicides in five new chemical groups have received federal section 3 registration since Nov 2002 for use on pepper and/or cucurbit crops. The active ingredients all specifically target oomycetes, the group of pathogens responsible for late blight and downy mildew as well as Phytophthora blight. Evaluating fungicides and other management practices for Phytophthora blight is notoriously difficult because severity often is too high, too low, or too variable to detect treatment effects. Effective control has been demonstrated, however, in some fungicide evaluations with these and additional fungicides in development. Some New York growers commented that they felt Phytophthora blight was less severe in 2006 because they applied these new fungicides. Blight was severe on pumpkin where these fungicides were not used. However, blight was also severe in some fields despite fungicide use when blight began to develop early in pumpkin development before fungicide treatment was started. Therefore a preventive application schedule is recommended. These new fungicides should be used in alternation and tank-mixed with protectant fungicides to manage fungicide resistance. Most have label restrictions requiring this.

New phosphorous acid fungicides (Agri-Fos, ProPhyt, Phostrol and Fosphite) (FRAC Group 33) are inherently more effective than Aliette. They are labeled for use on pepper, all cucurbits, plus additional crops. They are thought to have greatest benefit when applied early in crop development and to the soil so that they can be taken up by roots. ProPhyt and Fosphite are labeled for use at planting and/or transplanting (specific directions differ). Phosphite ion, the active ingredient for these fungicides, affects fungal pathogens directly and promotes the plant's defense system. There are also several phosphate fertilizer products that should not be confused with the fungicides as they do not have this active ingredient and it is illegal to use them for disease control because they are not registered as fungicides.

Ranman 400SC (EPA Reg. No. 71512-3; FRAC Group 21 fungicide; ISK Biosciences Corp) contains cyazofamid, an active ingredient effective for oomycetes. It is registered for use on tomatoes and potatoes in addition to cucurbit crops. It has limited systemic activity. Due to potential for resistance to develop, it is critical to implement resistance management strategies: apply Ranman both tank-mixed with a protectant fungicide and in alternation with other labeled fungicides that have a different mode of action (different FRAC Group number). Follow these strategies beginning the first year of use because the main goal of resistance management is to delay its development, rather than manage resistant strains, and furthermore these strategies are specified on the label which is a legal document. Use an organosilicone surfactant such as Silwet L-77 with Ranman. For Phytophthora blight, apply

Ranman at 2.75 fl oz/A beginning before symptoms for a maximum of 6 applications. Cost is about $16.75/A/application. It is labeled at a lower rate for downy mildew (2.1–2.75 fl oz/A). The minimum interval is 7 days, REI is 12 hr, and the PHI is 0 days.

Forum 4.18 SC (FRAC Group 15) is a new formulation of dimethomorph replacing Acrobat 50WP. It is labeled for use on all cucurbit crops at 6 oz/A every 5 to 10 days, depending on disease pressure, beginning when plants are 4-6 inches high for a maximum of 30 oz or 5 applications. Cost is about $8.90/A/application. The label specifies that it must be tank-mixed with another fungicide and applied no more than twice before alternating with another fungicide. Forum is also registered for use on lettuce, bulb vegetables, potato, eggplant, pepper and tomato. The REI is 12 hr and the PHI is 0 days.

Tanos (EPA Reg. No. 352-604), containing famoxadone (FRAC Group 11) and cymoxanil (Group 27), is labeled for use at 8 oz/A for a maximum of 4 applications. Cost is about $10.30/A/application. It must be tank-mixed with a copper fungicide and a fungicide containing maneb or mancozeb. Follow a strict alternation with no consecutive applications of Tanos. REI is 12 hours and PHI is 3 days. Other labeled crops include head lettuce, pepper, potato, and tomato.

Gavel 75DF (EPA Reg. No. 62719-441) contains mancozeb and zoxamide (FRAC Group 22), a new active ingredient that specifically targets *Phytophthora* and related fungi. Gavel can be used on cucumber, melon, summer squash, and watermelon but not on pumpkin or winter squash because it contains mancozeb. It is labeled on cucurbits for downy mildew, Alternaria leaf spot, and fruit and stem rot. The FIFRA 2(ee) approved in 2004 was needed because the label has just fruit and stem rot without specifying the pathogen Phytophthora. Gavel is also registered for use on tomato and potato. It is labeled for use at 1.5–2.0 lb/A every 7 to 10 days or when conditions are favorable for disease for a maximum of 8 applications. The REI is 48 hr and the PHI is 5 days. Cost is about $7.75-10.30/A/application.

For an intensive fungicide program for Phytophthora blight in cucurbits, begin by applying ProPhyt and Fosphite at planting or transplanting, then alternate among the following applied to foliage (5 to 10 day spray interval; can be extended under dry conditions):

1. Forum + copper fungicide when plants are 4-6 inches high or at 2-leaf stage.
2. Ranman + copper fungicide.
3. ProPhyt, Phostrol or Fosphite.
4. Tanos + copper fungicide + maneb or mancozeb.
5. Gavel for cucurbit crops other than pumpkin.

Please Note: The specific directions on fungicide labels must be adhered to – they supersede these recommendations if there is a conflict. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.

Managing Phytophthora Blight in Cucurbits

Margaret Tuttle McGrath, Plant Pathology, Cornell University

1. Avoid pathogen. Select non-infested fields when possible.
2. Long rotations (over 2 years).
3. Select well-drained fields.
4. Make drainage ditches so excessive water leaves the field during heavy rains.
5. Plant cover crop in low areas.
6. Physically separate susceptible crops. Manage water so it does not run between fields.
7. Select small-fruited pumpkins with hard rinds.
8. Set aside driveways in pumpkin fields rather than solid plant the field.
9. Use raised beds for non-vining crops.
10. Subsoil between rows to improve drainage.
11. Don't move soil between fields. Clean equipment.
12. Apply fungicides beginning before symptoms seen; apply in alternation.

    Ranman 400SC (FRAC Group 21 fungicide)
    Forum 4.18 SC (FRAC Group 15; a new formulation replacing Acrobat 50WP)
    phosphorous acid fungicides (Agri-Fos, ProPhyt, Phostrol and Fosphite) (FRAC Group 33)
    Tanos (FRAC Groups 11 and 27)
    Gavel 75DF (FRAC Group 22; not labeled for use on pumpkin and winter squash)
    Apply Ranman, Forum, and Tanos with copper fungicide for resistance management.

13. Irrigate as needed; not excessively.
14. Don't use pond water draining from infested field for irrigation.
15. Scout routinely.
16. Disk affected areas plus border area ASAP after development.
17. Remove cull fruit from field.
18. Remove good fruit from affected field ASAP. Hold a few days when feasible.
19. Don't display fruit in infested field.
20. Don't save seed from fruit from a field where Phytophthora blight occurred.

‘Villetta Rose’ (W2275-3R), a Red Skin Potato Line for Fresh Market and Canning

Bill Lamont, Horticulture, Penn State University

I have watched the consumption the “B” size red potatoes increase over the years. You can now purchase the plastic clam shells of small red potatoes in almost any marketplace. Most of these potatoes are graded off of a standard red variety. Why do consumers like these small potatoes? The consumers I have talked to have told me that they really like just grabbing a handful of small red potatoes and putting them in a pot of boiling water or steaming and enjoying them with skins and all. I have a friend who lives at the shore, and that is all he wants. He loves to make an awesome meal of small, red potatoes, a fresh, garden salad and baked, fresh striped bass that we catch off the surf. Trust me that is a winner.

I have been interested in the small “B” size red potatoes for some time and have grown them using plastic mulch and drip irrigation, a system suited for the direct marketer, especially in a dry year. In the past I was using ‘Red Pearl’ another UW-Madison line that many people really enjoyed eating. Now Jiming Jiang, Horia I. Groza, and Bryan D. Bowen from the UW-Madison potato breeding program have developed a new small red skin potato line, called ‘Villetta Rose’, for fresh market, canning, and gourmet use (steamers). This cultivar has medium-late maturity and is particularly well suited for canning. It has high tuber set; a uniform, round tuber shape; smooth, shallow eyes; uniform tuber size; good skin set; dark-red color at harvest; and white flesh. The tubers have a very attractive appearance. They are somewhat smaller than comparable varieties and the yield is in the medium range.

I planted some on June 5th and they were ready to harvest the last full week of July 2007. The thing that I like about them is that the tubers set right next to the stem. They have excellent dark red color, uniform size and have a good yield. I think that spacing could be 6-12 inches in the row with double rows on plastic mulch. They would certainly be a winner for the early roadside or farmers market. I ate some the other evening and they could not be beat. They had such a good fresh taste. Use can use the advertising slogan- “Look Mom-No Prep!!”

Growing Taro in a Pennsylvania High Tunnel

B.A. Kratky and S.C. Miyasaka, University of Hawaii, M.D. Orzolek and W.J. Lamont, PSU, Horticulture

Taro is a tropical crop that normally requires 6 to 10 months to mature and produce a starchy corm which may be boiled, steamed, baked or made into poi or chips. Such a long growing season requirement would be expected to exclude taro as a possible crop for Pennsylvania, even in a high tunnel. However, taro also produces edible leaves which are rich in vitamins (particularly A and C) and minerals. We estimate that leaves may be harvested from about 2 to 5 months after planting and, thus, become a candidate as a specialty crop for high tunnels.

Leaves with or without 6 inch sections of petioles may be cooked and eaten like spinach or wrapped over pork or fish in laulau bundles and steamed. Taro corms and leaves have an acrid irritation property caused by a protease associated with calcium oxalate crystals. This protease is a protein which can be deactivated by heat. Before eating, corms must be boiled or steamed for 1 to 5 hours and leaves with petioles must be boiled or steamed for 45 minutes to 5 hours, depending on the variety. The Chinese taro variety 'Bun Long' is known for its low acridity and corms may be cooked for only 1 hour and leaves with or without petioles can be cooked for 45 minutes.

In a cooperative venture with the University of Hawaii, 19 vegetative propagules of 'Bun Long' Chinese taro (*Colocasia esculenta*) were sent from Hawaii. They are called a *huli* and consist of suckers with about a ¼ inch section of a corm and 6 to 12 inches of petiole. They were planted in 3 gallon containers of a peat-perlite growing medium on June 26 and remained in a building until July 2 when they were planted in a high tunnel at the Rock Springs Horticultural Farm. Pots were placed on 1–inch high soft nursery trays which rested on the floor of a 20' x 4' tank such that there were 2 rows with 2 ft spacing within rows. All of the plants were growing by July 10. A constant 1.5 inch level of water is maintained with a float valve and the pots are watered by sub-irrigation.

The water is fertilized with a hydroponic formula from Hydro-Gardens, Colorado Springs, CO (Chem-Gro 8-15-36) plus calcium nitrate and magnesium sulfate. The solution is checked weekly with an electrical conductivity meter and is replenished to a level of 1.5 mS. The tank is covered with aluminized plastic mulch which is very reflective, but remains cool such that leaves do not burn when they contact the mulch. Harvesting of the leaves may begin after the plants have grown to about 3 to 4 ft tall and the modified arrow or heart-shaped leaves become 12-16 inches long. Then, starting with the fourth fully emerged leaf, every other leaf may be harvested.

The taro planting will be one of the featured crops at this year's Ag Progress Days (Aug. 14-16, 2007) on the bus tour to the High Tunnel Research and Education Facility.

Growing Edible Ginger in a Pennsylvania High Tunnel

B.A. Kratky, University of Hawaii, M.D. Orzolek and W.J. Lamont, PSU, Horticulture

Edible ginger (*Zingiber officinale* Roscoe) is a tropical crop that optimally requires a 10 month growing season in Hawaii to produce mature ginger rhizomes. A shorter growing season results in reduced yields and size of rhizomes. *Baby ginger* or *young ginger* is a gourmet quality product with a tender, low-fiber texture and is mostly used for pickling. Baby ginger yields are lower than that of mature ginger. Certainly, baby ginger is a candidate as a specialty crop for high tunnels. Although, it may not be possible to obtain equivalent mature ginger yields as from a tropical region, there remains potential as a profitable niche market crop, especially if the growing season can be extended by several months in high tunnels.

Fresh market ginger commands higher returns than the various processed ginger products. Both raw and cooked fresh ginger is prized in Indian and Asian culinary. Examples of processed food products include ginger ale, ginger beer, gingerbread and ginger snaps. Both fresh and prepared ginger has medical uses. Ginger is sold as a dietary supplement, because it is not FDA approved as a medicine. However, mixed claims have been made for effectiveness on nausea, motion sickness, a cold remedy, for settling an upset stomach and for inflammation. Doctors warn against possible blood thinning properties, because ginger may interact with other medicinal blood thinners.

In a cooperative venture with the University of Hawaii, 50 gram ginger rhizome 'seed pieces' were sent from Hawaii. They were planted in 3 gallon containers of a peat-perlite growing medium on May 14, 2007 and were top watered on a greenhouse bench until July 2 when the pots were placed on 1–inch high soft nursery trays which rested on the floor of a 10' x 4' tank such that there were 2 rows with 1 ft spacing within rows. There was at least one emerged stem in all of the pots. As the season progresses, multiple stems will emerge and the plants will become 2 to 4 ft tall. A constant 2 inch level of water is maintained with a float valve and the pots are watered by sub-irrigation. The water is fertilized with a complete hydroponic formula (Chem-Gro 8-15-36) plus calcium nitrate and magnesium sulfate. The solution is checked weekly with an electrical conductivity meter and is replenished to a level of 1.5 mS. The tank is covered with aluminized plastic mulch which is very reflective, but remains cool such that leaves do not burn when they contact the mulch.

In a second experiment, 14 ginger rhizomes were placed in a 10' x 4' peat perlite bed which was 10 inches deep. The growing medium was trenched to a 4-inch depth and seed pieces were planted 1 to 2 inches deep. As the crop grows, the growing medium will be hilled to promote vertical, rather than horizontal growth of the rhizomes. Ginger was planted on June 14 and 13/14 of the plants had emerged by July 9.

In a tropical environment, ginger would normally be harvested in December through February after the leaves turn yellow and dry down and the stems fall over. However, we anticipate harvesting these experiments around late October, hopefully before freezing temperatures in the high tunnel. Since the ginger might not be totally mature, the epidermis might still be fragile and handling care must be exercised. The ginger will be washed and dried on screened racks for about 5 days and then will be ready for market. Some of the crop will be used as seed for another crop next year.

The ginger experiments will be amongst the featured crops at this year's Ag Progress Days (Aug. 14-16, 2007) on the bus tour to the High Tunnel Research and Education Facility.

On-Farm Food Safety – Third Party Food Safety Audits Coming to Pennsylvania Farms

Luke LaBorde, PSU, Food Science

Growers that sell their products wholesale to packing houses, produce auctions, grocery stores, and restaurants are under new pressure from their buyers to develop on-farm food safety plans and pass a third part inspection audit. There are several auditing companies that provide audit services. Recently, the United States Department of Agriculture (USDA) partnered with the Pennsylvania Department of Agriculture to offer a voluntary "Good Agricultural Practices" audit program that provides fee-based auditing services. Penn State Cooperative Extension is currently developing a program that will help growers understand on-farm food safety practices, known as Good Agricultural Practices (GAPs), and to prepare for third party audits. GAPs information and templates that can be used to prepare an on-farm food safety plan are now available at a new website at http://foodsafety.psu.edu/gaps/. Questions on GAPS and food safety audits can be addressed to Dr. Luke LaBorde of the Department of Food Science (814-863-2298, lfl5@psu.edu)

Fungicide Sensitivity Assay Provides Information to Guide Cucurbit Powdery Mildew Management in Pennsylvania in 2007

Margaret Tuttle McGrath, Plant Pathology, Cornell University

A seedling fungicide sensitivity bioassay was conducted in two spring squash crops in Lancaster and Berks counties on 24 and 25 July. This assay entails treating seedlings with different fungicides that are prone to resistance development and then putting these seedlings in cucurbit crops with powdery mildew for a few hours to catch spores. The seedlings are then kept in a greenhouse until symptoms develop. Powdery mildew developed on plants treated with a QoI (FRAC code 11) fungicide. This was not surprising because resistance to this group of fungicides has been found elsewhere in the northeast since first detected in the US in 2002. Therefore Amistar, Cabrio, Flint, and Quadris are not recommended in PA. Powdery mildew developed on all rates tested of the DMI (code 3) fungicide Nova, including the highest rate of 120 ppm. Resistance to this group of fungicides is quantitative (rather than qualitative as with QoIs); therefore powdery mildew may be controllable with a high rate. Procure at the highest label rate (8 oz/A) is recommended because it will provide twice as much active ingredient as Nova at its highest rate, which was ineffective in a fungicide efficacy experiment conducted on Long Island, NY, in 2006. Powdery mildew did not develop on seedlings treated with any rate of Quintec or of boscalid, an active ingredient in the fungicide Pristine. Therefore these fungicides appear to be the best choices for managing powdery mildew, at least in eastern PA this season. Quintec is only labeled for use on melons. These mobile fungicides (Procure, Quintec and Pristine) should be tank mixed with protectant fungicides (e.g. chlorothalonil, copper, oil, sulfur) and applied in alternation for resistance management.

This assay was done as part of a project supported by PVGA and being conducted with Emelie Swackhamer and Tim Elkner.

New Tools Available for Monitoring Corn Earworm Flights: Watch for an Increase in Trap Catch, Late July - Early August

Bill Hutchison, Eric Burkness, Entomology, University of Minnesota, Shelby Fleischer, Entomology, Pennsylvania State University

This is the time of year when sweet corn growers might start sweating a little more than average. Corn Earworm (CEW) is set to migrate north to the Midwest and Northeast, from various crops in the Southern U.S. All sweet corn harvested prior to mid July should be able to "escape" most of the CEW pressure for the year. The primary crops at risk, including snap beans, tomatoes and peppers, all harvested after August 1st, will be most vulnerable to the typical late-season flights. Clearly, silking sweet corn is most attractive, but the other crops should be monitored closely when sweet corn silks begin to dry down. This week, we review two complementary, on-line, web friendly tools that can assist growers, and IPM decision-makers with improved timing of CEW treatments for selected crops.

CEW Migration Forecasts for the Midwest: "Insect Migration Risk Forecast" (IMRF), developed at Northern Illinois University by Mike Sandstrom and Dave Changnon are available now for the upper Midwestern US. They now have a new web site (AWARE, http://agweather.niu.edu/) for quick access the daily forecasts. If you wish to subscribe to their email list, to receive the daily forecasts, send a note to: Mike at: wxtrw44@yahoo.com. Although we do not currently have a similar system for the northeastern US, you may be interested in how they are approaching this for the Midwest. In brief, this system is based on our general understanding of insect migration in the northern U.S., where migration events are facilitated by the convergence of HIGH pressure systems moving east to west (towards Midwest region), with LOW pressures coming west to east. Insects traveling on northward jet streams at 500m or higher are known to "drop out" of the atmosphere when these High/Low systems collide. Experience to date, suggests that insects can fall out whether the event includes rainfall or not. Last summer, we conducted several "test runs" of the migration forecasts, and found, that for most forecasts in Minnesota, the system worked well for both Potato Leafhopper (PLH), early season (May-June), and for CEW late-season (July-Sept.). You can access the IMRFs via our CEW "ZEA MAP" National Monitoring site for CEW, at: http://www.vegedge.umn.edu/ZeaMap/zeamap.htm or, directly at the NIU site: http://www.maplecity.com/%7Esand/cew/imrf.html.

The IMRFs are provided 5 days/week (M-F) throughout the growing season. One caveat, at least for CEW, is that we typically notice a 1-2 day delay between the projected forecast date for a given locale, and the date that trap catches increase. This may be due to some necessary "recovery time" for the moths after dropping from the atmosphere. More on insect migration will be provided in future articles this summer.

PestWatch Goes National: Web Tracking of CEW Flights – This week, we are excited to debut *"PestWatch"* a greatly expanded National Corn Earworm Monitoring tool, for rapid, real-time delivery of CEW flight updates, now available for the Midwest, Southern and Eastern U.S. This effort is based upon early work by Dr. Shelby Fleischer, Entomologist, Penn State University, and several database/web design colleagues, including: Steve Crawford, Jon Voortman and Doug Miller, all at PSU. This team, with considerable input from extension and industry colleagues in the Midwest and Southern states as well as many new Trap Cooperators, has made this new tool possible.

PestWatch takes advantage of state-of-the-art, web-based data-entry and animation tools, to quickly track CEW population dynamics during the summer months. As CEW is a highly mobile and economically damaging pest of many crops throughout the U.S. and Canada, it is critical to understand how populations are developing on multiple hosts in real-time. Having this information more readily available will assist researchers, extension staff and industry in better understanding CEW dynamics at regional, landscape levels, as well as in farm-level IPM decision-making. For example, in the upper Midwest, it is very useful to know when CEW moth flights begin to increase in the High Plains of Texas, Louisiana, Arkansas and Kansas, as these areas have been implicated in previous years as "source populations" for some of the migrant moth populations we have trapped up north. Specifically, this week, both the CEW Forecast and PestWatch were useful in characterizing the current low risk of new CEW flights to the Midwest. However, because a dominant source region is currently southwestern Kansas, the recent increase in CEW flights in Kansas (> 75 moths/night), indicates this region has considerable potential for being a significant source when weather conditions become favorable for northerly migration (e.g., low pressure system from the west, converging with a high pressure from the east).

In future years, we plan to expand this to other Lepidopteran pests, and currently have data locations for European corn borer and the Fall Armyworm (Northeast). The site can be viewed at: http://www.pestwatch.psu.edu/sweetcorn/tool/tool.html.

Note: After accessing the PestWatch page, move the time bar to relevant periods. To facilitate variation in thresholds, the class breaks in the legend is adjustable by the user, and resulting colors tied to the time-series histograms that open when you click on any site.
Suggestions or questions can be sent to: Fleischer (sjf4@psu.edu), or Hutchison (hutch002@umn.edu).

Acknowledgements: In addition Doug Miller's group within the Environmental Center for Informatics (PSU), and the numerous trap catch coordinators, who have made the PestWatch expansion possible, Minnesota workers also acknowledge funding support from: North Central IPM Regional Center (MSU & UofIL), Rapid Agricultural Response Fund of the University of Minnesota Agric. Expt. Station, Insecticide Resistance Action Committee (IRAC), Midwest Food Processors Assoc. (MWFPA), Minnesota Department of Agriculture.

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www.vegedge.umn.edu/MNFruit%26VegNews/Vol4/vol4n9.htm
www.vegedge.umn.edu/MNFruit%26VegNews/Vol4/vol4n6.htm

High Tunnel Tour in Benton Harbor, MI

Submitted by Vicki Morrone, Michigan State University

Tour to visit High Tunnels (Extended Season Production) in Benton Harbor, MI, Wed Aug 15 at 6 pm

Please share information about this meeting and tour with anyone who may be interested. Using high tunnels is one strategy to stretch the farmer's market season and increase farmer income.

High tunnels are low-cost greenhouses that are gaining popularity for production of a large range of crops worldwide. A twilight meeting and research plot tour is scheduled for 6:00 pm on Wednesday, August 15, at the Southwest Michigan Research and Extension Center in Benton Harbor, MI. Anyone interested in how high tunnels can be used to increase produce quality or yields, reduce chemical pesticide inputs, and/or modify harvest seasons for berries, sweet cherries, vegetables, and even cut flowers are welcome. MSU researchers and extension educators will be on hand to discuss the Project GREEEN-funded research trials on production systems for various high value crops under Haygrove high tunnels.

To reach the Center, take exit 30 off I-94 (Napier Avenue), travel east on Napier for 2 1/2 miles to Hillandale Road. Turn south (right) and travel to the entrance to SWMREC (about 1/4 mile).
For additional directions call 269-944-1477.

Presented by: Dr. Eric Hanson, Dept of Horticulture, Small Fruit Specialist

Plant & Pest Advisory: Vegetable Alert!

Andy Wyenandt, Extension Specialist Plant Biology and Pathology, Rutgers

Date: 7/11/07

Pest: Cucurbit Downy mildew

Found: cucurbit Downy mildew reported in 2 watermelon fields in central PA (Franklin Co.) on July 10th.

Crop(s) at risk: all cucurbit crops.

Potential impact: Significant losses will occur if not controlled properly

What growers should do: Control of Downy mildew begins with regular scouting, recognizing symptoms and regular protectant fungicide applications. The following are the most effective materials.

Once Downy mildew has been detected in the Mid-Atlantic states, basic fungicide maintenance programs for cucurbit crops should be adjusted to include Downy mildew control. Check all labels to verify that materials can be used in your area.

Tank mix one of the products listed below with a protectant fungicide such as chlorothalonil (M5), or maneb (M3), or mancozeb (M3) (see label for rates and specific crop uses):

Ranman (cyazofamid, 21) at 2.1to 2.75 fl. oz. 400SC/A, or

Previcur Flex (propamocarb HCL, 28) at 1.2 pt 6F/A, or

Gavel (zoxamide + mancozeb, 22 + M3) at 1.5 to 2.0 lb 75DF/A (some muskmelon may be sensitive)

Curzate (cymoxanil, 27) at 3.2 oz 60DF/A, or

Tanos (famoxodone + cymoxanil, 11 + 27) at 8 oz 50WDG/A, or

Remember that downy mildew materials should always be tank mixed with a protectant fungicide and rotated weekly with fungicides from a different FRAC code to reduce the chances for fungicide resistance development. For more information on Downy mildew control for specific cucurbit crops please see the 2007 Commercial Vegetable Production Recommendations Guide.

All abandoned cucumber and summer squash fields should be sprayed with gramoxone or disced under immediately after use to kill the foliage! Abandoned fields left unattended after use will only serve as a source of inoculum for other fields once downy mildew makes it way into our area.

*If you suspect downy mildew on your farm, please contact your county agent or Andy Wyenandt (856) 455-3100 ext 4144 or your local Extension educator so we can confirm its presence.

To track the progress of cucurbit downy mildew in the eastern US and to keep up with reports of Downy mildew from other states please visit North Carolina State University's Cucurbit Downy Mildew Forecasting Center at http://www.ces.ncsu.edu/depts/pp/cucurbit/.

New Video: Vegetable Farmers and their Sustainable Tillage Practices

A new video is available called "Vegetable Farmers and their Sustainable Tillage Practices." It features 12 Northeast farmers and researchers describing tillage systems aimed at reducing tillage and maintaining soil health. Production of this 45 minute DVD was funded by Northeast SARE.

The video covers:

- effects of tillage on soil health
- soil spader to incorporate cover crops and compost
- chisel plow and field cultivator to prepare fields
- small-scale no-till using compost as mulch
- zone tillage
- custom-made zone tiller
- no-till using killed ryegrass
- ridge tillage research
- ridge till and cover crops

A limited number of DVDs are available free of charge to Extension, educators, agency personnel and other agricultural service providers who will use it in their programs.

To order a free copy fill out this form and return it to: UVM Center for Sustainable Agriculture, 63 Carrigan Drive, Burlington VT 05405-0004.
Fax 802-656-8874, e-mail: sustainable.agriculture@uvm.edu

Your name:

Your organization:

Please indicate your main professional role:
(extension, research, NRSC, consultant, etc.)

Postal Mailing Address with zip:

E-mail:

Telephone(s):

Briefly describe how you plan to use the video:

Estimate the number of people that will view it in one year:

By accepting a free video you agree to respond to a brief follow up survey that will take place in 2008 to evaluate how the video was utilized. Additional copies of the video on DVD cost $15 each, including postage. For more information on this video and other SARE funded videos, or to print an order form, please visit www.uvm.edu/vtvegandberry/Videos/videos.html

Upcoming Meetings

If you have a meeting you would like to announce, please send the meeting title, date, location and contact information to esanchez@psu.edu.

Local

- ✓ Aug 8, 2007. **Integrated Pest Management for Greenhouse Growers**, Still Pond Nursery, Earlville, PA. Presented by The Pennsylvania Women's Agricultural Network, Pennsylvania Department of Agriculture's Outreach & Assistance Program and Pennsylvania Landscape & Nursery Association. Register online at http://wagn.cas.psu.edu/Register9-7.html. For more information contact Linda moist at lsm9@psu.edu or (814) 865-7031.

- ✓ Aug 9, 2007. **Bus Tour of Retail Farm Markets**, Adams County, PA. Additional information can be found at http://agmarketing.extension.psu.edu/ or http://agmarketing.extension.psu.edu/Retail/PDFs/tourfarmmkt_aug07.pdf

- ✓ Aug 22, 2007. **Twilight Potato Meeting**, Forest Wessner's farm located at Church and Reservoir Rd., near Germansville, PA. For more information contact Bob Leiby at (610) 391-9840 or rel5@psu.edu.

- ✓ Aug 23, 2007. **PASA Field Day – Small Scale Sustainable Farming**. Fresh From the Vines, Crawford County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ Sept 6, 2007. **PASA Field Day – Science-Based Organic Grape Production**. Penn State Grape Center, Erie County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ Sept 15, 2007. **PASA Field Day – Urban Farming**. Greensgrow, Philadelphia County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ Sept 22 and 23, 2007. **Mother Earth Harvest Fair**. Spoutwood Farm, Glen Rock, PA. For more information call 717-235-6610 or visit www.spoutwood@supernet.com.

- ✓ Sept 27, 2007. **Pumpkin Variety Demonstration,** Franconia, Montgomery County. For more information contact Andrew Frankenfield at (610) 489-4315.

- ✓ Sept 28, 2007. **PASA Field Day – Bio-Diesel & Compost on the Farm**. Briar Patch Organic Farms, Union County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ Oct 3, 2007. **PASA Field Day – The Nuts and Bolts of Organizing and Packing a Choice CSA**. Red Earth Farm, Schuylkill County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ Oct 8, 2007. **PASA Field Day – New and Beginning Farmers: Small Group Tour with the Nordells**. For More information call (814) 349-9856 or visit www.pasafarming.org.

Regional

- ✓ Aug 6-18, 2007. **Permaculture Design Course**. Three Sisters Farm, Sandy Lake, PA. For more information, call Darrell Frey at 724-376-2797.

- ✓ August 14-16, 2007. **Ag Progress Days**, Rock Springs, PA. For more information call (814) 865-2071 or visit http://apd.cas.psu.edu.

- ✓ Nov 8-11, 2007. **Farm Education Symposium**. Shelburne Farms, Shelburne, VT. For more information visit www.farmbasededucation.org or call Brooke Redmond at 617-306-0090.

- ✓ Jan 15 – 17, 2008. **NJ Annual Vegetable Meeting** at the Taj Mahal in Atlantic City. For more information contract Mel Henninger at henninger@aesop.rutgers.edu.

- ✓ Feb 7-9, 2008. **Pennsylvania Association for Sustainable Agriculture (PASA) 17th Annual Farming for the Future Conference**. Penn Stater Conference Center, State College, PA. For more information visit www.pasafarming.org.

National

- ✓ June 18 – Aug 10, 2007. **Ecovillage & Permaculture Certificate Program**. Lost Valley Educational Center, Eugene, OR. For more information, call 541-937-3351 x112 or visit www.lostvalley.org/epcp.

- ✓ August 14-15, 2007. **North American Strawberry Growers Associations (NASGA) Summer Tour**. For more information contact Kevin Schooley at kconsult@allstream.net or visit www.nasga.org.

International

To join our distribution list, send an e-mail to: Gazette-L-subscribe-request@lists.psu.edu.
No subject or message text is required. The system picks up the name and address from the e-mail headers. To delete yourself from the list send an e-mail to: Gazette-L-unscribe-request@lists.psu.edu.
Again, no subject or message text is required.

The newsletter is also posted within three days on the Department of Horticulture Vegetable program website at: http://hortweb.cas.psu.edu/extension/vegcrops/newsletterlist.html.