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Reading the Pesticide Label is More Important than Ever Before

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Read almost any document today as it pertains to pest management, and if pesticides are recommended, there are some directions or a paragraph on pest resistance and how to properly manage the problem. Most farmers have been aware of issues surrounding pest resistance but there has been a greater effort the past several years by industry and educators to trumpet this message.

Pest resistance is nothing new in agriculture. Literature shows that insects were the first organisms in the US to develop resistance to the products that were supposed to give some level of control. One of the first documented cases of insect resistance occurred in California in the mid 1900's when red scale on citrus trees was no longer controlled with hydrogen cyanide. With the advancements in pesticide chemistry, during and after World War II, it was thought that the issue of pest resistance was a concern of the past. Insects soon developed resistance to these new chemistries and the issue in insecticide resistance continues today.

Fungicides were not to escape this problem either as resistance became a problem shortly after the introduction of systemic fungicides in the 1960's. There was an assumption several decades ago that weeds were unlikely to develop resistance. That theory fell by the wayside when the first herbicide resistant weed, field bindweed, made its appearance in the early 1970s.

Scientists and industry have aggressively addressed this issue by forming groups to facilitate the effective management of pesticide resistance, to prolong the effectiveness of "at risk" fungicides, and to limit crop losses should resistance occur. These groups are:

- Fungicide Resistance Action Committee (FRAC)
- Insecticide Resistance Action Committee (IRAC)
- Herbicide Resistance Action Committee (HRAC)

It is only the past several years that these groups and their work have been receiving a lot of attention. One of the reasons is what is showing up on the front of pesticide labels. For example, let's say you wanted to control early blight on tomato and you chose Flint. On the front of the pesticide label, you will notice the following code 

. This information tells you that the product is a fungicide and falls into Group 11. This code was developed by FRAC to help identify fungicides by their mode of action. For fungicide resistance management, do not tank mix or alternate fungicides with the same FRAC number in a spray program.

Continuing with the early blight and Flint example, you would want to apply another fungicide seven days later. Some of your options include Cabrio, Quadris, Bravo, and Dithane. Looking at these labels, both Cabrio and Quadris fall into Group 11, meaning all fungicides within this chemical group share a common mode of action.

Using chemicals that share a common mode of action repeatedly can lead to the development of resistance. The labels for Bravo and Dithane show that they fall into a different group and could be

utilized in a rotation with products in Group 11. Similar type codes have also been developed by IRAC and HRAC.

Although pesticide labels are not the most exciting read, it is critical that you are aware of the information located within the text. It not only contains information that is important to your health but information that will help prolong the life of these crop protectants.

Protecting Honey Bees from Chemical Pesticides

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Honey bees are vulnerable to many of the insecticides used to control damaging pest species by fruit, vegetable, nut, and seed growers. Growers dependent on honey bees for the pollination of their crop(s) must constantly maintain a delicate balance between protecting their crops from pests and pathogens, and protecting the insects that are necessary to pollinate these crops.

The recent dramatic die-off of tens-of-thousands of honey bee colonies has left many beekeepers devastated and possibly many growers without the quantity and quality of bees needed to pollinate crops this spring and summer. A research group; the Colony Collapse Disorder Working Group (see MAAREC.org) is trying to determine what factors are responsible for these unprecedented colony losses. Chemical contamination is one of the possible contributing factors that is being investigated. These include chemicals being used within the hive for mite and disease control as well as chemicals pesticides used on crops that may inadvertently find their way into hives. Until we have more documented information, it is advisable to use pesticides with care, erring on the precautionary side.

The neonicotinioids are a relatively new class of insecticides that impact the central nervous system of insects. They act either as contact insecticides or applied to plants, they are translocated throughout the plant tissue, making all parts of the plant toxic to pests that ingest them. While imidacloprid registered in 1992, is the best-known insecticide in this class, there have been a number of new neonicotinoids introduced since then (clothianidin, acetamiprid, thiamethoxam, etc.). Their use has increased dramatically over the past few years and they are now the most widely used group of insecticides in the US. Their many uses include: seed treatments for corn, cotton, canola and sunflowers; foliar sprays of fruit, nut and coffee crops; granular and liquid drench applications in turf, ornamentals and fruit crops and in forests; and in California the number one use of imidacloprid is for the control of structural pests.

There is conflicting information about the affects of neonicotinoids on honey bees, and different chemicals in this class are known to vary in their toxicity to bees, however the EPA identifies both imidacloprid and clothianidin as highly toxic to honey bees. For example: "Clothianidin is highly toxic to honey bees on an acute basis (LD50>0.0439 mg/bee). It has the potential for toxic chronic exposure to honey bees, as well as other non-target pollinators through the translocation of clothianidin resides in nectar and pollen. In honey bees, the affects of this toxic chronic exposure may include lethal and/or sub-lethal effects in the larvae and reproductive effects on the queen" [EPA Fact Sheet on Clothianidin]. Documented sub-lethal affects of neonicotinoids include physiological affects that impact enzyme activity leading to impairment of olfaction memory. Behavioral affects are reported on motor activity that impact navigation and orientation and feeding behavior. Additional research has found that imidacloprid impairs the memory and brain metabolism of bees, particularly the area of the brain that is used for making new memories (Decourtye et al., 2004). Recent research done on imidacloprid looked at crops where imidacloprid was used as a seed treatment. The chemical was present, by systemic uptake, in corn and sunflowers in levels high enough to pose a threat to honey bees (Bonmatin et al., 2003 and 2005). In 2002 a broad survey for pesticide residues in pollen was conducted across France. Imidacloprid was the most frequently found insecticide and was found in 49% of the 81 samples (Chauzat et al., 2006).

In addition, there is concern about the practice of combining certain insecticides and fungicides. A North Carolina University study found that some neonicotinoids in combination with certain fungicides, synergized to increase the toxicity of the neonicotinoid to honey bees over 1,000 fold in lab studies (Iwasa et al., 2004). Both the neonicotinoids and the fungicides (Terraguard and Procure) are widely used. This synergistic effect needs to be looked at more carefully.

Below is a summary of the chemical and brand names of the commonly used neonicotinoids and their toxicities to honey bees. ***We are asking growers who are using these materials and who are dependent on honey bees for pollination, to use caution when selecting and applying these materials.*** Below are more specific recommendations for growers.

Neonicotinoids' Toxicity to honey bees

Chemical	Brand Name	Acute Contact	Acute Oral
thiamethoxam	Actara, Platinum, Helix, Cruiser, Adage, Meridian, Centric, Flagship	Highly toxic	Highly toxic
clothianidin	Poncho, Titan, Clutch, Belay, Arena	Highly toxic	Highly toxic
imidacloprid	Confidor, Merit, Admire, Ledgend, Pravado, Encore, Goucho, Premise	Highly Toxic	Highly toxic
acetamiprid	Assail, Intruder, Adjust	Toxic	Toxic
thiacloprid	Calypso	Toxic	Toxic
dinotefuran	Venom	Highly Toxic	Highly Toxic

Recommendations for Growers

• Know the pesticides you are using and their toxicity to bees (do not depend on third party to provide this information).

• READ the LABEL AND FOLLOW THE LABEL DIRECTIONS

• **Never** use a neonicotinoid pesticide on a blooming crop or on blooming weeds if honey bees are present.

• The use of a neonicotinoid pesticide pre-bloom, just before bees are brought onto a crop **is not recommended**. If one of these materials MUST be used pre-bloom (for example at pink in apples), select a material that has a lower toxicity to bees (acetamiprid or thiacloprid) and apply only when bees are not foraging, preferably late evening.

• Do not apply these materials post bloom (example petal fall) until after the bees have been removed from the crop.

• Blooming time varies depending on varieties. Bees pollinating one variety or crop may be at risk while another post-bloom crop or variety is being treated. Also while crops may have completed blooming, bees may be visiting blooming weeds in an around crops. Be aware of these situations and

avoid the application of pesticides on a non-blooming crop if there is risk of drift onto blooming crops and weeds if bees are present. If a spray must be applied, use the least toxic material and apply when bees are not foraging.

• Protect water sources from contamination by pesticides. If necessary, provide a clean source of water close to colony locations prior to their arrival in the orchard or crop.

For more information on CCD visit the Mid-Atlantic Apiculture Research and Extension Consortium website: MAAREC.org

References

EPA Pesticide Fact Sheet on Clothianidin
EPA Pesticide Fact Sheet on Dinotefuran

Decourtye, A., C. Armengaud, M. Renou, J. Devillers, S. Cluzeau et al. (2004). Imidacloprid impairs memory and brain metabolism in the honeybee *(Apis mellifera L.) Pestic. Biochem. Phys* 78:83-92

Bonmatin, J. M., P. A. Marchand, R. Charvet, I. Moineau, E. R. Bengsch and M. E. Colin. 2005. Quantification of Imidacloprid Uptake in Maize Crops. *J. Agric. Food Chem*. 53, 5336-5341.

Bonmatin, J. M., I. Moineau, R. Charvet, M. E. Colin, C. Fleche, E. R. Bengsch. 2003. Fate of imidacloprid in fields and toxicity for honeybees. *Environmental Chemistry*.

Chauzat, M. P., J. P. Faucon, A. C. Martel, J. Lachaize, N. Cougoule and M. Aubert. (2006). Survey of Pesticide Residues in Pollen Loads Collected by Honey Bees in France. *J. Econ. Entomol*. 99 (2): 253-262

Iwasa, T. N. Motoyama, J. T. Ambrose and R. M. Roe. (2004). Mechanism for the differential toxicity of neonicotinoid insecticides in the honey bee, *Apis mellifera. Crop Protection* 23, 371-378

How Organic Mulches Suppress Weeds

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I recently read the article "Compost as an Alternative Weed Control Method" by Monica Ozores-Hampton from the University of Florida (1998: HortScience 33:938-944). The article reviewed literature on organic mulches and compost for managing weeds.

Weeds are suppressed by organic mulches and compost by two methods: they physically prevent weeds from growing and as they decompose, chemicals that are toxic to plants are produced as part of the breakdown process which can prevent weed seed germination.

Physically Preventing Weeds

Organic mulches (sawdust, straw, bark, etc) can be as effective as herbicides based on some research trials. They also can improve soil health by minimizing soil erosion and compaction. Their use has also resulted in increased yields (compared to not mulching or not using herbicides). Depending on crop, fruit quality can also been improved by preventing direct contact between the fruit and soil.

The effectiveness of organic mulches for suppressing weeds is dependent on the thickness of the mulch layer, with thicker layers resulting in fewer weeds. A four to six inch mulch layer has been found generally effective. Germination of weed seeds is lesser with thicker layers and has been linked to changes in light levels, temperature and moisture. The effectiveness of organic mulches for suppressing weeds is also dependent on the type of organic mulch, weeds species present and environmental conditions.

Phytotoxic Effects during Composting

During the composting process, organic materials (animal manures, leaves, paper, wood chips, straw, textiles, etc.) are decomposed by microbes which over time convert the organic material into compost. Decomposition results in the release of nutrients in plant-available form from compost. However, chemicals toxic to plants are also released including acetic acid, acetaldehyde, ethanol, acetone, ethylene and allelopathic compounds. These chemicals are typically not present in mature or finished compost. Some research has shown than phytotoxic compounds tend to disappear more quickly when a static pile system is used compared to a windrow system.

Immature compost should not be applied to soils because phytotoxic chemicals are present. The most phytotoxic chemical in decomposing compost is acetic acid which can inhibit seed germination of crops and weeds. In one trial immature (4-week-old) sewage sludge-based compost (strict regulations exist for applying sewage sludge to agricultural lands) was applied to the alleys between raised beds and successfully suppressed weeds for 8 months due to physical restriction and the phytotoxic chemicals in the compost. Immature compost can also decrease oxygen levels and increase temperatures in the soil which can negatively affect plant root growth.

The Bottom Line

Organic mulches (newspaper, broiler litter mulch, oak bark, etc.) have been used very successfully for managing weeds in many crops. Studies have concluded that organic mulches suppress weeds by inhibiting germination physically and chemically. However, since they are not applied until after crop seedling emergence has occurred, the negative effects of toxic compounds have not been observed. In

the last issue of the Gazette I reported on a trial were newspaper mulches were evaluated for weed management in a cucumber crop. In that trial, all of our mulch treatments suppressed weeds to below yield-depressing levels. However, there are also some issues to be aware of before using them. Organic mulches can create a habitat for small animals (voles, mice) that can damage crops. This doesn't happen every year or in every field, but it can be an issue. A few years back we had a strawberry trial and used straw mulch covered with a row cover for winter protection. In the spring about 1/3 of the plants had been damaged by voles who had taken up residence in the straw. Organic mulches can maintain soil moisture, limiting the amount of irrigation crops may need. However, they can create moist environments that can favor root rots, especially in a wet year. Organic mulches may provide less weed suppression and can be more expensive than herbicides. They also need to be replenished to maintain their depth as they break down.

Finally, if buying compost, consider storing it if it is immature until it matures. When mature compost is incorporated into soil can result in increased crop yields and improve soil health.

Nutrition Management for Greenhouse and High Tunnel Tomato Production

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Tomatoes are a very popular crop throughout Pennsylvania. As with other crops, growers should become familiar with the growing requirements for tomatoes before planting any tomato plants in a greenhouse or high tunnel. The following are recommendations for fertility management for either a spring or fall crop. These tips and guidelines will help produce healthy, productive, actively growing tomato plants and reduce or eliminate potential nutrition problems.

Always conduct a soil test of the greenhouse soil or media before planting tomato plants. Results to be evaluated include soil pH, soluble salts (optimum range 2.0 to 3.5 mmhos/cm) and all the major and minor nutrients. Any deficiencies should be corrected before planting tomatoes, NOT after planting tomatoes.

Be sure the cations (K^{+}, Mg^{+} and Ca^{++}) are balanced and approximately in the following range: Potassium – 3 to 5%, Magnesium – 8 to 12% and Calcium – at least 65%. Potassium must remain above 2.5 % to prevent the appearance of yellow shoulders on mature fruit. Many growers find it beneficial to apply boron at least once in the cropping cycle – preferably early in plant development. The recommended application rate is 8 oz per 100 plants. Also – be sure to run the irrigation system long enough that all fertilizer is cleared from the lines. This will insure that all plants receive an equal amount of fertilizer at each application. Flushing will also help prevent plugging of the emitters from salt build-up.

For optimum tomato production, a nitrogen (N) concentration of 120 to 150 ppm, maintained in the soil solution, will produce a tomato plant large enough to support 18 to 22 pounds of fruit. Too much N in tomato plants results in excessive vegetative growth and the plant will/can abort new flower clusters. High N causes the plant to switch from fruit production to vegetative growth. In addition, once excessive N has been applied to the plant it is nearly impossible to control plant growth. Once you encourage rapid vegetative growth in the tomato plant it will not switch back to fruit production until the extra N has been used-up in the plant. This means that the N level (from a tissue test) is readjusted to its normal range of 3.5 to 4.0% nitrogen. Monitoring a fertility program for tomato can be accomplished through tissue testing. An ideal N concentration in tomato leaf tissue from transplanting until the appearance of mature fruit clusters is 3.5 to 4.0%. While good foliage is necessary for fruit quality, too much foliage will reduce yields and ultimately profit.

The fertility program for a spring crop of tomatoes is distinctively different from that of a fall crop. For a spring crop, tomato transplants are set in a greenhouse during a period of short days and relatively low light intensity. As the spring progresses, days are getting longer. Growing conditions for a fall crop are just the opposite.

The following fertility guidelines should be modified according to growing conditions encountered at each farm. During prolonged periods of dark, cloudy weather, nutrient uptake by the tomato plant is greatly reduced and it may be desirable to skip feeding the tomatoes for one week. Excessive amounts of fertilizer should be avoided when plants are small and before fruit has set on the first cluster.

Fertility Recommendations – Spring Tomato Crop

Weeks after Transplanting	Fertilizer and Amount Applied per 100 Plants
1 and 2	water only - no fertilizer
3 to 6	calcium nitrate – 3 pounds per 50 gallons of water
7	potassium nitrate – 6 pounds per 50 gallons of water
8	calcium nitrate + chelated iron - 6 pounds per 50 gallons of water + 0.25 lbs. iron
9	potassium nitrate - 5 pounds per 50 gallons of water
10	20-20-20 - 5 pounds per 50 gallons of water
11	calcium nitrate + chelated iron - 5 pounds per 50 gallons of water + 0.25 lbs. iron
12	potassium nitrate - 5 pounds per 50 gallons of water
13	calcium nitrate - 5 pounds per 50 gallons of water
14	20-20-20 - 4 pounds per 50 gallons of water
15	calcium nitrate - 5 pounds per 50 gallons of water
16	potassium nitrate - 4 pounds per 50 gallons of water
17	potassium nitrate - 4 pounds per 50 gallons of water
18	20-20-20 - 4 pounds per 50 gallons of water
19	calcium nitrate - 3 pounds per 50 gallons of water
20	potassium nitrate - 3 pounds per 50 gallons of water
21	potassium nitrate - 3 pounds per 50 gallons of water
22	20-20-20 - 2 pounds per 50 gallons of water
23	calcium nitrate - 2 pounds per 50 gallons of water
24	calcium nitrate - 2 pounds per 50 gallons of water

Fertility Recommendations – Fall Tomato Crop

Modify the spring program as follows:

- Application of potassium nitrate in week 1 at 3 pounds per 50 gallons of water.
- Application of calcium nitrate in week 2 at 3 pounds per 50 gallons of water.
- From weeks 3 to 9, application of potassium nitrate at the rate of 6 pounds per 50 gallons of water.
- From weeks 10 to 20, fertility schedule would be the same as the spring crop.

Note: Generally week 20 in a fall tomato crop would fall in mid-December when environmental conditions are sub-optimum for continued tomato production in the greenhouse.

Management of Wireworms in Potatoes

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Wireworms (Coleoptera: Elateridae) are the most important soil-dwelling pests of crops in the Pacific Northwest and are becoming increasingly important in several other regions in the U.S. The predominant wireworm species in Idaho is the sugarbeet wireworm, *Limonius californicus* (Mannerheim). Significant potato crop losses of up to 25 percent from wireworm damage have been reported in Idaho, with losses resulting in millions of dollars annually from insecticide costs, yield loss, yield quality down grades, and whole shipping load rejections. Management options for wireworms are limited by an incomplete knowledge of their biology and the inability to reliably predict fields at risk.

The life cycle of our most common wireworms requires up to 6 years. Wireworms spend the winter in the soil either as partially grown larvae or as new adults. Adults work their way up to the soil surface in the spring when soil temperatures are 55°F or above. These adults require little or no food and cause no economic damage. Wireworm larvae cause the most severe feeding damage during their second and third years. In the spring when soil temperatures are 50°F or above, the larvae move toward the soil surface from overwintering depths of 6 to 24 inches.

Growers in the U.S. rely on a few registered organophosphate and carbamate insecticides, which are not always effective for control of wireworms. Insecticides are applied pre-planting or at planting and have to be soil incorporated and must be persistent. The identification of more effective insecticides than the ones currently registered for wireworm control would result in a better wireworm management and reduced wireworm damage.

Experiments conducted at the University of Idaho, Kimberly Research and Extension Center in Idaho evaluated the effectiveness of several chemical treatments. Since the Environmental Protection Agency (EPA) could eventually cancel some or all organophosphate and carbamate pesticides on potatoes under the requirements of the Food Quality Protection Act, we assessed the efficacy of labeled and non-labeled insecticide products in these experiments. Relatively new chemistries that are currently labeled in potatoes for control of other insect pests such as Colorado potato beetle and aphids (for example the neonicotinoids imidacloprid and thiamethoxam) were included. Different application methods (seed treatments, band applications, and in furrow at planting treatments) and different formulations (granular and liquid treatments) were assessed.

Because of the patchy distribution of these insects in the ground, individual treatment plots had individual controls on both sides of the plot. The experiment was replicated for three years (2003-2005). Tubers from both treated and check plots were harvested, weighed, examined for wireworm feeding damage, and data combined for the untreated control. For the percentage of affected tubers, a tuber with one or more wireworm holes was considered an affected tuber. A total of 36,000 tubers were examined. One additional experiment that included a soil fumigant was conducted in 2006. Fumigation treatments with Telone were conducted the previous fall (August 29, 2005) by a commercial applicator. All other insecticide treatments were applied in the spring pre-planting and

also as in-furrow at planting (see Table 1 for rates and methods of application). All tuber evaluations were conducted as explained above.

Table 1. Effect of various insecticides on the reduction of wireworm damage on potato tubers in 2006

Treatment and Rate	Method of application	Avg. holes ± S.E.	Avg. tuber weight (g) ± S.E.	% Affect. Tubers	% U.S No. 1
Experimental (3.2 oz/acre) (NL)	In furrow at planting	0.08±0.02d	176.11±4.70a	6	29.5
Telone II* (15gal/acre)	Soil fumigant-preplanting	0.15±0.03cd	118.95± 3.74d	10.75	18
Telone II (20gal/acre) + Thimet 20-G (16.53 oz/1000 ft row)	Soil fumigant-preplanting + in furrow at planting	0.20±0.03c	135.51±3.72c	13.5	23
Mocap EC (1 gal/acre)	Broadcast incorporated	0.20±0.03c	136.61±4.18c	13.25	21.25
Mocap EC (1 gal/acre) + Temik 15G NW (20lbs) (NL)	Broadcast incorporated + in furrow at planting	0.26±0.04b	155.42±3.87b	16.75	29.75
Thimet 20G (16.53 oz/1000 ft row)	In furrow at planting	0.27±0.03b	156.96±4.40b	18.75	26
Control		0.35±0.01a	137.43±1.60c	21.88	27.25

Column values with different letters were significantly different in a general ANOVA with a Fisher's LSD criterion at the 0.05 level (n=400).
NL=not labeled for wireworm control; used only for experimental purposes.
*= Telone label states that the product suppresses wireworms.

The wireworm seasonal activity and timing of injury to tubers was also determined. Every week, 10 random plants were dug during the course of the experiments, from untreated potato plots established adjacent to insecticide test plots, to assess the amount of damage at different physiological stages of the crop and time of season. From these data an estimate of timing of peak wireworm larval activity in Idaho was made. This information will allow growers to make more effective use of the products and would also allow growers to know how long a pre-plant chemical needs to last in the field to prevent damage.

Results: With the exception of neonicotinoid insecticides (which are labeled for control of other insect pests in potatoes as explained above), all insecticides labeled for wireworm control provided reduction in the number of damage sites per tuber when compared to the untreated control. Neonicotinoid insecticide treatments presented equal or higher damage than the controls. In-furrow treatments in general presented a lower average number of holes per tuber than seed treatments. An insecticide not labeled for potatoes consistently provided the lowest number of holes per tuber and also the lowest percentage of affected tubers during the three years of this study. This insecticide may be registered in the future. The mean number of holes of the experimental insecticide treatment was not statistically significantly different com pared with Mocap and Thimet treatments in two of the three years.

The experiment that included fumigants in 2006 indicates that Telone II is an effective option for reducing wireworm damage since all Telone II treatments presented a low number of holes per tuber and low percentage of affected tubers when compared to control rows. However, these treatments seem to affect the quality of the potato tubers since all the Telone II treatments resulted in a lower tuber weight and percentage of U.S. No. 1 tubers. As in the previous three years, the experimental insecticide was better than any other insecticide product tested and plots treated with this insecticide presented the lowest number of holes per tuber. Experimental insecticide-treated plots also had the

lowest percentage of affected tubers and the highest percentage of U.S. No. 1 tubers. In conclusion, from the few insecticides registered at this time, Mocap and Thimet seem to provide the best reduction in wireworm damage under Idaho conditions. However, Mocap seems to provide more consistent effectiveness than Thimet.

Results of Wireworm Activity Experiment: Early in the season, it was observed that many of the wireworms were feeding on the seed piece, and not on small developing tubers. Most damage to tubers occurred after mid-June. This indicates that all the wireworm insecticides may be applied prematurely (at planting) because the wireworm damage is occurring mostly at the end of the season when the effectiveness of these insecticides has been reduced.

Understanding and Controlling Damping-Off

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Damping-off is caused by a number of important vegetable pathogens and is very common this time of year. Damping-off can kill seedlings before they break the soil line (pre-emergent damping-off) or kill seedlings soon after they emerge (post-emergent damping-off). Common pathogens that cause damping-off include *Pythium*, *Phytophthora*, *Rhizoctonia* and *Fusarium* spp. Although all four pathogens are associated with damping-off, the conditions which favor their development are very different. In general, Phytophthora and Pythium are more likely to cause damping-off in cool, wet soils. While, Rhizoctonia and Fusarium are more likely to cause damping-off under warmer, drier conditions. In general, Pythium tends to kill seedlings before they emerge where Rhizoctonia and Fusarium tend to kill seedlings after they emerge. There are exceptions to the rules in some cases, but none the less, all damping-off pathogens can cause serious losses if not controlled properly. Control of damping-off depends on a number of factors. First, is recognizing the conditions which may be leading to the problem (i.e. weather, greenhouse growing conditions) and secondly, properly identifying the pathogen causing the problem. Why is this so important? The fungicides applied to prevent or control damping-off are specific in the pathogens they control. Fungicides used to control Pythium or Phytophthora won't control the other damping-off pathogens. Why is this? The biology of the fungus and the mode of action of the fungicide dictates fungicide efficacy. For example, Ridomol Gold and Ultra Flourish (mefenoxam, FRAC code 4) and Previcur Flex (propamocarb, 28) help control the 'water molds' (Pythiums and Phytophthora) where Terraclor (PCNB, 14), Rovral (iprodione, 2) and Amistar (azoxystrobin, 11) helps control damping-off caused by Rhizoctonia. Therefore, it is extremely important to know which pathogen is causing the damping-off problem and which fungicide to properly apply. Always refer to the fungicide label for crop use, pathogens controlled and application rates.

Using Cover Crops to Reduce Erosion in Plasticulture Vegetable Production

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A considerable amount of fresh market vegetables are produced using raised-beds and plastic mulch. The plasticulture system has numerous production advantages for the grower. However, using plastic mulch requires extensive soil tillage and can lead to increased soil erosion during heavy rainfalls. Runoff from the plastic will also increase erosion, especially on sloped sites.

Cover crops have been shown to reduce soil erosion, especially those that provide a dense cover. However, a living cover crop can compete with the vegetable crop for water and nutrients as well as potentially harbor insect pests. Growers using the plasticulture system have begun to experiment with living mulches between rows of plastic in some areas of Pennsylvania. In 2005 and 2006 we examined the effects of living and burned down cover crops in row middles of vegetables produced using plasticulture to provide recommendations to growers. In all studies the crop was grown using standard production practices regarding fertility and pest control.

In 2005 tomatoes were grown in a field that had bare soil, annual ryegrass, or red clover cover crops between the rows. The cover crops were established just after the plastic mulch was laid. Cover crops were mowed as necessary until harvest started. Yields were recorded at each harvest and combined to give total yields for each mulch treatment.

A similar evaluation with watermelon was conducted with bare soil, annual ryegrass or oats as cover crops. The cover crops were burned down with glyphosate prior to vine running. Yields were measured at each harvest and combined for total yields per mulch treatment.

Pumpkins were utilized as a third crop to evaluate. Treatments were bare soil (no herbicide), bare soil + Strategy™ herbicide, living cover crops, cover crops burned down with glyphosate, and cover crops burned down and Strategy™ applied. Cover crops used were oats, annual ryegrass or cereal rye. Due to the dry weather cover crops did not establish well in this part of the trial.

While there was no difference in total yields between the cover crops (annual ryegrass and red clover) tomato yields were 65% higher with a cover crop than bare soil. The grower cooperator in this trial noted that fruit set was better in the lower portion of the plants in plots with cover crops than in bare soil. Since these cover crops were alive and controlled by mowing, we suspect that the cover crops resulted in lower (more favorable) temperatures for fruit set. The 2005 growing season was hot and this effect may not be present every season, especially in a normal season where this cooling could lower yields.

In watermelon, yields from mulch treatments that were rolled and sprayed had equal yields to the bare soil. Cover crop plots that were only sprayed (but not rolled) had lower yields than the other treatments. Two explanations we have are better weed control because of formation of a better “mat” of vegetation with rolling and possible pollination problems in plots with standing residue.

High weed pressure in the untreated plot in pumpkins significantly reduced yield. In the non-killed cover crops yields were also reduced but not as much as in the untreated plots. Cover crops that were killed prior to vine run resulted in yields that were the same as the standard treatment of Strategy™ herbicide.

In 2006 we again looked at a cover crop in row middles in pumpkins grown using plastic mulch. The treatments were bare soil with no herbicides, bare soil with Strategy™ herbicide and annual ryegrass burned down prior to vine run. The 2006 season was cooler and weed pressure was not as great as in 2005. There were no significant differences among the treatments although yield was slightly lower in annual ryegrass plots. Some grass and weeds emerged in these plots after burn down and may have competed with the crop or affected pollination.

Based on these studies we believe that cover crops, when properly managed, can be successfully used in plasticulture row middles for vegetable production. Living mulches can be used in upright crops where they can be managed by mowing. Vine crops require the cover crop to be killed prior to vine run. Besides cleaner crops at harvest, mulches in row middles will help protect the soil from erosion.

We would like to thank the PA Vegetable Marketing and Research program for funding to support these studies.

Vegetable Disease Update

Andy Wyenandt, Assistant Extension Specialist, Department of Plant Biology and Pathology, Rutgers
Wes Kline, Cumberland County Agricultural Agent, Rutgers

Asparagus – Phytophthora crown and spear rot – In fields with low spots (poorly drained soils) or fields with a history of crown and/or spear rot apply Ridomil Gold 4E (mefenoxam, 4) at 1 pt/A over beds just before 1st harvest. For new plantings, apply the same after planting or after crown covering. For more information please see the 2007 Commercial Vegetable Production Recommendations Guide.

Cabbage – Damping-off – To help control losses due to damping-off pathogens apply Ridomil Gold (mefenoxam, 4) at 1 to 2 pt/A 4E or Amistar (azoxystrobin, 11) at 0.125 to 0.25 oz 80WDG or OLF/1000 row ft (for Rhizoctonia only) or Quadris (azoxystrobin, 11) at 0.4 to 0.8 fl oz 2.08F/1000 row ft (for Rhizoctonia only) in a band up to 7 in after seeding. For more information please see the 2007 Commercial Vegetable Production Recommendations Guide.

Cole crops – Downy mildew and Alternaria – Symptoms of Downy mildew include purple to yellowish-brown spots on upper leaf surfaces. A grayish-white spore mass will develop and cover the underside of leaves under ideal temperatures (night temperatures of 46 to 61°F and day temperatures below 75°F. Downy mildew can kill young plants. Heavily infected leaves may drop providing entry points for bacterial infections (Black rot and Soft rot). Symptoms of Alternaria on infected leaves include small, expanding circular lesions with concentric rings that may have a 'shot-hole' appearance as lesions age. Heavily infected seedlings may result in damping-off. Control of Downy mildew and Alternaria begin with preventative fungicide applications. Use one of the following at the first sign of disease and continue every 7 to 10 days (Please refer to the pesticide table on page F19 of the Commercial Vegetable Production Recommendations to determine which fungicide is labeled for each specific crop.): Amistar (azoxystrobin, 11) at 3.5 to 5.0 oz 80 WDG/A or Quadris (azoxystrobin, 11) at 6.2 to 15.4 fl oz 2.08F/A, or chlorothalonil (M5) at 1.5 pt 6F/A or OLF, or Cabrio (pyraclostrobin, 11) at 12 to 16 oz 20EG/A, or Endura (boscalid, 7) at 6 to 9 oz 70WG/A, or maneb (M3) at 1.5 to 2 lb 80WP/A or OLF, or Ridomil Gold Bravo (mefenoxam + chlorothalonil, 4 + M4) at 1.5 lb 76.5WP/A (14-day schedule), or Switch (cyprodinil, 9) at 11 to 14 oz 62.5WG/A (Alternaria only). For downy mildew only, apply Actigard (acibenzolar-S-methyl, P) at 1 oz 50WG/A (begin applications 7-10 days after thinning and re-apply every 7 days for a total of 4 applications per season.), or Aliette (fosletyl Al, 33) at 3 to 5 lb 80WDG/A (on 14-day schedule). For more information please see the 2007 Commercial Vegetable Production Recommendations Guide.

Parsley – Septoria Blight /Bacterial (blight) leaf spot – Leaf spots caused by Septoria blight are easily distinguished by small, angular to round leaf spots with grayish-brown centers with a definitive dark, brown margin. Numerous black fruiting bodies develop in the center of lesions. Septoria blight is spread by wind-driven rain, heavy dews and overhead irrigation. Workers and equipment may also spread the disease during wet conditions. Best management practices include i) proper crop rotations of at least 2 years and using clean or treated seed, ii) scouting fields early for symptom development, iii) keeping workers and equipment out of fields with wet foliage and iv) plowing under residue of harvested crop and avoid planting in fields adjacent or near previously infected fields. Applications of

azoxystrobin (Amistar or Quadris) and fixed copper can be alternated every 7 days for control. Bacterial leaf spot (*Psuedomonas syringae*) of parsley can also show up at the same time as Septoria blight. Leaf spots caused by Bacterial blight appear as small brown to black spots on the leaves. The pathogen can be soil or seed borne and develops during cool, moist weather. The disease spreads during cool, rainy weather or with overhead irrigation; and is exacerbated by high plant density. The same control measures listed for Septoria will assist in preventing the spread of Bacterial leaf spot as long as the fixed copper is included with azoxystrobin and the fungicides are applied preventatively. If Oxidate is used, follow the label carefully.

Spring Peas – Damping-off -Use seed already treated with an approved seed treatment, or treat seed with a slurry or dust that contains an approved commercial fungicide-insecticide mixture. For Pythium control and/or for damping-off and root rot caused by Pythium, apply Ridomil Gold (mefenoxam, 4) at 0.5 to 1.0 pt 4E/A or Amistar (azoxystrobin, 11) at 0.125 to 0.25 oz 80 WDG/1000 row ft or Quadris (azoxystrobin, 11) at 0.40 to 0.80 fl oz 2.08F/1000 row ft as a broadcast treatment at seeding. For more information on seed treatment options and control please see the 2007 Commercial Vegetable Production Recommendations Guide.

Spinach Greens (Damping-off) – See the table on page E30 for seed treatment options. Apply Ridomil Gold 4E/A (mefenoxam, 4) at 1 to 2 pt/A or Ultra Flourish 2E (mefenoxam, 4) at 2 to 4 pt/A pre-plant incorporated or as a soil surface spray after planting. For more information please see the 2007 Commercial Vegetable Production Recommendations Guide.

Summary of Small Fruit Pesticide Changes for 2007

Kathy Demchak, Senior Extension Associate, Department of Horticulture, Penn State University

Last month, we had mentioned that updated pesticides tables (only those with changes) for the Mid-Atlantic Berry Guide can be found at http://hortweb.cas.psu.edu/extension/smallfruits/berry_guide_updates.html. Here is a summary of the changes for those of you without Web access, or who aren't wild about surfing the Web…

First, Nemacur use is being discontinued, though sales are permitted until May 31, 2008, and growers may continue to use existing stocks. A note of this is made in tables where Nemacur is listed.

In order to provide consistency across strobilurin fungicide recommendations, the maximum number of recommended applications of group 11 (strobilurin) fungicides is decreased to 4 per crop year for strawberries, and 3 for brambles and blueberries. For berry crops, group 11 fungicides are Abound, Cabrio, and one of the active ingredients in Pristine. This is not due to a change in labeling, but rather to provide consistency across labels and to delay development of resistance. A note of this is made in tables where these fungicides are listed.

Specific to table 18 (strawberry insecticides and fungicides), Admire 2F at 16-24 fl oz/a is added for white grub control before planting. Procure 50WS at 4-8 oz/a and Quintec at 4-6 fl oz/a are added for powdery mildew management. Both Procure and Quintec have a 1-day PHI. For two-spotted spider mites, Oberon 2SC at 12-16 fl oz/a (3-day PHI) is added and a note is made that the registration of products containing dicofol (Kelthane and Dicofol) is being discontinued, though existing stocks may be used. For whiteflies, Oberon 2SC (3-day PHI) at 12-16 fl oz/a and Esteem 0.86EC at 10 fl oz/a (2-day PHI) are added. Changes are made in references to maximum number of strobilurin fungicide applications recommended and on Nemacur use as mentioned in the previous 2 paragraphs.

In table 20 (strawberry herbicides), a note is made to stress the importance of following applications of Sinbar to non-dormant strawberries during the planting year with 0.5-1.0 inches of water. Chateau WDG at 3 oz/a is added for preemergent control of broadleaved weeds and some grasses. Applications of Chateau can be made to dormant strawberries in late fall of the transplanting year and in fall or early spring of harvest years.

In table 47 (bramble insecticides and fungicides), the last date for which Guthion could be used on brambles (Sept. 30, 2006) is now past, so Guthion is removed from this table. Because of the discontinuation of dicofol registrations, Virginia's 24C label for Kelthane is being discontinued. VA was the only state covered by this guide that had this registration. Changes are made in references to maximum number of strobilurin fungicide applications recommended and for Nemacur use as mentioned in paragraphs 2 and 3.

In table 32 (blueberry insecticides and fungicides), Indar 75WSP at 2 oz/a is added for control of mummy berry primary and secondary infections. Indar has a 30-day PHI. The Ziram formulation is changed from Ziram 76WDG to Ziram Granuflo. The rates remain the same. Surround 95WP at 12.5-50 lb/a is added to the list of materials for plum curculio management at petal fall and for blueberry maggot management during fruit maturation, but only within the first 3 weeks after fruit set

due to white residues on the fruit. Changes are made in references to maximum number of strobilurin fungicide applications recommended as mentioned in paragraph 3.

Concerning new materials mentioned above, Chateau, Indar, Quintec, Procure, and Oberon all have 12-hr REI's. Surround's REI is 4 hours. As always, the label is the law and is the final word on how pesticides should be used.

That's a Berry Good Question!!!

Kathy Demchak, Senior Extension Associate, Department of Horticulture, Penn State University

Q. Most of the new growth on our strawberry plants contains small holes. I can't see any pests on the plants. This is a second year crop grown on raised beds with plastic. Any suggestions on what may be causing this? What should I be looking for to determine the cause? Recommendations on what to do to control them? Thanks for your help. (Cheri Newcomb, Level Crest Farm, Butler, PA)

A. The symptoms of damage match with those caused by strawberry rootworm. The adults emerge from overwintering in the spring, and feed on the leaves. I've seen them cause leaf damage on raspberries, and they also cause damage on blueberries and azaleas. Adults either are or will be laying eggs shortly, and the larvae feed on the roots, hence the name. If the planting is held throughout the summer (not likely in your case) a larger generation of adults will emerge later in the year and often causes even more noticeable leaf damage. The reason that you aren't seeing the adults is that they are active at night, and tend to hide under debris (like leaf litter or straw mulch) or in soil cracks during the day. The adults are small, black to brown beetles, only about 1/8-inch long. The roots and crowns may already have been damaged from earlier feeding, and you may notice a lack of plant thriftiness. You can dig some plants up and check the roots (they may appear short) and crowns (I've also found small holes in them in severe infestations) for damage.

The only pesticide I know of that is specifically labeled for strawberry rootworm is Pyrellin E.C., though the Pyganic label also would allow such use. Just make sure you spray either before bloom, or if it's too late, see if adults are still around after bloom. Also, watch for the next generation later this summer if keeping the planting. It's better to spray in the evening when the beetles will be coming out. This will help to protect any bees that might be out and about, even if the strawberries are past bloom – the bees could be busy pollinating other crops (or weeds). Both Pyrellin and Pyganic have only a short period of residual toxicity, though they are dangerous to pollinators at the time of application. Other broad spectrum insecticides like Thionex, Brigade, Sevin, and Malathion that would sometimes be applied early in the season also control strawberry rootworm, which might explain why this is a problem in some fields more so than others.

Grape colaspis, by the way, can cause similar damage, except that the holes will be larger, and you'll be able to find the beetles during the day. They're about twice as long.

Got a question? Chances are that someone else has the same question! Send your question to Kathy Demchak, at 102 Tyson Bldg., University Park, PA 16802, or via email to kdemchak@psu.edu. You will be credited with the question, or can remain anonymous, as you wish.

2007 Wye Strawberry Twilight Meeting

Mike Newell, Faculty Research Assistant & Program Manager, Wye Research and Education Center, Crops University of Maryland
Submitted by Kathy Demchak, Senior Extension Associate, Department of Horticulture, Penn State University

The 2007 Strawberry Twilight meeting at the Wye Research and Education Center, Wye, MD, will be held on Thursday, May 24 2007 from 6:00-8:00PM. Speakers will be Dr. Anne DeMarsay, UM plant pathologist, speaking on current disease control strategies and products; Dr. Harry Swartz, UM small fruit breeder who will discuss current work; Mr. Michael Embrey, UM-WREC apiary specialist who will discuss pollinator concerns; and Mr. Michael Newell, UM- WREC, discussing Fall production research and field plasticulture variety trials.

Growers will be able to see 19 strawberry cultivars on plastic from California, Florida and USDA breeding programs as part of several research trials, including 'Carmine', 'Evie-2', 'Ventana', 'Albion', 'Bish', 'Treasure', 'Festival', 'Oso', 'Camino Real', and 'Diamante' in comparison to more commonly-grown cultivars. In addition, a high tunnel Fall production system can be seen using bag culture with the cultivars 'Chandler', 'Camarosa', 'Ventana', 'Carmine', and 'Sweet Charlie'. Finally, participants are asked to bring in samples of strawberry insects and diseases if available.

Light refreshments will be served after the meeting. No pre-registration is necessary.
The Wye Research and Education is 7 miles Southeast of Queenstown, MD on Maryland's Eastern Shore. A map is can be access from http://agresearch.umd.edu/RECs/WREC, then click on "Directions" on the left side of the page. Questions? Contact Mike Newell 410-827-7388 or email mnewell@umd.edu.

NASGA Summer Tour: Ontario and New York

Submitted by Kevin Schooley, North American Strawberry Growers Association

Before the summer comes to an end, treat yourself to a mini-break and the annual NASGA Summer Tour, August 14-15, 2007. NASGA's summer tours provide a unique chance to see other farm businesses in full swing. The 2007 summer tour will be based in Niagara Falls, Ontario.

We will visit many interesting farms and markets. We will begin in Ontario on day one with some historic sites along the breathtaking Niagara Parkway. Stops include a beautiful farm market, and a neighboring strawberry farm with plasticulture and day neutral production. The Niagara area has a large greenhouse industry and we hope to visit a 25 acre operation that produces all its energy needs on site using wind and biofuel ingestors. Our last stop will be at Strawberry Tyme Farms where we will see a variety of activities including nursery production, plasticulture and matted row strawberries and approximately 30 acres of tunnel production.

On our second day we will cross the border to New York to tour fruit farms near the beautiful shores of Lake Ontario. We will visit berry farms, a first rate market and value-added enterprises where products such as fruit butters and fruit wines are made. At one stop, Andrew Landers, from Cornell University will host a sprayer demonstration. Our final stop will be along the south shore of Lake Ontario where we will enjoy the scenery and reflect on the last two days of tours.

A block of rooms is reserved at the beautiful Sheraton Fallsview. This is a busy time of the year in Niagara Falls so if you are considering participating in the tour, book a room now. The Sheraton has created a personalized website for us to reserve rooms for our event at http://www.starwoodmeeting.com/StarGroupsWeb/res?id=0703190882&key=69157. If you prefer to call in your reservation (1-877-353-2557) please quote group code NAH14A.

For more information and updates see: www.nasga.org

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

- ✓ May 4, 2007. **Herb and Weed Walks with Grace Lefever**. Sonnewald Educational Homestead, Spring Grove, PA, 6-8pm. Call Grace at 717-225-3456 for more information. Walks will also be held on May 8, 10, 12, 15, 23, 26 &30.

- ✓ May 4 and 5, 2007. **Pennsylvania Women in Agriculture Workshop – Living in Balance: A Centered Approach to a Farming Life**. One World Environmental Camp, Spring Mills, PA. This workshop presents the concept of conscious and mindful living made practical through a day-to-day approach to life on and off the farm. Contact Ann Stone at 814-863-4489 or 717-582-3858 for more information.

- ✓ May 11 and 12, 2007. **5th Annual Pennsylvania Land Conservation Conference**. Penn Stater Conference Center Hotel, State College, The Pennsylvania Land Conservation Conference is Pennsylvania's annual training, networking and inspirational event for those involved with private and public land conservation. Learn more at http://conserveland.org/conferences/2007/.

- ✓ May 19, 2007. **PASA Field Day – Composting: Small Scale to Farm Scale**. Two Particular Acres, Montgomery Co. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ June 5, 2007. **PASA Field Day – Cover Crop Research and Management Summit**. Penn State Rock Springs Agronomy Farm, Centre County. You must pre register with Lisa Crytser at Penn State by May 30 by phone (814) 865-2543 or email lac8@psu.edu.

- ✓ June 13, 2007. **PASA Field Day – Managing Weeds and Soil Quality Organically**. Russell E. Larson Research Center, Centre County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ June 23, 2007. **Summer Solstice Sustainable Farming & Energy Celebration**. 4-9pm, Wilson College, Chambersburg, PA. Includes farm tour of Fulton Farm, renewable energy demonstrations, music, food & fun! Contact Matt Steiman for more information, 717-264-4141 x3247.

- ✓ July 14, 2007. **PASA Field Day – Living on Your Land, Leaving a Small Footprint**. Matre Manoeuvre Farm, Fulton County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ July 25, 2007. **Kutztown Produce Auction Meeting**, Fleetwood, PA. For more information contact John Berry at (610) 391-9840 or jberry@psu.edu or Mena Hautau at (610) 378-1327 or mmh10@psu.edu.

- ✓ Aug 1, 2007. **PASA Field Day – The Impact of Soil Quality on Productivity**. Ran Gargasz Farm, Lawrence County. For More information call (814) 349-9856 or visit www.pasafarming.org.

- ✓ 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 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

- ✓ July 11-14, 2007. **The Second National Conference on Facilitating Sustainable Agriculture Education**. Cornell University's Alice Cook House, Ithaca, NY. Contact Kathi Colen Peck, Conference Coordinator at kscp@turbonet.com for more information.

- ✓ 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.

- ✓ 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.

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