New York Berry News

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Here we go…Spring has finally sprung! The warm and (mostly) sunny weather predicted over the next 7 days or so (from 4/15) will push many of our slumbering crops into the green. The cool and wet weather, although slowing plant growth, was ideal weather for many of the fungal pathogens that attack small fruit crops. Mummyberry, gray mold, and diseases caused by *Phytophthora* spp. are what growers should anticipate having to contend with from now until the end of June. By mid-May growers should be prepared to deal with frost events in their strawberries; Marvin Pritts gets us geared up to deal with it in this issue of the NYBN. Weed control is another spring chore; actually it's a year round chore but if you plan on using broadleaf herbicides it starts in the spring. Courtney Weber runs through the options strawberry and raspberry growers have this spring. Greg English-Loeb has put together a very nice article dealing with the spring-time insect pests. And finally, the "Smart Marketing" people explore the opportunity for supplying fresh produce to restaurants of all kinds!

Upcoming Meetings

April 30-May 1, 2004: *Organic Beekeeping Workshop*, Pfeiffer Center, Chestnut Ridge, N.Y. For more information call 845-352-5020, ext. 20, or visit www.pfeiffercenter.org

August 10-12, 2004: *Empire Farm Days*, Rodman Lott & Son Farms, Seneca Falls, N.Y. For more information call 877-697-7837, or visit www.empirefarmdays.com

August 18-20, 2004: *NASGA's Summer Tour*, Quebec City, Canada, for more information you may call Patricia Heuser at 814-2383364 or visit www.nasga.org/meetings/04summertour/promo.htm

Methyl Bromide Phase-Out Extended

Eleven developed nations agreed to delay the implementation of a deal to stop using methyl bromide during a conference held in late March. Methyl bromide was due to be phased out in developed nations by Jan. 1, 2005 under the 1987 Montreal Protocol. But, under the new deal, the 11 developed nations, including the United States, would be given exemptions allowing them to use the fumigant at least until the end of 2005. Developing nations have until 2015 to phase out methyl bromide.

Under the agreement, the 11 developed countries received exemptions totaling 14,813 tons for 2005. The 2001 consumption figure for all 34 developed countries in 2001 was 25,891 tons. The 11 countries were: Australia (160 tons), Belgium (52), Canada (62), France (449), Greece (205), Italy (2,351), Japan 313), Portugal (55), Spain (1,167), Britain (142) and the United States (9,857). In addition, the United States has agreed to limit its 2005 production levels for methyl bromide to 7,659 tons (equal to 30 percent of its baseline, as compared with 35 percent for its exemption). This means that it will supply some of its exemptions from existing stockpiles.

The deal was reached after the developed nations testified during a United Nations-sponsored meeting held March 24-26 in Montreal. The nations testified that

there is no viable alternative for methyl bromide. The exemptions were allowed to give farmers and others who use methyl bromide additional time to examine cost-effective substitutes for the pesticide, which is used to eliminate pests in such crops as tomatoes, strawberries, melons, peppers, cucumbers and flowers.

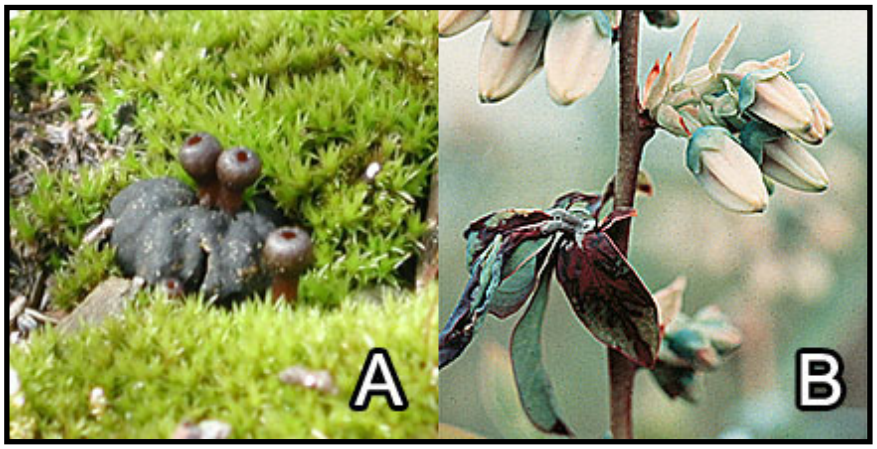
More than 350 participants – representing 114 governments – attended the Extraordinary Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (ExMOP) conference. They discussed a series of issues relating to methyl bromide that had been left unresolved at the 15th Meeting of the Parties in November 2003. According to the Earth Negotiations Bulletin, compromise was reached by adopting a double-cap concept distinguishing between use and production for critical-use exemptions and by establishing an ad hoc working group to review the working procedures and terms of reference of the Methyl Bromide Technical Options Committee. Delegates to the ExMOP also adopted decisions relating to further specific interim reductions of methyl bromide for the period beyond 2005 and conditions for granting and reporting critical-use exemptions for methyl bromide. Methyl bromide is being phased out because of its damage to the ozone layer and to possible dangers to those who come in contact with the pesticide. The Montreal Protocol allows governments to apply for exemptions when there are no technically or economically feasible alternatives, or for health or safety reasons. For more information, visit www.unep.org and search for "methyl bromide."
(Source: The Fruit Growers News, April 2004)

Unraveling Mummyberry

Peter V. Oudemans, Dept. of Plant Pathology, Rutgers University, Chatsworth, NJ

[*Editors note:* I have modified this article slightly to better fit New York circumstances, particularly as it refers to fungicide recommendations. In addition to this article, you can read last month's edition of the NYBN for a detailed look at this disease.]

For mummy berry control, two phases must be considered. The primary phase occurs when spores produced from the cups infect developing shoots. Blueberry cultivars are susceptible from budbreak until shoots are ON AVERAGE two inches in length. Infections occur approximately two weeks before symptoms appear and symptoms must correspond with the flowering period for the disease to complete its lifecycle. Control of the primary stage should be made to prevent infection. Thus, fungicide applications to control the primary phase should target budbreak. Cup development can also be monitored in the field. Spore production occurs when stipes form a deep indentation at the tip and the tip begins to expand to form the cup. (Figure A shows the state the "cups" were in on 4/12 in Oswego County – these are still immature, but will mature quickly under warm conditions – e.g., after 3 days at room temperature (4/15) the cups opened and mature spores were readily found).



Mummy berry occurs in wet and poorly drained areas of the field. The fungus cannot overwinter in dry soils and apothecium (the "cup") formation cannot occur on dry soils. Scouting should therefore target the wet areas of a field. Sprays should also target wet areas with mummies and include at least a 300 foot buffer surrounding these areas. Cultivars such as Berkeley, Bluetta, Blueray, Earliblue, Jersey, Nelson, Patriot, and Weymouth are susceptible whereas Bluecrop, Duke and Elliott are much less susceptible.

There are currently seven fungicides registered for mummy berry control this year and one under a section 18 in New York (Table 1). Most have low efficacy and provide marginal control. Two of these materials, Abound and Switch, performed very well in tests in 2003 in New Jersey {*Editor's note: I assume the control targeted the secondary spore phase-DO NOT rely on these fungicides for control of the primary phase*}. Indar is among the best and most consistent for both the primary and secondary phases. (*Indar was granted a section 18 in New York for 2004. You can download the label by visiting the Tree Fruit and Berry Pathology 'Pesticide Resources' section*). For control in areas with a susceptible variety, fungicide applications should begin at budbreak and follow a ten day interval. Scouting should target leaf blighting when bloom begins. In areas with native populations of blueberry growers may see significant berry infections without leaf blighting. For these areas and fields with signs of leaf blighting fungicide applications should continue through the bloom period. All of the materials listed below have excellent Botryis control and several have excellent anthracnose control. Therefore applications made during bloom should be made in consideration of other diseases that may become active during these times. (*Source*: Blueberry Bulletin, Vol. XIX, No. 1)

Table 1. Fungicides currently registered for mummyberry control in New York. *Regular text are NJ (P. Oudemans) ratings; italicized text are MI (A. Schilder) ratings; underlined text are Turechek's feelings.

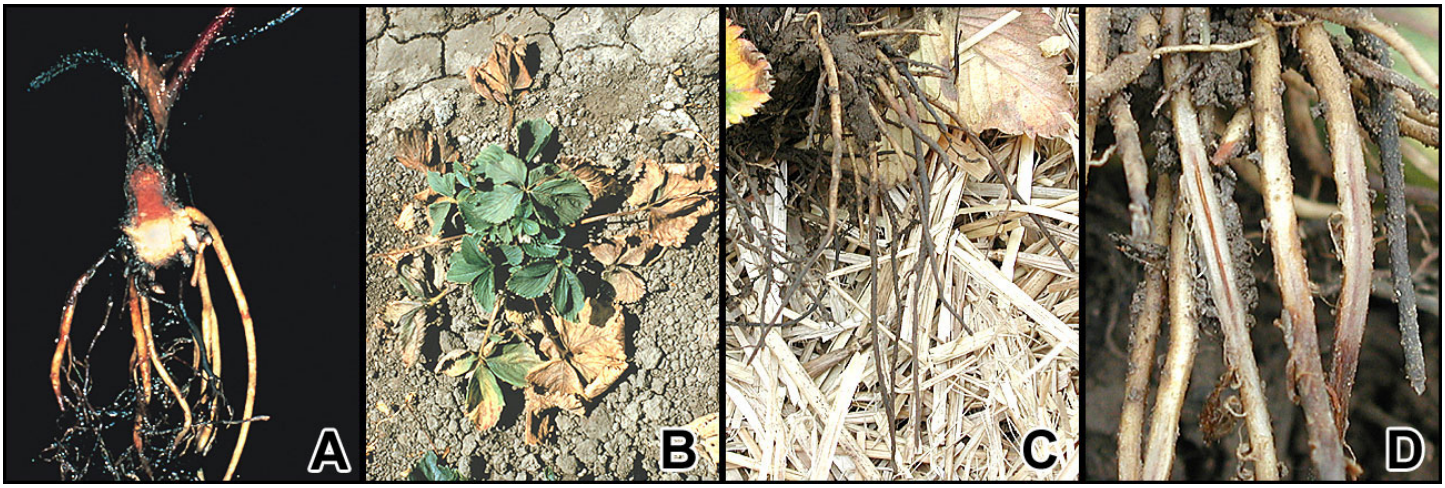
Material	Rate/A	Primary activity*	Secondary activity*	Maximum number of applications
Abound[1,2]	15.4 oz	*Poor*	*Moderate*	3
Bravo WeatherStik[3]	4 pt	Poor	Moderate	3
Captan 80W[1,2]	3 lb	Poor	*Moderate*	14
Captevate[1,2]	3.5 lb	Poor	*Moderate*	4
Elevate[1]	1.5 lb	*Poor*	*Moderate*	4
Indar[4]	2 oz	Excellent	*Excellent*	5
Switch[1]	14 oz	Excellent/*Moderate*	Excellent/*Moderate*	4
Ziram[1,2]	4.0 lb	Poor	*Moderate*	4

1. Excellent gray mold control; 2. Excellent anthracnose control; 3. Can by phytotoxic to bloom; 4. Section 18 expires June 30, 2004.

Phytophthora Diseases of Berry Crops

Bill Turechek, Dept. of Plant Pathology, Cornell University, Geneva, NY

The wet and cool conditions we are experiencing this spring are ideal for infection and development of diseased caused by the soil born pathogen *Phytophthora spp*. Red stele and Phytophthora crown rot of strawberries, and Phytophthora root rot of raspberries are three diseases that thrive in wet, cool soil. Below is a brief description of these diseases to help growers identify the problem in suspect plantings. This is followed by control recommendations.



Red stele (P. fragariae* var fragariae*):

Symptoms: Affected plants appear stunted and off-color and eventually wilt and collapse during periods of rapid growth or when the weather turns warm and dry. Plants are usually affected in clusters within fields, generally in low-lying or wet areas of the field, rather than as isolated plants scattered throughout the planting. Unlike crown rot (Fig. A), the roots of affected plants have a "rat tail" appearance caused by the loss of the fine, branched feeder roots from the main roots (Fig. C). The main roots are generally rotted at the tips back towards the crown and dark lesions are often found along the roots. Scraping away the outer portion of the root just above the rotted portion usually reveals a reddish stripe down the center of the root (i.e., the stele)(Fig. D).

Phytophthora crown rot (P. cactorum):

Symptoms: Like red stele, affected plants are stunted and the leaves appear pale or bluish-green. During periods of rapid growth, during fruit development and/or as the season becomes warmer and drier, the leaves quickly wilt, turn brown and the entire plant collapses (this is unlike symptoms caused Verticillium wilt where wilting occurs from the outer leaves towards the crown of the plant [Fig. B]). Plants are usually affected in clusters within fields, generally in low-lying or wet

areas of the field, rather than as isolated plants scattered throughout the planting. Extensive reddish-brown to brown necrosis of the upper portion of the crown is typical for plants infected recently (Fig. A). This is seen by digging up and cutting the crown in half longitudinally. The main and feeder roots of affected plants tend not to be as discolored or damaged compared to those roots affected by red stele (see below). As the infection progresses, the entire crown rots and decays, making diagnosis difficult. This fungus also affects the berries and causes the disease leather rot. Interestingly, the two symptoms may or may not occur together during the same year.

***Raspberry (P. fragariae* var rubi) :**

Raspberry plants infected with Phytophthora root rot may be a little more difficult to diagnose. Infected plants produce few primocanes. The few floricanes and primocanes produced often appear wilted with leaves appearing scorched along the margins, between veins. Eventually the leaves turn completely yellow as the disease progresses over the season. Scraping the epidermis of infected raspberry roots will reveal a reddish brown tissue (as in Fig A above) with a distinct margin where it meets the healthy white tissue. The infection may also extend into the crown.

Control:

Strawberry: There a number of varieties that are resistant or have some tolerance to red stele such as Earliglow, Allstar, Northeastern, Mohawk, Tristar, and Sparkle. If a planting was lost due to either of these diseases, strawberries should not be replanted to this site until it has undergone several years of rotation with non-host crops or, if you are gambler, you can try to plant a resistant variety if the site can be improved. In established plantings, excess water should be drained from fields where possible. New plantings should be planted on a well-drained site and/or drainage tiles should be installed if standing water is a recurrent problem. Because splashing water helps to distribute both pathogens, a thick layer of straw mulch is recommended to reduce splashing. This will also protect berries from developing red stele where crown rot is a problem. Also, avoid walking or driving machinery through affected areas and then entering unaffected areas of the planting. The fungi are easily transported on soils stuck to the bottom of shoes or in tractor tires.

Raspberry: According to Courtney Weber and his graduate student Jeremy Pattison, Prelude, Anne, Latham, Nova, Josephine, Boyne, Caroline, and Killarney are red raspberries that appear the most resistant to *P.f.* var rubi. Titan, Lauren, Encore, Canby, and Polana are extremely susceptible. Black raspberries are generally the least susceptible. Because raspberry is notoriously susceptible to Phytophthora root rot, it is generally recommended that all raspberries be planted on sites with excellent drainage and on berms 10 to 14 inches high.

Chemical Control: Ridomil Gold 4EC (1 pt/treated A) OR Aliette 80WDG (2.5-5 lbs/A) are effective against reducing the severity of these diseases. When infections are mild, it may be possible for plants to recover after chemical treatment. However, these fungicides will not offer very much protection if applied to susceptible varieties planted on a wet site. When treating for either of these two diseases, you need to treat only in and a few rows around the affected area, i.e., you do not need to treat the entire planting.

Managing Gray Mold of Strawberry

Bill Turechek, Dept. of Plant Pathology, Cornell University, Geneva, NY

Gray mold is the most common fruit rotting pathogen of strawberry in New York. It is a major problem during bloom and on ripening, mature and harvested fruit, particularly during wet weather. Aside from the direct losses the disease can cause in the field, diseased fruit are unsightly in pick-your-own operations or in pre-picked baskets and may have an adverse affect return customers.

Disease Cycle

Gray mold is caused by the fungus *Botrytis cinerea*. This fungus is probably the most ubiquitous pathogen worldwide in that it attacks numerous fruits, vegetables, and ornamental plants. *B. cinerea* survives the winter in dead or dying leaf tissue and plant debris. In spring, the fungus produces spores that are disseminated to susceptible plant parts by wind and splashing rain (or irrigation water).

Under cool and wet conditions, fungal spores germinate and infect the blossoms and leaves. Symptoms on leaves are not obvious until leaves begin to die, and for several weeks afterwards the fungus produces spores on the dead and dying leaves (Fig A). These spores serve as the primary source of inoculum for blossom and fruit infection. Blossom and mature fruit infection is possible when rain, heavy dew, or overhead irrigation occurs in combination with temperatures in the range of 40-85 F; the most conducive temperatures for infection lie within the range of 59-77 F. Infection can occur with as little as 6 hours of wetness, and the rate of infection approaches 90% when flowers or fruit are wet for 24 hours or more.

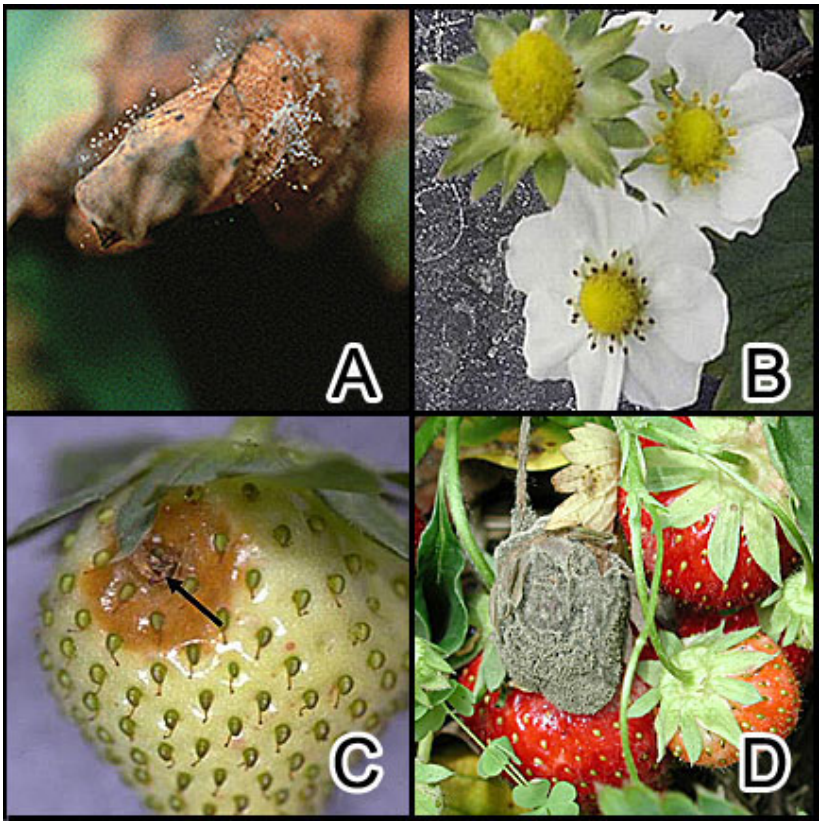
Blossom infection is the primary means in which fruit become infected. Flowers are susceptible once they have opened, but the susceptibility to infection increases dramatically two to three days after opening. The fungus attacks the petals, stamens, and pistils but not the sepals (Fig B). One to several blossoms per cluster (inflorescence) may become infected, and infected blossoms often turn brown, wilt, and die. This is called blossom blight. The fungus enters developing or immature fruit via these individual flower infections where it remains quiescent (latent) until the fruit begin to ripen. Green fruit are virtually resistant to direct infection.

As the berries begin to ripen, the fungus becomes active and begins to colonize the fruit. Symptoms start as a discoloration and typically at the calyx end (Fig C). If the infected berries do not fall to the ground, they shrivel, dry and eventually form a "mummy". In the process, the fruit become covered with the grey powdery fungal spores that are easily dispersed by wind and splashing rain (Fig D). Additional fruit infection from these spores is possible, but considered to be of minor importance compared to those initiated through blossom infection. However, mature fruit do become infected when they are in direct contact with rotten fruit, particularly when wet weather occurs through the harvest period.

Disease Management

Several cultural practices can help minimize disease development. Because prolonged wetting events significantly increase the risk of infection, any practice that facilitates good air circulation through the canopy and rapid drying of fruit can diminish the amount of infection. This includes proper plant spacing within and between rows and weed control. Gray mold is often most severe within the canopy where the air circulation is poorest. Another practice that helps reduce the risk of infection is to remove the dead and rotting tissue from the planting. It is these rotting tissues where the fungus produces the majority of the infective spores. Although, the fungus can attack many plants, it appears that outside sources of inoculum play a small role in the overall development of the epidemic relative to local sources of inoculum. Mature fruit are very susceptible to infection, especially if they have been bruised during picking. Therefore, fruits should be handled gently during picking and packing. If wet weather is prevalent during harvest, fruits should be picked promptly to avoid additional infection in the field.

In New York, gray mold can be controlled usually with two well-timed fungicide applications during bloom. The first application should be made at early bloom (5-10%) followed by another 7 to 10 days later or at full bloom. Remember that early blooms (king bloom) typically produce your largest and best quality fruit, so protection needs to be started early. Under wet conditions or during prolonged bloom periods more than two sprays may be necessary. When these conditions occur it will be important to provide fungicide protection throughout bloom. The number of bloom sprays required depends upon the weather. If it is hot and dry, no fungicides are required. If it is very dry and overhead irrigation is used for supplemental water, irrigation can be applied in early morning so that plants dry as fast as possible. Keeping plants dry reduces the need for a fungicide application. Most years are not this dry and fungicides are generally applied as discussed above or on a 7-day schedule through bloom. If it is extremely wet, a shorter interval (4-5 days) may be required in order to protect new flowers as they open.



Many products are labeled for use on strawberry. Elevate 50WG or Captevate 68WDG and Switch 62.5WG are the most effective fungicides for disease management during bloom. For resistance management, no more than 2 consecutive sprays of Elevate or Switch should be applied. Therefore, in years when wet weather prevails during bloom (i.e., when more than two sprays are needed), a broad-spectrum fungicide such as Captan (50WP, 80WP, 80WDG or Captec 4L), Thiram 65WSB, or Topsin-M 70WSB should follow the use of Elevate and Switch. These fungicides also have some activity against the foliar diseases leaf blight and leaf spot.

Anthracnose and Leather Rot:

Although gray mold is the primary disease of concern during bloom, we should also be thinking about managing anthracnose. In the pre-bloom period, Captan should be applied if the weather is particularly wet and warm to reduce the build-up of anthracnose spores. During bloom the “new” fungicide Captevate (a prepackage mix of Captan

and Elevate) will provide excellent control of gray mold and will have some efficacy against anthracnose. Switch is labeled for control of both gray mold and anthracnose. This fungicide is excellent against gray mold but the jury is still out on how well it works against anthracnose. Once the berries begin to develop, a different class of fungicides will be used to manage anthracnose fruit rot. This will be covered in next month's edition of the NYBN.

Aliette 80WDG is labeled for control of Red Stele and Leather Rot. For Leather Rot, apply 2.5 to 5 lb/A. Apply as a foliar spray between 10% bloom and early fruit set, and continue on a 7-14 day interval as long as conditions are favorable for disease development. Applications can be made the same day as harvest (PHI=0 days). Aliette has no activity against gray mold, so this fungicide should be included in mixture with your gray mold fungicide

Fungicides for Caneberry and Bushberry

Rovral 4F (1-2 pt/A), Switch 62.5WG (11-14 oz/A), Elevate 50WDG (1.5 lb/a), and Captan 80WDG (2.5 lb/A) are labeled for use on caneberries (i.e., raspberries and blackberries) and bushberries (i.e., blueberries, currants, gooseberries, and elderberries) for control of gray mold; Captevate 68WDG (3.5-4.7 lb/A) is labeled on blueberry. The number of applications per season varies per product but for most of these fungicides the last application can made up to and including the day of harvest. The new Captan 80WDG formulation is particularly important for control of anthracnose and spur blight on raspberry.

Frost Protection in Strawberries

Marvin Pritts, Dept. of Horticultural Sciences, Cornell University, Ithaca, NY

Strawberry growers can ensure a full crop of berries only if they exert some influence on temperature during the year. Temperature control is especially important during the winter and early spring when flowers are susceptible to frost. Of all the factors that negatively affect strawberry production, frost can be the most serious. Frost can eliminate an entire crop almost instantaneously. Strawberries often bloom before the last frost free date, and if a frost occurs during or just prior to bloom, significant losses can result. The strawberry flower opens toward the sky, and this configuration makes the flower particularly susceptible to frost damage from radiational cooling. A black (rather than yellow) flower center indicates that frost damage has occurred.

Strawberry growers occasionally delay the removal of straw mulch in spring to delay bloom and avoid frost. Research has demonstrated, however, that this practice also results in reduced yields. Also, applying straw between the rows just prior to bloom will insulate the soil from the air. This will increase the incidence of frost injury as solar radiation will not be absorbed by the soil and re-radiated at night. If additional straw is to be applied between the rows in spring, delay its application for as long as possible before fruit set.

Overhead irrigation is frequently used for frost control because flowers must be kept wet during a freeze in order to provide protection. As long as liquid water is present on the flower, the temperature of the ice will remain at 32F because the transition from liquid to ice releases heat. Strawberry flowers are not injured until their temperature falls below 28F. This 4 degree margin allows the strawberry grower to completely cover a field with ice and yet receive no injury from frost. However, if insufficient water is applied to a field during a freeze event, more injury can occur than if no water was applied.

Several principles are responsible for the ability of ice to protect strawberry flowers from injury. First, although pure water freezes at 32F, the liquid in the strawberry plant is really a solution of sugar and salt. This depresses the freezing point to below 32F. Also, ice crystals need nucleators to allow them to form initially. Certain bacteria serve as nucleators. Sometimes, in strawberry flowers, the bacteria that allow ice to form are absent, allowing the freezing point to be lowered. The temperature of the applied water is usually greater than the temperature of the plants, so this serves to warm the flowers before heat is lost to the air. As long as liquid water is continually applied to the plants, the temperature under the ice will not fall below 32F. When one gallon of water freezes into ice, 1172 BTUs of heat are released.

Several factors affect the amount of water that is required to provide for frost protection, and the timing of application. At a minimum, apply water at 0.1 - 0.15 in/hr with a fast rotating head (1 cycle/min). Water must be applied continuously to be effective. A water source of 45 - 60 gal/min-acre is required to provide this amount of water. Choose nozzle sizes to deliver the amount of water required to provide protection under typical spring conditions in your location. Under windy conditions, heat is lost from the water at a faster rate, so more water is required to provide frost protection. For every gallon of water that evaporates, 7760 BTUs are lost. The application rate then depends on both air temperature and wind speed (see Table 1).

Under windy conditions, there is less chance of flower temperatures falling below that of the air because of the mixing of air that occurs at the boundary of the flower. Winds are beneficial if the temperature stays above the critical freezing point, but detrimental if the temperature approaches the critical point. Less evaporation (and cooling) will occur on a still, humid

Table 1. Water application rate (in/hr) for a given humidity and wind speed.

	Wind Speed				
Temp (F)	**0-1**	**2-4**	**5-8**	**10-14**	**18-22**
Relative humidity of 50%					
27	0.10	0.20	0.30	0.40	0.45
24	0.10	0.30	0.35	0.45	0.60
20	0.15	0.35	0.45	0.60	0.75
18	0.20	0.40	0.50	0.65	0.80
Relative humidity of 75%					
27	0.05	0.10	0.20	0.25	0.25
24	0.10	0.20	0.30	0.35	0.40
20	0.10	0.25	0.40	0.45	0.60
18	0.15	0.30	0.45	0.55	0.70

FROSTPRO Model; North Carolina State University

night. Under extremely windy conditions, it may be best not to irrigate because the heat lost to evaporation can be greater than the heat released from freezing

Stage of development: Strawberry flowers are most sensitive to frost injury immediately before and during opening. At this stage, temperatures lower than 28F likely will injure them. However, when strawberry flowers are in tight clusters as they are when emerging from the crown, they will tolerate temperatures as low as 22F. Likewise, once the fruit begins to develop, temperatures lower than 26F may be tolerated for short periods. The length of time that plants are exposed to cold temperatures prior to frost also influences injury. Plants exposed to a period of cold temperatures before a frost are more tolerant than those exposed to warm weather. A freeze event following a period of warm weather is most detrimental.

Flower temperature: The temperature of all flowers in a field is not the same. Flowers under leaves may not be as cold as others, and those near the soil generally will be warmer than those higher on the plant. On a clear night, the temperature of a strawberry flower can be lower than the surrounding air. Radiational cooling allows heat to be lost from leaves and flowers faster than it accumulates through conduction from the surrounding air.

Soil also retains heat during the day and releases heat at night. It is possible that on a calm, cloudy night, the air temperature can be below freezing yet the flowers can be warm. Wet, dark soil has better heat retaining properties than dry, light-colored soil.

Using row covers: Row covers modify the influence of wind, evaporative cooling, radiational cooling, and convection. Because wind velocity is less under a row cover, less heat will be removed from the soil and less evaporative cooling will occur. Also, relative humidity will be higher under a row cover, reducing heat loss from evaporation. In addition, convective and radiational heat loss is reduced because of the physical barrier provided by the cover. Plant temperature under a cover may eventually equal that of the air, but this equilibration takes longer than with uncovered plants. In other words, row covers do not provide you with additional degrees of protection, but they do buy time on a cold night as flower temperatures will fall less rapidly inside a cover. Often the temperatures fall so slowly under a row cover that irrigation is not needed. If irrigation is required, less water is needed to provide the same degree of frost protection under a row cover. Water can be applied directly over the row covers to protect the flowers inside.

Rules of thumb

1. Store sufficient water for 2 or 3 consecutive nights of frost protection
2. Use small diameter nozzles (1/16 - 3/16 in. diameter)
3. A 30 X 30 ft. staggered spacing of nozzles is preferable
4. Use metal sprinklers to minimize icing
5. Minimum rotation of once per minute

Turning on the water: Since cold air falls to the lowest spot in the field, a thermometer should be located here. Place it in the aisle at the level of the flowers, exposed to the sky, and away from plants. Air temperature measured at this level can be quite different from the temperature recorded on a thermometer at the back of the house. The dewpoint temperature measured in the evening is often a good indication of how low the temperature will drop on a clear night, and is related to the relative humidity. Air temperature will fall less if the humidity is high. If the air is very dry (a low dewpoint), evaporative cooling will occur when water is first applied to the plants, so irrigation must be started at a relatively warm

temperature. Most local weathermen can provide the current dewpoint, or it can be obtained from World Wide Web-based weather information services.

If the air temperature falls below 34F on a clear, calm night, especially before 3 A.M., it would be wise to start irrigating since flower temperatures could be several degrees colder (Table 2). On the other hand, if conditions are cloudy, it may not be necessary to start irrigation until the temperature approaches 31F. If conditions are windy or the air is dry, and irrigation is not turned on until the temperature approaches 31F, then damage can occur due to a drop in temperature when the water first contacts the blossom and evaporation occurs. Therefore, the range in air temperatures which indicates the need for irrigation at flowering is normally between 31 and 34F, depending on cloud cover, wind speed and humidity, but can be as high as 40F. Admittedly, these numbers are conservative. Flowers can tolerate colder temperatures for short periods of time, and irrigation may not be needed if the sun is about to rise. Obviously, one does not want to irrigate too soon since pumping is expensive, and excess water in the field can cause disease problems.

Table 2. Starting temperature for frost protection based on dewpoint

Dewpoint	Suggested starting air temperature
30 F	32 F
29 F	33 F
27 F	34 F
25 F	35 F
24 F	37 F
22 F	38 F
20 F	39 F
17 F	40 F

Turning off the water: Once irrigation begins, it should not be shut off until the sun comes out in the morning and the ice begins to slough off the plants, or until the ice begins to melt without the applied water.

Waterless frost protection agents: Future solutions to frost protection could lie in waterless methods, such as genetically engineered bacteria that do not promote the formation of ice. However, to date, these materials have not been consistently effective, so they are not recommended as the sole basis for frost protection.

Spring Arthropod Pest Management for Berry Crops in New York

Greg English-Loeb, Dept. of Entomology, Cornell University, Geneva, NY

Management of arthropod pests begins in earnest as the temperatures increase and the growing season gets under way. Before reviewing the list of **potential** arthropod pests for each of the major berry crops, I want to summarize some changes in chemical control options for the 2004 version of the Pest Management Guidelines for Berry Crops. Over the next few years, use of Azinphos-methyl (Guthion 50WP) will be restricted or lost. Strawberries will no longer be included on the new label. Caneberries will only be supported through 2005 and only for one pest (raspberry crown borer). Guthion can still be used on blueberries (for maggot, fruitworms, plum curculio, lecanium scale), but note that for U-pick operations, the general public is not allowed to enter a Guthion-treated field within 30 days of application. Also note that Bayer Corporation (manufacturer of Guthion) will no longer market the Guthion 2L formulation.

In other general pesticide news, in the past editions of the guidelines we neglected to indicate that the organophosphate insecticide Imidan (phosmet) is a restricted use insecticide. We have now corrected that mistake. The reduced risk insecticide Spintor 2 SC (spinosid) is now labeled for blueberries, caneberries, and strawberries. The organic version of this product, Entrust, is also labeled for blueberries and strawberries. The EPA has approved tolerances for additional crops for the neo-nicitinoid insecticide imidacloprid (either Pravado as foliar application or Admire for soil treatment) including strawberries, currants and gooseberries. They are also reviewing the addition of blueberries. This insecticide is not currently available for use in New York, but it may in the future. With regards to the pyrethroid insecticides Brigade (bifentrthrin) and Danitol (fenpropathrin), note that they are both labeled for use in strawberries and include clipper, tarnished plant bug, spittle bug and two-spotted spider mite on their labels. In the 2003 guidelines I incorrectly listed Danitol for control of adult root weevils. Only Brigade has root weevils on its label (another good reason to read the labels; don't just rely on the guidelines). Finally, note that a new miticide (bifenazate or Acramite) has been labeled for non-bearing strawberries, caneberries and currants. I did not get this addition in the 2004 guidelines. If you use this product and have hard water or pH above 7, add a water conditioner.

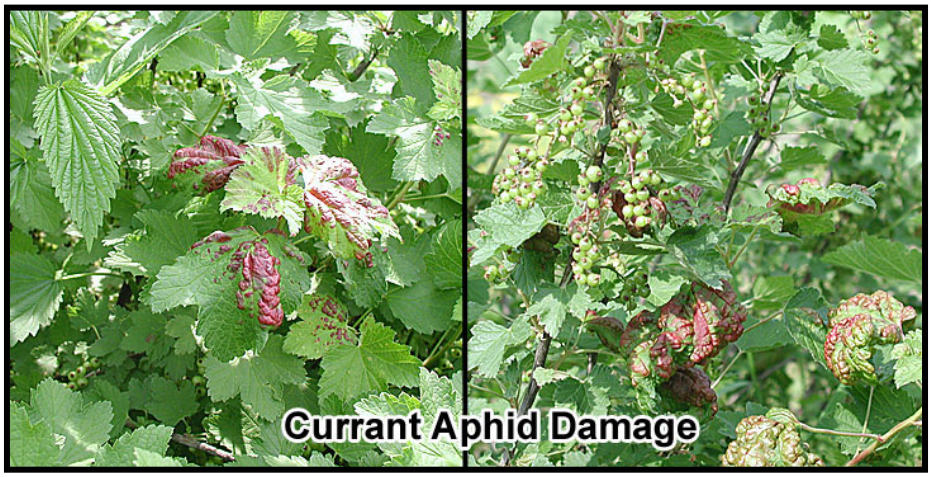
Blueberries

A number of species of **scale insects** feed on the twigs of blueberry and can greatly reduce plant vigor. Look for the hard-covered female scale on small branches early in the spring. A dormant oil (2-2.5%) applied at budswell, but before the first leaf stands out, can be effective in reducing scale populations. **Cranberry Fruitworm** and **Cherry Fruitworm** are the main blueberry arthropod pests in the spring and early summer. These moths overwinter as fully-grown larvae. They pupate in the spring and begin flying in late May and early June (around the time of flowering). Egg-laying begins at

around petal fall with eggs being placed at the base of newly set fruit. A sex pheromone is available to monitor the flight activity of adult **cranberry fruitworm** (Great Lakes IPM, www.greatlakesipm.com, 989-268-5693). Two applications of an insecticide such as Confirm or Guthion, starting at petal fall and 10 days later, is required for sites with heavy pressure. Research in New Jersey indicates that in areas of moderate pressure, one application 5 to 7 days after petal fall provides as good control as two applications. Other pests to keep an eye out for are **plum curculio** (notice crescent-shaped scar created from egg-laying on young fruit), **leafrollers** (larvae make shelters by silking together terminal leaves), and **blueberry tip borer** (larvae bore into stem causing shoot tips to die back). Of course, later in the summer you need to be alert for **blueberry maggot flies**, **blueberry stem borer**, and **Japanese beetle** (more on these in next newsletter).

Currants and Gooseberries

Over the past few years we have been seeing a fair amount of leaf cupping caused by the **Currant Aphid**, especially on red currant plants. In addition to leaf cupping, rounded galls form on the top side of the leaves in response to the presence of aphids in pockets on the underside. An economic threshold for currant aphid has not been worked out. Malathion is labeled for currant aphid on currants, applied as leaf buds are opening. **Imported Currant Worm** (ICW), when present, can cause considerable injury to foliage. The adult, which becomes active in the spring, is wasp-like in appearance (indeed its in the wasp group, but part of a primitive line called sawflies that are herbivorous as larvae). Eggs are laid along the midrib or on the undersides of the leaves. Larvae of the first brood appear in spring, shortly after leaves are out. They initially feed in colonies but as they become larger, feed singly. A second brood of larvae is produced in early summer and in some years a partial third brood is produced later in the summer. Malathion is labeled for use against ICW. Another currant and gooseberry pest to be on the look out for in the spring is the **currant borer**. A relative of the raspberry crown borer, the adult moth has clear wings, blue-black body with yellow markings resembling a wasp. The adult emerges in the spring, mates and begins laying brownish eggs on the bark of canes. After hatching, larvae burrow into canes and begin feeding within the pith. No insecticides are labeled for currant borer although removal of weak canes in the spring and fall will help keep populations down. Other pests that might be observed attacking currants and gooseberries in the spring to early summer include the **currant stem girdler** (lays an egg in shoot tips and then girdles stem below) and **gooseberry fruitworm** (larvae feed inside young fruit, sometimes weaving portions of stems together with silk).



Raspberries

There are a number of potential pests of raspberries to be concerned with during this time period (early prebloom to postbloom). Be on the alert for feeding damage from the adult **raspberry fruitworm** (a beetle, light brown in color) on foliage and fruit buds. The larvae of this beetle pest feed inside flower buds and young fruit. Adult feeding damage on foliage creates a skeletonized appearance somewhat similar to the feeding damage caused by larvae of **raspberry sawfly** (pale green caterpillar-like body with many long hairs). Both the fruitworm and the sawfly appear during the prebloom period. Carbaryl [Sevin] is labeled for both of these pests and the timing is similar as is Spintor [spinosid].

Tarnished plant bug (TPB) is another potential problem for raspberry growers during the period from bloom to harvest. Both the adults and their nymphs can cause deformed fruit, although the deformities are not as obvious in raspberries as in strawberries where TPB is also an important pest (see below). We do not have a good estimate of the economic threshold for TPB in raspberries but a rough guide would be 10 to 20% of canes infested with adults or nymphs. Carbaryl is labeled for control of TPB on raspberry. It's not the most effective material on plant bugs but pretty much all we have with plant bugs specifically on the label. Malathion can be effective against TPB, but I have yet to find a product registered in NY with plant bug on the label for caneberries. Note that weedy fields aggravate TPB problems.

Raspberry cane borer and related beetle species make their appearance during this period. The adults emerge in the spring, mate and start laying eggs. Larvae bore into canes and during the season and for some species, the next season. They cause injury and death to canes and potentially entire crowns. The best time to kill adults is during the late prebloom period (for summer-bearing raspberries), although note that there is nothing specifically labeled for it now that methoxychlor [Marlate] is no longer available. As an alternative to insecticides, during the season remove wilted shoot tips below the girdled stem (two rows of punctures around an inch apart) where the egg of the raspberry cane borer has been placed. Also, during the dormant season remove and destroy canes with swellings. Another pest that can cause serious injury to canes and the crown is the **Raspberry crown borer**. The larvae of this moth feed at the base of the cane and into the crown over a two-year period. The first signs of a problem often appear during fruit maturation. The withering of and dying of canes, often with half matured fruit, can be a symptom of feeding damage at the base. Canes with these symptoms, and the associated crowns, should be removed during the growing season and destroyed. The adult moth actually does not appear until later in the summer (early August). It is a very attractive moth that superficially resembles a yellow jacket. Until 2005 Guthion is labeled for use against raspberry crown borer larvae. Apply to lower parts of canes and soil only in spring to summer (you are only allowed 2 applications per season, at least 10 days apart). As noted above, the general public is not allowed into the planting within 30 days of application.

During the spring and into the summer you may find two species of aphids that attack raspberries, **large raspberry aphid** and **small raspberry aphid**. Feeding damage by aphids causes leaf curling and reduced growth of shoots. The more important injury comes from viruses transmitted by the aphids (raspberry mosaic virus by the big aphid and raspberry leaf curl virus by the small aphid). This can be a particular problem for nursery plants. Both Malathion 57 EC and Di-Syston (disulfoton) are labeled for aphids, but Di-syston is restricted for use for nursery stock. Finally, I should mention **two-spotted spider mite (TSSM)** as a potential pest. These tiny spider-like arthropods can become very numerous on foliage, causing white stippling on leaves. They seem to be most problematic in dry sites and/or in mild growing areas such as the Hudson Valley and Long Island. As of a couple of years ago there is a miticide registered in New York for control of TSSM (Savey DF). Predatory mites can also provide control of TSSM. These beneficial mites are frequently naturally present in raspberry fields, especially where few broad-spectrum insecticides are used, but can also be purchased from a supply house. For both Savey and predatory mites, it's important to start control actions early before you see lots of severe injury to foliage (bronzing). Additional arthropod pests that might show up later in the season (bloom to harvest) include **Root weevil, Japanese beetle**, **picnic beetle**, and **potato leafhopper**.

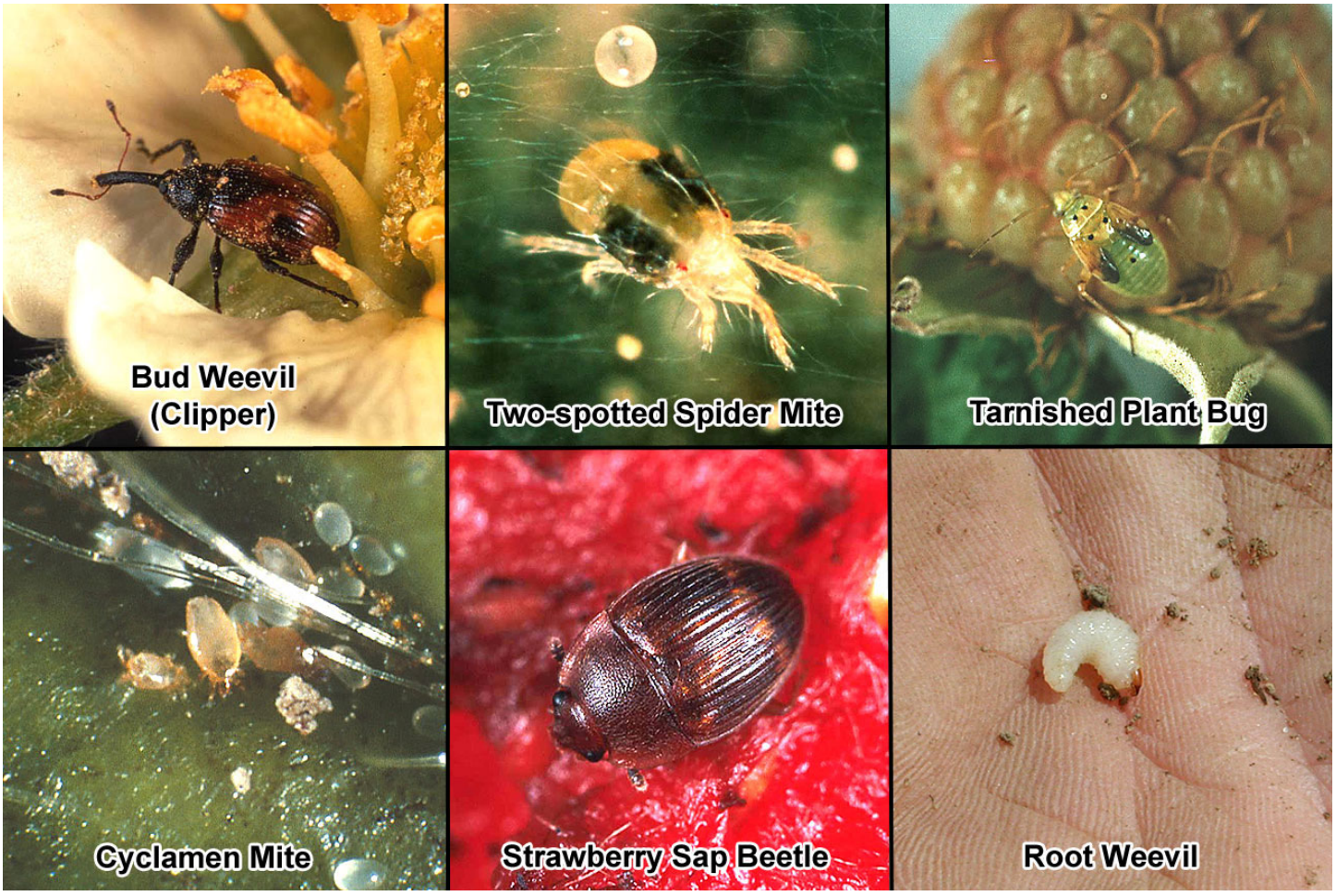
Strawberries

During the prebloom period the **strawberry bud weevil (clipper)** is the main arthropod pest to watch out for. In recent years we have learned that many strawberry cultivars, such as Jewel and Seneca, can tolerate a fair amount of bud loss from this pest, although at sufficient densities, it can still be a problem. As a rough rule of thumb, treat for clipper when you observe more than one clipped primary or secondary flower bud or more than 2 tertiary buds per truss, on more than one truss per foot of row. Note that once flowers are open they are no longer at risk from clipper. Clipper often is a more severe problem along borders of plantings, near woods. Lorsban [chlorpyrifos] and Brigade [bifenthrin] are labeled for clipper in New York. Also during the prebloom period (and extending through harvest and sometimes after renovation) **two-spotted spider mite** can be a problem in some plantings. Look for whitish or yellowish stippling on leaves. Current threshold is 5 mites per leaf or about 25% of leaflets have at least 1 mite. This is likely a conservative

threshold for a healthy planting. There are several compounds labeled for mites on strawberries in New York: Kelthane [dicofol], Vendex [hexakis], Agri-mek [abamectin], Savey [hexthiazox], Acramite, Danitol [fenpropathrin] and Brigade. Acramite is only labeled for nonbearing plantings. Kelthane, Danitol and Brigade are hard on predatory mites. Agri-mek

label calls for 2 applications, 2 weeks apart. For all these materials, coverage is very important, especially on the underside of leaves.

Tarnished plant bug (TPB) is the key insect pest of strawberries during bloom to near harvest. Both adult bugs and the nymphs cause injury (deformed fruit) but nymphs are probably of the greatest concern for June-bearing cultivars. The economic threshold is half a nymph per flower cluster (you sample by tapping cluster over a white plate and counting nymphs that fall off). It is worth sampling for this pest on a regular basis since it varies in population size from place to place and from one year to the next. Spraying a pesticide when nymph counts are below threshold costs you money and can kill beneficial arthropods unnecessarily. Good weed management can help reduce problems with TPB. **Cyclamen mite** is a potentially serious pest that seemed to show up in more fields than usual three years ago but was not very prevalent recently. The mites get active in the spring with populations peaking after bloom. The mites like to feed on young leaf tissue (just as the leaves are unfolding). The mites themselves are difficult to see without a good hand lens. Cyclamen-damaged leaves tend to be stunted and crinkled. Prior to bloom or after renovation are good times to treat for this pest. Kelthane and Thiodan [endosulfan] are labeled for use against cyclamen mites. Use lots of water for thorough coverage.



Two more insect pests deserve mention at this time. The first is **Strawberry sap beetle (SSB)**. This small, brownish beetle seems to be increasing as a pest in New York strawberries. Both the adult beetles and the larvae feed on ripe and overripe fruit. We still are exploring the best ways to control SSB. Two pyrethroids are labeled in New York for its control: Dantitol and Brigade. Note that Brigade does not have a preharvest interval while for Danitol it is 2 days. However, Brigade is more expensive. For both materials, good coverage is likely to be important for its control. Note that SSB probably does not move into strawberry fields in significant numbers until fruit begins to ripen. **Spittlebug** starts appearing on leaves, stems, and flowering racemes about this time (bloom) and extending into harvest. They overwinter as eggs in the soil and hatch out as temperatures rise in the spring. The nymphs crawl up the plant and begin feeding on the xylem tissue (the water conducting vessels of the plant). There are not a lot of nutrients in xylem and therefore nymphs need to process a lot of sap, extracting the few nutrients out for their use and excreting the remaining water. This water is frothed into white spittle, which helps protect the nymphs from desiccation and natural enemies. You can often find several nymphs within a spittle mass. Feeding by spittlebugs, if extensive, can stunt plants and reduce berry size. Perhaps more importantly, the spittle masses are a nuisance to pickers. Threshold for spittle bug masses is 1 mass per foot row.

Thiodan, Brigade and Danitol are labeled for use against spittlebugs. Weedy fields tend to have more problems with spittlebugs.

Root weevil (there are several species) is the last strawberry pest I want to discuss in this issue. The larvae feed on roots and crowns and when abundant can cause serious damage to plantings. Beds with heavy infestations show distinct patches or spots that appear stunted and have reduced yields. Drought stress aggravates the injury from larval feeding. Chemical control (Brigade) is targeted at the adults that emerge in mid to late June. Look for characteristic adult feeding damage on leaves (notching from the edge) to help determine timing. The adults feed for a few days before starting to lay eggs. Some growers have also had success controlling root weevil larvae using parasitic nematodes. These can be applied either in the spring (late April and early May) and/or in the fall. Use sufficient water to get good penetration. Rotation out of strawberries is the best remedy for root weevils. They are wingless and do not move a great distance. However, new plantings should be placed 50 meters or more from an infested planting.

Weed Management in Matted Row Strawberries

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Weed control is probably the single most important factor determining longevity of matted row strawberry plantings in the northeast. It is critical for growers to successfully manage weeds in spite of limited herbicide availability and the high cost for hand weeding. A truly integrated approach to weed control is needed including chemical control, hand weeding, and cultural practices to successfully control weeds.

Chemical control is most appropriate at renovation and during strawberry dormancy in the fall or early spring. By late spring chemical control in strawberries is limited to grass control and to new, non-bearing plantings due to days-to-harvest restrictions and phytotoxicity to actively growing strawberry plants. Sethoxydim (Poast) can be applied for control of grasses less than 6 inches tall and actively growing up until the 7 days to harvest.

For new fields, the elimination of perennial weeds before planting with cultivation and a broad-spectrum herbicide such as glyphosate (RoundUp) is important for good stand establishment. Also an application of a preemergent herbicide such as napropamide (Devrinol) should give good control of germinating seeds for the first 4-8 weeks. As the residual activity of this herbicide disappears, cultivation becomes the main option until dormancy in late fall. Sinbar was recently granted a supplemental label on first year strawberries for control of annual grasses and broadleaf weeds. Sinbar should be applied at 2-3 oz per acre after transplanting but before new runner plants start to root. If strawberry plants are allowed to develop new foliage prior to Sinbar application, the application ***must*** be followed immediately by 0.5 to 1 inch of irrigation or rainfall to wash the Sinbar off the strawberry foliage. Finger weeders, flex tine cultivators, and rolling cultivators can provide good weed control in new plantings and also help set runners into the row. A grass herbicide such as sethoxydim (Poast) can provide control of actively growing grasses only and may be appropriate for specific weed problems.

Hand weeding is important in late spring to clean up any weeds missed by fall and early spring herbicide treatments. Several weeds can be established and flowering by late spring leading to summer weed problems. Dandelions, field pansy (Johnny-jump-ups), and groundsel can all be flowering and distributing seeds widely at this time. These weeds can develop seeds from open flowers even after pulling or cultivation so the plants need to be removed from the field to eliminate the seeds. Field bindweed is also emerging at this time and needs to be nipped in the bud before it gets out of hand.

Cultural practices such as mowing border areas and clearing fence rows is important to avoid new weed seeds blowing into fields. Additional straw mulch can also be added to thin areas in fields to keep weed seeds from germinating while also maintaining soil moisture and keeping soil away from developing berries. Managing weed pests through an integrated program of chemical control, good cultural practices, and vigilant hand weeding can help ensure the vigorous establishment of new plantings and a long life for matted row strawberry fields in the northeast.

Raspberry Weed Management

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A combined approach using chemical controls, cultural practices, and selective hand weeding can be used to effectively manage weeds in raspberry. Herbicides provide good overall control of most weeds. The key to successful chemical control is a vigorous, healthy stand of canes to crowd out competing weeds within rows. Between row control can be managed using a cover crop with herbicide banding to limit spreading, mulches, cultivation, or broad-spectrum herbicide application.

Chemical control is most effective in combination with the establishment of a vigorous stand of canes. In the

establishment year, care must be taken to eliminate perennial weeds such a Canadian thistle and field bindweed with a broad-spectrum herbicide such as glyphosate (RoundUp) before planting because these weeds can spread from root pieces moved during cultivation. Once established in a planting, they are very difficult to control.

After planting, a preemergent herbicide such as napropamide (Devrinol) should be applied to eliminate germinating weed seeds. Be aware that tissue culture plugs and young canes can show increased sensitivity to many herbicides until they are well established and reduced rates may be needed. Shallow cultivation is also recommended in the establishment year to eliminate young weeds while allowing the new canes to develop. Deep cultivation is not recommended as it can damage the root systems and turn up new weed seed that would not be controlled by the preemergent herbicide. Turf can be seeded between rows late in the summer to crowd out weeds and can be managed successfully by banding with a grass herbicide along the rows as the planting matures. Mulches within the rows as well as in row centers can be used to keep weeds down but care should be taken to maintain soil fertility. Also, in less than optimally drained soils or when growing root rot susceptible varieties, mulches can retain excess moisture and exacerbate root rot problems. Bare ground can also be maintained between rows with shallow cultivation, mowing, and/or broad-spectrum herbicides, but erosion can be a problem. However, special care must be taken to avoid disturbing the raspberry roots with the cultivator, to avoid weed seed development through regular mowing, and to avoid spray drift onto the raspberries when maintaining alleyways.

In established plantings, much of the chemical control is done in the fall or in the spring before bud break. By late spring, chemical control is limited to sethoxydim (Poast) for grass control. Be aware that Poast has a 45 days-to-harvest period in raspberry and by late spring may not suitable for early season varieties that can fruit in June such as Prelude, Killarney, and Reveille. Spot treatments of glyphosate with a wick applicator can be used to treat problem weeds making sure to avoid contact with the raspberries. This herbicide will translocate and kill not only the cane touched but also ones connected by the roots and can be spread not only by the applicator but by treated weeds blowing into the canes while still wet. A well thought out herbicide program combined with timely mowing and selective hand weeding is an effective integrated approach to weed control in raspberry and can be used to successfully manage weed pests for maximum yields and profits.

Opportunities for Fresh Fruits and Vegetables are Many and Growing in the Food Service Industry

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*This article is part of the 2003 FreshTrack study by the Food Industry Management Program at Cornell University developed for the Produce Marketing Association.

U.S. foodservice industry sales are expected to grow 4.5% in 2003 to reach $426 billion. Full-service restaurants, which encompass family, casual, and white tablecloth restaurants, are expecting to experience a 4.8% increase in sales, while limited-service establishments, which include quick-service and fast casual restaurants, are expected to have a 4.1% sales increase. This would be the 12th consecutive year of real growth for this sector. Benefiting from the longterm trend towards eating out among consumers of all ages in this country, the foodservice industry continues to flourish in spite of the weak domestic economy. Factors contributing to this trend -- including an increase in consumer disposable income, a decline in free time, and a desire for convenience, as well as a decrease in the cost difference between dining out and eating at home -- are expected to continue into the future. In fact, the National Restaurant Association estimates that by 2010 total sales in the restaurant industry will exceed $577 billion and will represent 53% of consumers' expenditures on food.

Nonetheless, as remarkable as the success of the foodservice industry is, it is a highly competitive industry, too. Operators are constantly faced with many challenges to keep up with the industry's continuous growth, to increase their market share, to find and retain employees, to control costs, and to ensure profitability. Competition is not only intense within segments of this industry but also among different segments. For example, fast casual restaurants that have been experiencing an amazing growth rate are enhancing their quick-service and casual dining experience with a "fresher", "healthier" and more "up-scale" image and better service. At the same time, some casual restaurants are adding take-out service, which is stealing away sales from the quick-service restaurants for which take-out has typically represented 67% of total sales, and even from fast food restaurants.

To successfully compete in this environment, operators are striving to improve customer choices, and to provide convenience and value by increasing their menu offerings and following consumers' fickle tastes. This implies that operators must continuously come up with new ideas to stimulate sales and long-term growth. Key demographic trends influencing restaurants' decisions in this area include the growing diversification of the U.S. population, a growing baby boomers' segment with an increasing interest in eating well, and younger consumers who are more sophisticated and interested in new tastes. Underlying trends include the U.S. consumer's desire for convenience, healthier options, fresh

and natural products, comfort foods, and ethnic cuisines, which nowadays extend beyond Italian, Mexican, and Chinese to include Japanese, Korean, Indian, Latino, and Mediterranean foods, all the way to fusion foods.

As the foodservice industry continues growing and as operators strive to conquer the market by delivering on consumers' tastes and preferences through their menu offerings, the opportunities for fresh fruits and vegetables and their suppliers are many and growing!

Inclusion of more fresh produce items in menus has become evident in restaurants' offerings from quick service to fine dining. An example is Wendy's successful Garden Sensations line of salads which has been quickly followed by others in this segment, including Burger King and McDonald's. More importantly, it has been confirmed by 69% of the operators participating in the 2003 FreshTrack foodservice study that produce items are important or very important for them today when considering new menu items, and 83% anticipate that produce will be more important by 2005. Similarly, 70% of these operators indicated that they anticipate the number of fresh produce items on their menus will increase by 2005.

How can suppliers of fresh produce identify what products operators will be interested in and how to develop offers that will be attractive?

When considering adding new produce items to their menu, the ability to "improve the value perception" of a meal was definitely the most important factor among operators participating in the 2003 FreshTrack foodservice study. Additionally, "consumer request", "superior taste", and "color and appearance" are important factors identified by over 90% of participants. Furthermore, interviews with operators, as well as results from the operators' survey, revealed other specific characteristics desired for produce. Operators want products that will help their menu offerings be "trendy" or "ahead of trend", reflect a "healthy image", and be "more authentic and/or ethnic", and ingredients or garnishes that will "add eye appeal" to the dishes, with an "ethnic zip", and with "bold flavors" or a "hot or spicy" touch. Depending on the specific segment of the industry, operators are looking for additional specific characteristics in fresh produce offerings, such as "ready-to-use" and "easy-to-assemble" items in the fast casual and quick-service segments, products that will help them develop "signature items" in the casual dining segment, and "unique" and "specialty" products in the fine dining segment.

All this describes opportunities for produce items in many different ways. Just imagine all the new products and varieties that can be grown, and the multitude of ways in which they can be mixed, cut, packaged, and presented in order to satisfy these avid clients. However, in order to capitalize on these opportunities, suppliers of fruits and vegetables need to understand their target customers' challenges and be ready to offer not just a product but a "program" that will allow foodservice operators to use it for the intended purpose in an efficient and effective way. Yes, "a program" in which you can offer foodservice operators new fresh produce items in a properly executed service package at a reasonable price!

Check out the NYSAES Tree Fruit and Berry Pathology web site at:

www.nysaes.cornell.edu/pp/extension/tfabp

Questions or Comments about the New York Berry News?

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