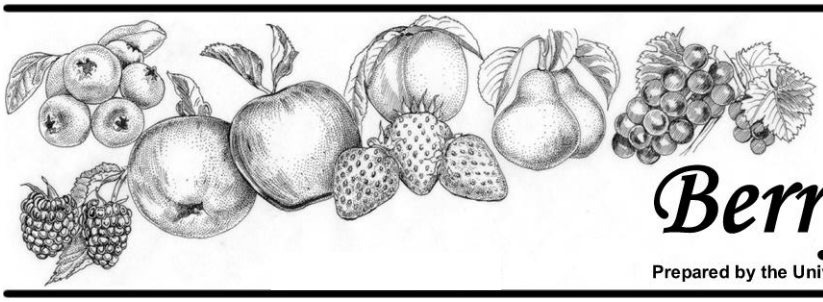

Berry Notes

Prepared by the University of Massachusetts Fruit Team

MASSACHUSETTS BERRY NOTES

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Message from the Editor:

Summer Schedule: Berry Notes will appear on a weekly basis for the next 10 weeks or so. I will try to post it each Tuesday by 5:00pm. Any variation on this schedule will be announced a week ahead of time. As always, please feel free to send comments or questions about Berry Notes to me at sgs@umext.umass.edu.

Twilight Meeting: A twilight meeting will be held on Tuesday June 24, 2003 at Nourse Farms (http://www.noursefarms.com/) in Whately, MA starting at 5:30 pm. This meeting will showcase varieties of strawberries, raspberries, gooseberries and currants. Please contact either Nourse Farms (413-665-2658) or me (413-545-4347) for more information and directions.

Crop Conditions:

Strawberries: Wet weather during bloom has set the stage for high pressure for fruit rot diseases in strawberries. Regular fungicide applications during the bloom period should reduce, but may not eliminate fruit rot from the fields this year. (See the article on Botrytis Fruit Rot in the previous issue of Berry Notes) On the bright side, we have had few frost events this year (especially when compared to last year) so fruit set is very high. Cool weather has also delayed the season by about a week. More in some locations. This late start to the season may result in a shortened season overall, if the weather heats up and pushes ripening. Be ready. Insect pest management is an important post bloom activity. Tarnished plant bug is the main concern at this time. **Blueberries:** Mummyberry pressure has been high this year, especially in locations that have a history of infection. Indar® 75WSP has a section 18 Emergency Exemption label for use in blueberries this year and can be used until June 30. It also cannot be used any closer than 30 days to harvest. Bloom applications can help with the secondary infections of this disease. Please remember to fill out the Application Reporting Forms if you use Indar for mummyberry this year. Without these forms to document use, we have difficulty making the case for emergency labels in future years. The first fertilizer applications should go on during bloom and the second a month later. Growers should place Cranberry Fruit Worm traps out now. **Raspberries** are in early pre-bloom. Growers should be prepared for Anthracnose, Spur blight, and Cane blight in summer bearers. Keep an eye out for strawberry clipper damage in expanding raspberry flower clusters and for leaf feeding by raspberry fruitworm. **Grapes** are growing very slowly. Disease management is still a high priority. Keep and eye out for flea beetle damage to new foliage. Also, check under the bark of trunks and canes for evidence of mealy bug.

Spring Arthropod Pest Management for Berry Crops

Greg English-Loeb, Cornell University

[Note: go to original article at http://www.nysaes.cornell.edu/pp/extension/tfabp/newslett/nybn25.pdf for outstanding pictures of these pests]

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 comment on a few changes in chemical control options for berry growers. Actually, not much has changed since last year. As a reminder, Confirm 2F (Dow), an insect growth regulator with specificity against many lepidopteran pests, received NY DEC approval last year for use on blueberries with the principal target pest being the cranberry fruitworm. Another Dow product, Spintor 2SC, has also received DEC approval for use in blueberries. I have not had much experience with either of these materials although based on information out of New Jersery (courtesy of Dr. Sridhar Polavarapu), Confirm is probably the better choice for cranberry fruitworm because of its longer residual activity. In other news, a new miticide from Uniroyal (Acramite) has received both federal EPA and state DEC registration for use in a number of fruit crops including strawberries.

The Food Quality Protection Act, passed in 1996, required the EPA to review the label status of a number of older generation pesticides. Organophosphate insecticides were one of the first groups reviewed followed by carbamate pesticides. This review is still in progress. Last year I reported that azinphosmethyl [Guthion] was slated to be cancelled on certain crops such as strawberries and grapes. However, as of now, this has not occurred and Guthion is still available. Note that phosmet [Imidan] and carbaryl [Sevin] are currently under review, with particular focus on extending the re-entry interval. We will keep you posted on the outcome of these various activities.

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 and research currently being conducted should provide a better estimate. 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. 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. The mites mostly stay 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 two years ago but was not very prevalent in 2002. 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) (see previous issue for more details on biology and management of 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. **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. Guthion and Thiodan 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 (Danitol or 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) 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.

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. Carbarl [Sevin] is labeled for both of these pests and the timing is similar.

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. Its not the most effective material on plant bugs but pretty much all we have with plant bugs specifically on the label. 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 puntures 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 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. No insecticides are currently registered in New York for control of crown borer.

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. Guthion is labeled for aphids on raspberries.

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 last year there is now a miticide registered in New York for control of TSSM (Savey WP). 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.**

Blueberries

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-shapped 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**.

Currants and Gooseberries

Imported current 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). (***Source**: New York Berry News, Volume 02, Number 05, May 16, 2003*)

Strawberries

Gray mold control in strawberries

Annemiek Schilder, Michigan State University

[note: This article was adapted from an article by Dan Legard, University of Florida Extension]

Gray mold, caused by *Botrytis cinerea*, one of the most important fruit diseases of strawberries. It is also a major cause of post-harvest losses during storage and transit, since the fungus grows at refrigeration temperatures. *Botrytis cinerea* infects a wide range of plants including many fruit, vegetable, and weed species. On strawberry, infection begins at the flower stage but symptoms are observed on green or ripening fruit. Fruit lesions are typically found on the stem end of the berry and are frequently associated with infected stamens, or with dead petals that stick to the fruit or become trapped under the calyx. Lesions begin as small, firm, light-brown spots that quickly enlarge and become covered with white fungal growth and gray to brown spores. Botrytis eventually consumes and mummifies fruit that are not harvested. When moldy fruit are disturbed, large numbers of spores can be released.

Gray mold epidemics are typically started by spores produced on dead strawberry leaves within the field. Young expanding strawberry leaves are colonized by the fungus without producing any symptoms. As the leaf senesces, the pathogen spreads quickly through the dying tissue and sporulates. Spores are dispersed by air, water or harvesting and ultimately infect different floral parts including stamens and petals. After infecting the flower, the fungus eventually invades maturing fruit and causes rot. The fungus can also spread to adjacent fruit by direct contact. As the epidemic progresses, the pathogen sporulates on diseased flowers and fruit, and these become important sources of inoculum.

Control of gray mold requires a combination of chemical, cultural, and genetic control methods. Although no strawberry cultivars are highly resistant to gray mold, cultivars with large clasping calyxes are often more susceptible, because moisture collects between the calyx and the receptacle and encourages the spread of the pathogen from stamens and petals to the developing fruit. The removal of all diseased and unmarketable fruit from within the plant canopy is critical for effective management of gray mold, as this fruit is an important source of inoculum that directly infects nearby flowers and fruit. The removal of senescent foliage also reduces inoculum but provides only limited control of gray mold.

Effective fungicidal control of gray mold involves protecting the flowers from infection. Applying specific fungicides during bloom is therefore especially important, e.g., at 10 percent bloom and again seven days later. Fungicide applications close to harvest can aid in control of post-harvest gray mold. Fungicides labeled for control of gray mold are: Elevate, Switch, Rovral, Topsin M, Thiram and Captan. The strobilurin fungicides Cabrio and Quadris are not very strong against Botrytis, however, they control various fungal leaf spots and anthracnose. Elevate and Switch have unique modes of action and are very effective against gray mold. Only one application of Rovral at first fruiting flower is allowed, so it has limited utility. Be sure to alternate fungicides of different modes of action for resistance management purposes. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 18, No. 6, May 20, 2003*)

Brambles

Raspberry Fruitworm

Sonia Schloemann, UMass Extension

Infestations of raspberry fruitworm, *Byturus unicolor*, are evident during the prebloom period from the leaf feeding done by the adult form (small brown beetles) of this insect. Larvae (worms) that are later found inside the fruit can cause significant yield losses if they are not controlled.

Field Symptoms - The first indication of raspberry fruitworm is often be the presence of small yellowish-white worms mixed in with harvested fruit. Earlier detection is possible if you know what to look for. The first indications is the tell-tale leaf tattering or elliptical holes in the leaves that results from the feeding by adults on unfolding leaves. The next indication is injury to the unopened blossom buds also done by the adult beetle. Finally, adult feeding injury can also be found on open blossom petals and fruit receptacles. When this feeding is severe, entire fruit clusters can fall off the plants.

Life Cycle - Adult beetles emerge from the soil during late April and early May, about the time the first leaves of raspberries are beginning to unfold. They begin to feed along the midrib of partially folded leaves. Beetles later seek protection between the blossom buds where they attack the soft tissues of the supporting pedicles. As buds begin to separate, the insects attack the blossom buds, making large entrance holes to feed on floral parts.

Female fruitworm beetles deposit their eggs on unopened blossom buds. Sometimes eggs may be laid inside buds or on developing fruit. The grayish-white eggs hatch after a few days, and the larvae commonly bore through the bud and enter the receptacle where they begin to tunnel. As the larvae increase in size, the tunnels are made larger, ultimately becoming grooves in the receptacle adjacent to the berry. When infested fruit is picked, some larvae remain attached to the interior of the fruit and end up in the harvesting basket. Those that remain on the receptacle soon drop to the ground where they pupate and remain over winter.

Control – There is some evidence suggesting that this insect is more of a problem in weedy planting. If early damage is noted (leaf tattering), cover sprays should be applied prior to bloom. Adults (beetles) tend to be most active and noticeable on plants in the early evening hours. Sevin XLR (carbaryl), malathion, Pyrellin, and Aza-Direct (neem oil) are among the insecticides labeled for this insect.

Orange Rust of Blackberries and Raspberries

Bill Turechek, Cornell University

We should expect to be seeing symptoms of orange rust on infected black and purple raspberries and blackberries soon. Orange rust occurs only on black and purple raspberries and blackberries and not on red raspberries. New canes from infected plants tend to be weak, spindly, thornless, and usually have misshapen, pale leaves. In contrast to new canes, they usually come up in bunches rather than singly. The lower surfaces of new leaves and for several weeks afterwards are covered with orange spores. It is important to scout your plantings and *dig up and remove* any infected plants before they release spores and spread the disease. Once a plant is infected with disease, it is infected for its life. Growers that wish to use chemical control for orange rust should begin sprays just before the orange spores

are released from infected plants. These sprays should focus on protecting uninfected plants in plantings with infected plants. The fungicides Nova 40W at 2.5 oz/A and Cabrio EG at 14 oz/A are the fungicides currently registered for control of orange rust. They should be applied on a 10 to 14 day schedule until leaves on infected plants dry up and stop producing the orange spores. This is usually around mid-July. (***Source**: New York Berry News, Vol 2., No. 5, May 16, 2003*)

Raspberry Weed Management

Courtney Weber, Cornell University

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. (***Source**: New York Berry News, Vol 2., No. 5, May 16, 2003*)

Blueberries

Managing Blueberry Anthracnose Begins Now

Peter Oudemans, Rutgers University [edited by Bill Turechek].

Anthracnose is an important disease to control now. The symptoms appear just prior to or following harvest as softened fruit followed by orange colored spores covering part of the fruit surface. Although the fungus can infect fruit throughout the season and the symptoms do not develop until the fruit ripen, we believe the majority of initial infections begin **during bloom**. A significant impact on control can be made by starting applications during early bloom. Anthracnose control should begin now.

For 2003, a number of fungicides are registered for anthracnose (see below). Bravo can be very effective, but it has a 42-day pre-harvest-interval and it may have

phytotoxicity problems on blossoms. Bravo is persistent and should provide protection for 2-3 weeks. Captan and Ziram are less persistent and therefore need to be applied more frequently. Captan has a 4-day re-entry period and Ziram has a 14-day pre-harvest interval. Ziram does show a longer persistence than Captan and the interval for Captan should be 7-10 days whereas Ziram can be extended to 10 -14 days. Two newer compounds, Abound and Cabrio, are available for anthracnose control. These materials have excellent activity however, they should be used with care. Resistance management means you should not use these compounds in more than two sequential applications because the fungus will build up resistance. Also, Abound can be extremely phytotoxic to certain apple varieties. Therefore, Abound should not be sprayed anywhere near an apple orchard, and spray tanks which have been used to apply Abound **should not** be used to apply pesticides to apples as the residue in these tanks is enough to cause sever phytotoxicity. Switch is also labeled for anthracnose however we have not conducted sufficient tests to determine efficacy against this disease. All of these fungicides are protectant only, they have no kick-back activity. Therefore, they must be applied before infection takes place. A fourth compound, Aliette, has a very different mode of action. In our tests, Aliette had very little protectant activity but showed significant curative ability. For use in commercial production this material would be most effective if used prior to second and third picking as it should provide improved keeping quality for the fresh market. Aliette has a 12 hr re-entry and a 0-day pre-harvest-interval.

Table 1. Fungicides labeled for blueberry disease management in New York (modified by Turechek for NY from original article).

Fungicide	Activity*	Max. # of apps	Rate/acre	Interval	REI	PHI
Abound	Ant, Alt, MB	3	6.2-15.4 oz	7-14 days	4 hr	0 days
Aliette WDG	Ant, Phy	4	5.0 lb	14-21 days	12 hr	0 days
Bravo Ultrex	MB, Ant	3	2.7-3.6 lb	7-10 days	12 hr	42 days
Bravo Weather Stik	MB, Ant	3	3-4 pts	7-10 days	12 hr	42 days
Cabrio EG	Ant	4	14 oz	7-14 days	24 hr	0 days
Captan 80WP / 50WP	Ant, Ph	14	3.1 / 5 lb	7-10 days	4 days	0 days
Elevate 50WDG	Bot	4	1.5 lb	7-10 days	12 hr	0 day
Indar 75 WSP*	MB	5	2 oz	7-10 days	12 hr	30 days
Lime Sulfur	Ph	1	5-6 gal	Do not apply within 14 days of oil		
Rovral	Bot, MB	4	1-2 lb (100gal)	14 days	24 hr	0 days
Switch 62.5WG	Bot, MB, Ph	4	11-14 oz	7-10 days	12 hr	0 days
Topsin-M WSB*	Bot, Ph	3	1 lb	7-10 days	12 hr	7 days
Ziram 76DF	Ant, Alt, MB	5	3 – 4 lb	7-10 days	48 hr	3 wk post

* Ant=Anthracnose; Alt=Alternaria fruit rot; Bot=Botrytis or gray mold; MB=Mummyberry; Ph=Phomopsis; Phy=Phytophthora
** see section 18 label

(***Source****: New York Berry News, Volume 02, Number 05, May 16, 2003*)

Managing blueberry fruitworms during bloom

Rufus Isaacs and John Wise, Michigan State University

The larvae of two moth species can infest young blueberry fruit starting at the early fruit set stage, in some years before 100 percent petal fall. Their presence is often not noticed until several weeks after 100 percent petal fall with premature ripening of infested berries or the webbing of berries together by cranberry fruitworm. However, an Integrated Pest Management approach using monitoring, scouting and appropriate application of effective controls can prevent fruit contamination by these pests.

The cranberry fruitworm and the cherry fruitworm have similar biology, so they are usually controlled together.

Adults of both species can be monitored using pheromone traps hung in the top third of bushes, preferably on edge bushes near wooded borders. Traps are checked weekly to provide information on the start of moth flight and duration of adult emergence. Although the traps have caught very few moths so far this year, the expected warming trend this week is expected to bring the first consistent emergence of these pests. No degree day model has been developed for this insect, so once adults have been trapped scouting for eggs should commence. Egg scouting should initially be focused on bushes near to woods or un-managed blueberry fields where abundance is usually the highest. Eggs are laid in or around the calyx cup of young developing fruit and usually clustered three to five feet high on the bush. A hand lens is generally needed to see these eggs, and a fact sheet on identifying fruitworms in blueberry is available at the MSUE blueberry information page at: http://www.msue.msu.edu/fruit/bluberry.htm

Once eggs hatch, the young larvae burrow directly into the fruit, so there is only a small window of time when insecticide residues can be picked up by the insect. Cherry fruitworm will spend all of their larval stage within one or two berries, whereas cranberry fruitworm larvae will move from berry to berry until the whole duster is webbed and full of brown frass. Correct timing and coverage are critically important, and so regular scouting of fields, use of sufficient spray volume and selecting appropriate spreader-stickers can increase activity of most insecticides applied for fruitworm control.

During bloom period when there is some early fruit set, options for control are limited due to the need to protect foraging bees. However, three products registered for use during bloom have provided consistent control of fruitworms in trials at the Trevor Nichols Research Complex over the past several years. These are the B.t. products such as Dipel® and the insect growth regulators Esteem® and Confirm®. B.t. products must be ingested by the larva to be effective and are best applied when daily temperatures are likely to reach 70°F. B.t. has relatively short activity, providing five to seven days active residue depending on the weather conditions. Confirm is also active primarily through larval ingestion, but has a longer residual activity of 14 days. Esteem is active primarily on the egg stage of fruitworms, therefore should be applied soon after egg-laying commences.

After 100 percent petal fall, the range of options for fruitworm control increases with Guthion®, Imidan®, Asana®, and SpinTor® all providing effective control. With all these products, maintaining good coverage is still important to get residue to the parts of the berry where fruitworms are found. Large-scale research trials with Michigan blueberry growers have also demonstrated that use of Confirm® can also provide control of fruitworms in the post-petal fall period. Because of the selectivity of this product, it has minimal impact on natural enemies that lay their eggs inside fruitworm larvae. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 18, No. 6, May 20, 2003*)

Grapes

Prebloom Disease And Insect Concerns

Alice Wise, Cornell University Extension of Suffolk Cty.

Black rot – One of the more controllable diseases since we have good protectants (mancozeb, captan, Ziram, Abound, Flint, Sovran) as well as several materials with post-infection activity (Nova, Elite). Letting infections get started on leaves prebloom puts the sporulating lesions directly adjacent to clusters. There have been situations over the years where black rot infection of fruit has occurred because of this.

Downy mildew – Though we think of this as more of a bloom time (and later) concern, wet weather may precipitate prebloom infections. These can cause serious damage when they occur on clusters. Mancozeb, captan and copper control downy well as does Abound. Sovran offers some control, Flint very little. Phosphorous acid products are primarily post-infection materials, they offer only a few days of forward protection.

Phomopsis – Perhaps the most worrisome as the cool wet weather in early budbreak has been conductive to infections. Cabernet Sauvignon, particularly spurred pruned vines, seems to be the preferred target at the research vineyard. It is impossible to get protection on every shoot, meaning that low level phomopsis can be found in most vineyards in most years. The key is keeping it under control especially when susceptible rachises (cluster stems) appear. Captan and mancozeb are the most effective materials.

Powdery mildew – Early infections are rare though after last season, all bets are off. Season long protection is necessary. The topic of powdery mildew will be more fully explored in a coming newsletter. For now, if using sterol inhibitors (Nova, Elite, Procure, Rubigan) or strobilurins (Abound, Sovran, Flint), throw in some sulfur for insurance.

Botrytis – early leaf infections often occur in cool wet weather. These are usually wedge shaped and border the leaf edge. There are no controls labeled for this, not a big deal as these infections are a curiosity. Maintain moderate nitrogen levels in vineyard to minimize outbreaks. (***Source****: Long Island Fruit & Vegetable Update No 10, May 16, 2003*)

More on Nitrogen Fertilization

Terry Bates, Cornell University

I received some more questions on nitrogen fertilization after last week's crop update. . . so here is my bare bones approach to nitrogen fertilization.

Nitrogen sources: There are basically three nitrogen sources for grapevine growth: mineralization of nitrogen from organic matter, remobilization of stored nitrogen from perennial tissues, and inorganic nitrogen fertilizers. By far, the largest pool of N for grapevine growth comes from the mineralization of organic matter. Although there are manybiological, chemical, and environmental processes at work, the basic rule of thumb is that for every 1% of organic matter in your vineyard soil about 15-20 pounds of N is released for plant uptake. Stored N is probably the most easily used by the vines in the spring because it is already in the vine and just needs to be converted and remobilized. Inorganic nitrogen fertilizers are basically just used to supplement the other two sources during periods of peak N demand.

Nitrogen Demand and Fertilizer Efficiency: Concord vines demand and will take up large amounts of nitrogen during periods of rapid growth and with sufficient transpiration rates. More specifically, bloom to veraison. Relatively little nitrogen (around 5%) is taken up prior to bloom when compared to what is taken up after bloom. However, this 5%may be important if weak vines have inadequate nitrogen stores. The 5% is less important in healthy vineyards where nitrogen reserves directly provide nitrogen for growth - including new root growth that absorbs additional soil nitrogen. Research out of Michigan by Stan Howell indicates that mature healthy Concord vines need approximately 70 pounds of nitrogen per year. Further research (again out of Michigan) by Tom Zabadal and Eric Hansen shows that bud break applied N fertilizer is only 10% efficient and bloom applied N fertilizer is a bit more efficient at 15-20%. Meaning, for every 100 pounds on nitrogen applied at bud break, only about 10 pounds is making it to the vines.

Lets do some math: Say I have a healthy mature Concord vineyard with 3% organic matter. I figure that the vines need 70 pounds of N per year and that my soil is releasing approximately 60 pounds from mineralization. I need to make up 10 pounds of nitrogen through inorganic fertilizers. If I apply fertilizer only at bud break and get only 10% uptake efficiency I need to put on 100 pounds of fertilizer nitrogen just to make up the needed 10 pounds. If I rely on reserves and organic matter in the pre-bloom period and apply nitrogen around bloom and increase fertilizer efficiency to 20% then I only need to apply 50 pounds of fertilizer nitrogen to make up the needed 10 pounds.

Does our math work in the field? Long term research from the West Tier shows that ownrooted Concord vines on soil with 2-3% organic matter achieve maximum productivity with 50 pounds of N fertilizer. Going up to 100 pounds does not improve productivity and is a waste of money. At the nitrogen trial at the Betts' vineyard on a heavy soil type, the organic matter is a bit higher at 4-5%. In this case, we have recorded no differences in vine growth or productivity with 0, 50, or 100 pounds of nitrogen. It is both possible and probable that the mineralization of organic matter is providing the total vine nitrogen needs in that particular vineyard block.

What happens to the rest of the fertilizer nitrogen? Some of the nitrogen is used by the other macro and micro organisms in the soil such as weeds, worms, and bacteria. This nitrogen enters the living portion of organic matter and can eventually be used by the vines in the future. A very small amount of nitrogen is absorbed onto soil particles by cation and anion exchange. The rest of the nitrogen can be lost to the system through leaching, erosion, and denitrification. Nitrogen loss, especially leaching, is getting more attention these days because of its potential impact on the environment. It is in all of our best interests - financially and environmentally - to use efficient fertilizer practices. (Source: Lake Erie Regional Grape Program Update, May 22, 2003)

General Information

Pesticide Safety Around the Farm.

Bill Coli, UMass Extension Farm Safety Coordinator

Those of us who use pesticides certainly make every effort to do so in accordance with label conditions regarding rates, personal protective equipment (PPE), re-entry intervals (REIs), PreHarvest intervals (PHIs) and the like, and take pains to be sure that farm workers and family members are not exposed to pesticides. With the passage in 1996 of the Food Quality Protection Act (FQPA) additional attention has been paid by the EPA to concerns about worker exposure and potential dietary effects of pesticides on children.

However, studies conducted at the Pacific Northwest Agricultural Safety and Health Center (PNASHC) have indicated that children may be exposed to pesticides in other ways (See "Pesticides and Farming: Are Children in Harm's Way?" NIOSH Ag. Research Centers Update, Spring 2003, Vol. 1, No. 2 as well as the next article). The PNASHC found "elevated" levels of agri-chemicals in household dust in homes of agricultural workers compared to the general public. A recent report on the studies went on to add that "..children of pesticide applicators also had higher levels of pesticide metabolites" in their urine than children whose parents did not work in agriculture.

Another PNASHC study of 44 pre-school children of non-agricultural workers who live in close proximity to sprayed agricultural areas found that levels of pesticide metabolites in their urine increased during the spraying season and returned to normal after the end of the season. Of course the situation in Massachusetts is likely very different from Washington State in terms of the size of agricultural areas being treated with pesticides. Nonetheless, As noted by the PNASHC study authors, it would still seem prudent to consider ways "to strike a proper balance between the risks and benefits of agricultural pesticide use", and minimize potential exposure of our families and our neighbors.

Laundering the clothing used during application of pesticides

Adapted from the Institute of Rural and Environmental Health, University of Saskatchewan by Craig Hollingsworth

Applicators cannot completely avoid exposure to the chemicals that they apply. Exposure occurs during any of the many activities involved in the spraying operation, including transporting the pesticide, tank filling and mixing, container rinsing, spraying sprayer maintenance, pesticide storage and early re-entry to treated areas.

Exposure can involve contact with pesticide vapors and aerosols, the concentrated pesticide formulation in a liquid, granular, or powder form, and the spray mixture itself. Workers absorb chemicals into the body through the skin, eyes, respiratory (breathing) or digestive system. (swallowing). Studies have shown that good personal hygiene practices reduce the risk of long term health effects.

General Recommendations

- ⇒ Read and understand the product label and material safety data sheet before application.
- ⇒ Bathe or shower after completion of pesticide application, including shampooing hair thoroughly and cleaning under nails.
- ⇒ Put on clean clothing.
- ⇒ Clothing worn during application must be washed daily after each use.
- ⇒ Launder all clothing used for spraying separately from the family's regular clothes.
- ⇒ Personal protection equipment should be cleaned daily after use.

⇒ Discard any clothing that is heavily soiled with pesticide concentrate.

Preparation for Laundering

⇒ Remove pesticide granules from cuffs and pockets outdoors (in the field).
⇒ Discard (according to label instructions) any garment saturated with a full-strength chemical.
⇒ Handle soiled clothing with chemical resistant gloves.
⇒ Use disposable plastic garbage bags for temporary storage of pesticide-soiled clothes before washing.
⇒ Pre-treat pesticide-soiled clothes with a laundry stain removal product intended for oily stains when an oil-base (emulsifiable) formulation has been used.
⇒ Pre-treat heavily soiled areas.
⇒ Read the pesticide label for information.
⇒ Pre-rinse pesticide-soiled clothing: on pre-soak cycle of automatic washer or presoaking in a suitable container (dump water on field) or spray/ hose the garment outdoors (away from children and pets).

Laundering

⇒ Isolate pesticide-contaminated work clothes and wash them separately from the regular family laundry to avoid contamination.
⇒ Do not overcrowd clothes in the washing machine.
⇒ Use hot water 140^{O}F) setting.
⇒ Use full water level.
⇒ Use normal wash cycle (about 12 minutes).
⇒ Use more detergent than recommended by product label.
⇒ Use fabric starch. Pesticide residues cling to the starch and are removed in the subsequent wash cycle when the starch is washed away.
⇒ Choose a heavy-duty detergent (liquid or powder).
⇒ Re-wash clothing two or three times.
⇒ Line dry clothing to avoid contamination of the dryer and to allow sunlight to break down pesticide residues.
⇒ Run the empty washer through a full/wash rinse cycle afterward.

Instructions for Cleaning Protective Equipment

⇒ Wear rubber gloves while cleaning equipment
⇒ Wash hard hat or waterproof hat, goggles, face shield, apron, boots with hot soapy water, rinse and dry.
⇒ Wash the respirator face-piece only. Before cleaning, remove the cartridges.
⇒ Wash the respirator in warm soapy water, rinse and air-dry.
⇒ Check seals and valves for signs of damage or wear.
⇒ Store the respirator and cartridges in a sealed plastic bag
⇒ Last wash your gloves with hot soapy water, rinse and dry.
⇒ Inspect and replace any worn or damaged protective equipment.

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