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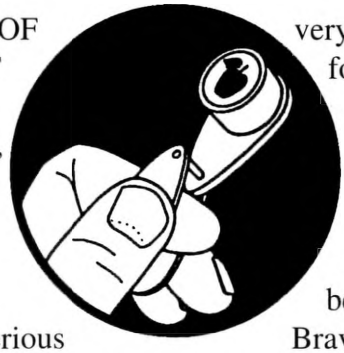
Update on Pest Management and Crop Development

April 21, 2003 VOLUME 12, No. 6 Geneva, NY

DISEASES

THE MUMMY'S CURSE

BROWN ROT OF STONE FRUIT
(Bill Turechek, Plant Pathology, Geneva)



Introduction

❖❖ Brown rot is the most serious disease of peaches, cherries, plums, prunes, nectarines, and apricots in New York. The fungus infects the blossoms, immature and mature fruit, spurs, and small branches. Complete crop loss can occur if weather conditions favor disease development and fungicide protection is lacking during bloom and just before ripening.

Warm, wet weather favors brown rot infection. In the northeast, most brown rot infections develop from conidia that are produced on mummies and infected twigs. Conidia are produced in late spring when temperatures range from 55–77°F and are spread by wind, rain, and insects. Although conidia can germinate and infect at temperatures between 32 and 90°F, optimum temperature for blossom infection of peach range from 70–77°F. Under these conditions, spores germinate and penetrate plant cells on wet blossom surfaces in as little as 5 hours. In tart cherries, significant blossom infection can occur following 12 hr of wetness at 60°F or 24 hr of wetness at 50°F. Blossom blight may also develop at lower temperatures with prolonged wetting periods.

Fungicide program

Some of the label information and restrictions for brown rot fungicides are summarized in Table 1. The protectant fungicides (e.g., Bravo, captan, sulfur) must be applied prior to a wetting a period to be effective. If disease pressure is not very high, captan may be a good choice for blossom blight sprays because it is economical. Be aware, however, that captan can be phytotoxic to some sweet cherry and plum varieties. Bravo is a better choice for brown rot control on sour cherries and plums because it also controls black knot. Bravo is also the better choice when disease pressure is high, but it cannot be applied beyond shuck split.

The sterol-inhibiting (SI) fungicides include Elite, Indar, and Orbit. All of them are labeled for control of blossom blight and can be applied again 2 to 3 weeks prior to harvest to control fruit rots. None of them are labeled for brown rot control at shuck split or first cover, but if applied at these times to control other diseases on the label (mildew, peach scab, cherry leaf spot, etc.) they will also suppress brown rot infections on green fruit. There are various label restrictions across products. In particular, there are restrictions concerning which stone fruits can be

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UPCOMING PEST EVENTS

PHENOLOGIES

Table 1. Labeled uses of fungicides for control of brown rot on stone fruit.

Chemical Category	Fungicide	PB	Bloom	PF	SS	Pre-harvest	PHI
Protectants[3]	Bravo	ACNP[2]	ACNP	ACNP	ACNP	- - - -	0
	Captan	ACNP	ACNP	ACNP	- CNP	ACNP	0
	Ferbam	- - - -	- - - -	- C- -	- C- -	- C- -	7
	Sulfur	- CNP	- CNP	- CNP	- CNP	- CNP	0
	Thiram	- - - -	- - N -	- - N -	- - N -	- - N -	7
	Ziram	ACN -	ACN -	ACN -	ACN -	ACN -	14/30
Sterol Inhibitors[4]	Elite	- CN-	- CN-	- CN-	- - - -	- CN-	0
	Indar	ACN-	ACN-	ACN-	- - - -	ACN-	0
	Orbit	ACNP	ACNP	ACNP	- - - -	ACN-	0
Dicarboximide[5]	Rovral	ACNP	ACNP	ACNP	- - - -	- - - -	0
Strobilurins[6]	Abound	ACNP	ACNP	ACNP	ACNP	ACNP	0
Benzimidazoles[7]	Topsin-M	ACNP	ACNP	ACNP	ACNP	ACNP	1
Analinopyrimidine[8]	Vangard	ACNP	ACNP	- - - -	- - - -	- - - -	0

[1] PB=pre-bloom (red bud for apricot, popcorn for cherry, pink for peach and nectarine, and white bud for plum and prune; PF=petal fall; SS=shuck split; Covers=cover sprays; PHI= pre-harvest interval.

[2] A=Apricot; C=Cherry; N=Peach and Nectarine; P=Plum and Prune.

[3] Do not apply Bravo after shuck split. On apricot, petal fall applications of captan should be made at 75% petal fall. Application of sulfur to mature nectarines may cause discoloration.

[4] Elite is also labeled on cherry for control of leaf spot and powdery mildew beginning at petal fall until terminal growth stops. On peaches, Indar can be applied for control of peach scab and on cherries for control of leaf spot beginning at shuck split at 10-14 day intervals up to harvest. Do not apply Orbit to 'Stanley type' prunes; do not apply to prunes after petal fall; do not apply more than 12 oz from early bloom through petal fall; no more than 2 applications are permitted for fruit rot control. Two additional applications can be applied to all stone fruits for control of powdery mildew or, on cherry, for leaf spot.

[5] Do not make more than 2 applications per season

[6] Abound is extremely **phytotoxic** to certain apple varieties. DO NOT spray Abound where spray drift may reach apple trees; do not spray when conditions favor drift beyond intended area of application; do not use spray equipment that has been previously used to spray Abound to spray apple trees.

[7] If resistance is not an issue, these may be used in fungicide resistance program. Fruit rot, applications can begin 3 weeks prior to harvest. Topsin-M should not be used alone.

[8] Do not apply to sweet cherries.

sprayed, spray timing, numbers of applications per season, etc., so read labels carefully. SI fungicides should not be used exclusively for both blossom blight and fruit rot; these fungicides must be rotated with non-SI fungicides for effective resistance management. The SI fungicides can provide 24–48 hrs of kickback activity if conditions prevented a timely application of a protectant fungicide prior to an infection period.

The benzimidazoles were once very effective brown rot fungicides. Widespread resistance to this

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class of fungicides has left them ineffective for most areas in New York State. The benzimidazoles may provide effective brown rot control in young orchards in isolated locations where resistant strains from older orchards are unlikely to be present. The benzimidazoles used in combinations with other brown rot fungicides can suppress black knot if applied at 7-day intervals between white bud and shuck split. Rovral is a dicarboximide fungicide labeled for use against blossom blight. It should be used as a protective spray although it does have limited post-infection activity (~48 hrs at 68°F). Vangard is in a different class of fungicides and, like Rovral, is labeled for only blossom blight control. It is labeled for use on all stone fruits EXCEPT sweet cherry. Vangard has yet to be extensively tested for blossom blight in New York. In trials conducted in New Jersey, blossom blight programs that included Vangard at pink or early bloom performed as well as those programs that used Rovral or Abound at pink.

Abound is also registered for blossom blight and fruit rot control. The use of Abound, however, is generally not recommended because Abound is **extremely phytotoxic** to certain apple varieties. Yet, Abound may fill certain needs for plum growers. If you choose to use Abound: DO NOT spray Abound where spray drift may reach apple trees; DO NOT spray when conditions favor drift beyond intended area of application; DO NOT use spray equipment that has been previously used to spray Abound to spray apple trees. These restrictions make it very difficult to use Abound in accordance to its label when it is applied with an airblast sprayer.

Final Considerations

For many stone fruits, only one blossom blight spray may be needed unless disease pressure is high. Where large numbers of fruit were left unharvested the year before, or when conditions are warm (above 60°F) and wet, more than one blossom blight application will be required. Petal fall applications are essential if bloom sprays were omitted and conditions turn warm and wet at petal fall. Fruit are very susceptible to infection 1–3 weeks after shuck split, so shuck split and first cover sprays are important, especially in wet weather. Spray intervals should be tightened 3 weeks prior to harvest when fruit are most susceptible to brown rot. In order to manage disease resistance, SI fungicides such as Indar, Elite or Orbit should not be used continuously throughout the season for BOTH blossom blight AND fruit rot control. Use captan or other fungicides intermittently with preharvest SI fungicides. Lastly, ALWAYS remember to check product labels for timing and rates of application. ❖❖

TAG TEAM

APPLE SCAB: ARE THE SIs USED UP, AND HOW DO THE STROBILURINS HELP OUT?

(Bill Turechek & Wolfram Koeller, Plant Pathology, Geneva)

❖❖ In the March 31 edition of *Scaffolds*, Dave Rosenberger covered the basic strategies for managing apple scab in 2003. His article emphasized the need for early scab protection because of the potential for high disease pressure in orchards that had foliar scab last year and because of poor scab control caused by SI fungicide resistance.

There are several reasons for concern about SI resistance in New York. Let us go back in history. The SI fungicides Rubigan and Nova were introduced in 1988; Procure was added later. It had been noticed early that the SI's had excellent post-infection performance in the control of scab. These post-infection activities allowed the development of a delayed four-spray program for scab, with applications made at tight cluster, pink, petal fall and first cover. But it was clearly emphasized from the start that the delayed four-spray program should only be used in orchards with a low potential ascospore dose (PAD), and that the SI's should be mixed with a protectant at least for the last two of the four applications. The recommendation to mix had two reasons. One was to provide additional protection of fruits, because the SI's had shown some weaknesses in the control of fruit scab. The other reason was to

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add an anti-resistance component to the equation. The delayed four-spray program worked well for many growers and for many years.

Over the years, we have kept track of SI resistance through both research in experimental orchards at the Geneva Experiment Station and periodic testing of SI resistance in commercial orchards. We found that the protectant mixed with an SI did not delay resistance in strict post-infection programs. SI resistance developed slowly but steadily, putting more and more pressure on the protectant partner. We also found that SI resistance developed faster in orchards where SI's were used at low doses, a statement deserving of a comment. Low doses are not only determined by low application rates. Low doses are also reached when spray intervals are long and when spray coverage is poor to begin with.

Where do we stand in 2003 with regard to SI resistance? We have monitored the development of SI resistance over the many years growers have used the SI's. We found that full-blown SI resistance could develop after a total of 30 applications in orchards where the PAD was high and where SI's were not always used in mixture with a protectant. On the other hand, we found orchards that have seen over 40 SI-plus-protectant sprays without any sign of resistance developing. Not surprisingly, we found that most of the orchards we tested were in between these two extremes: they were not fully resistant to SI's, but they also were no longer at baseline. This in-between status prompted us last year to make the statement that the "party for the original four-spray SI program is over" in the majority of our orchards. This warning does not imply that SI's are used up entirely. It means that more emphasis needs to be placed on using protectants in mixture with the SI's and on protection early in the season because the "delayed" part of the four-spray SI program is worn out.

In 2002, we were fortunate to have complete spray records as well as assessments of fruit scab at harvest for 17 commercial orchards located throughout the state. These growers were participants in the so-called "RAMP" project; a large, multi-state, federally funded project looking at the efficacy and economics of reduced-risk programs for insect and mite control. In NY, the RAMP project involves apple scab. Participating growers were asked to apply their standard scab programs, and the incidence of fruit scab was evaluated at harvest. Analyses of the 2002 data provided by Harvey Reissig and Art Agnello were revealing:

1. The 17 apple growers participating applied an average of eight scab fungicides, with a range of five to 11 applications. The table below summarizes the pattern of fungicide usage by the growers. The protectant fungicides mancozeb and captan, applied alone or in mixture, were the most widely used. Apparently, many growers trust the conventional protectants most. This is not a bad decision, because mancozeb and captan are quite reliable, if they are applied on a protective calendar schedule. We must remember though that they are quite unforgiving whenever post-infection activities are needed.

2. Three of the seventeen growers applied exclusively mancozeb or captan, with eight to 11 treatments made on a standard schedule. Three growers continued to apply the reduced-SI spray program. Scab control was excellent in 2 of these orchards. In the third, over 20% fruit scab was encountered; a failure most likely attributed to SI resistance. We will test this orchard in 2003.

3. The benzimidazole Topsin M, dodine and the anilinopyrimidine Vangard were part of the scab management equation. Avoidance of Topsin M is a good choice, because benzimidazole resistance persists in most of our orchards. The situation with dodine resistance is not as clear cut, and the value of Vangard is still debatable.

4. Seven growers replaced some or all of their former SI-plus-protectant applications with a strobilurin fungicide. Three of these seven growers experienced more fruit scab than commercially acceptable (5-20%).

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Fungicide Class	% Usage
Mancozeb (Dithane, Penncozeb, Manzate)	34.6
Captan	29.4
SI's (Nova, Rubigan, Procure) mixed w/ protectant	18.4
SI's alone	5.1
Strobilurin (Sovran or Flint)	11.8
Benzimnidazoles (Topsin M)	0.7
Dodine (Syllit)	0.0*
Anilinopyramidines (Vangard)	0.0

* Two applications in mixture with a DMI

There are several concerns relating to the use of SI's and the strobilurins. One concern is that some growers still use SI's alone without a protectant added. This has become very risky because of SI resistance. The data also show that the SI's are still very reliable in some of the orchards. This underscores our results that the level of SI resistance is by now very different from orchard to orchard but almost impossible to predict. One of our major concerns is that the strobilurins didn't fare too well. Why was this so? We should first answer the following question: Can we use the strobilurins in post-infection programs as we used the SI's in their good old days? We might be able to provide an answer.

The strobilurins are better protectants than the SI's ever were, but their post-infection performance is not as good as that of the SI's when SI's were first introduced. Just replacing post-infection SI's with a strobilurin is risky, in particular if the decision was made because of declining SI performance. First, the strobilurins will not have the same reach-back activity the SI's once had. Secondly, just replacing SI's with a strobilurin in a delayed four-spray SI program will undoubtedly drive strobilurin resistance. For example, we tested a Michigan orchard in 2001 where the grower had full-blown SI resistance and had used strobilurins instead of SI's without changing the application schedule. After only two seasons with four applications each season, scab became a problem. Our tests showed that strobilurin resistance was clearly on the march in that orchard.

We know by now how strobilurin resistance will develop. First, the strobilurins will succumb to the gradual emergence of SI-type resistance and a gradual loss of activity. This aspect of resistance can be managed with higher doses of strobilurins. Higher doses can be achieved using either higher application rates or shortened spray intervals or both. But this initial SI-type resistance will then be followed by the "all-or-nothing" benomyl-type of resistance. At that stage, high doses of strobilurins will have no impact whatsoever and scab will not be affected by strobilurin sprays.

Are the SI's used up? The answer is that they are not in many orchards. Will the strobilurins help out? Yes, they will. But we have to keep in mind that they will not provide the same reach-back activity the SI's once had and still have in sensitive orchards. The strobilurins are very potent protectants, and they provide powdery mildew control in addition. But if we use them in the same post-infection programs as we used the SI's before resistance was on the rise, we will drive strobilurin resistance and will lose these fungicides.

What are our recommendations? Most growers will still be able to use the SI's, but in many orchards, the "party" of the delayed four-spray SI program is over. Early protection and less reliance on post-infection programs will be the key. The strobilurins will be very effective, but we must keep in mind that they are less active in post-infection programs than the SI's were at the time we started to use them. We are currently working on an affordable test to determine orchard levels of resistance to all of our modern scab fungicides. This will help to design scab programs without the risk of being burned by fungicide resistance. In the meantime, we should play it safe.

Fruit scab has never been cheap. In a Cornell Bulletin published in 1946 and entitled: "Apple Quality and Its Effect on Price and Rate of Sales", it said that "In New York, apple scab is probably the most serious defect resulting from disease or insect." It also said: "These discounts are highly important to growers. One or two serious defects could reduce the value of marketable fruit by $100 or more per acre. Such an amount would have amply

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covered any ordinary costs of spraying." Although the dollar figures are much higher now for both the potential loss and the fungicides, the basic message has not changed much. The difference is that resistance was not an issue in 1946. Now, we have to factor resistance in.

If the performance of SI's has noticeably declined over the past years, this was most likely caused by resistance. In many cases, the SI's will not be used up entirely, but it will be risky to continue with their post-infection use. The strobilurins will help out, but in strict post-infection programs they are just not as good as the SI's once were. They do have some post-infection activity, but this should be reserved for emergency situations. Just replacing a SI with a strobilurin without changing spray schedules will be risky, and it will drive strobilurin resistance. Has good scab control become more expensive? Perhaps it has, but the above 1946 statement is still true. If we look at the potential "discount" losses, then this "amount would have amply covered any ordinary costs of spraying". ❖❖

FIELD NOTES

HUDSON VALLEY

APPLE SCAB UPDATE
(Dave Rosenberger, Plant Pathology, Highland)

Apple scab maturity counts (counted by Fritz Meyer, Hudson Valley Lab, and Julie Carroll, NY IPM, Geneva)

Date	Bud Stage	% Imm	% Mature	% Empty	Tower Shoot
Schuylerville, NY (Saratoga area)					
4/15	ST	95	5	0	0
Sodus, NY - 1					
4/14	ST	63	35	2	58
Sodus, NY - 1					
4/14	ST	64	36	0	ND
Knowlesville, NY (Orleans Co.)					
4/14	ST	82	18	0	ND

ST = silver tip, ND = no data

❖❖ Spore maturity from Schuylerville was considerably delayed compared with other regions of the state, and maturity in Knowlesville was behind that noted for Sodus. At both Schuylerville and Knowlesville, snow cover persisted longer than at other sites and may have contributed to delayed maturity. In Schuylerville, snow cover disappeared just a day or two before the samples were collected on 15 April.

The leaf sample collected near Sodus on 14 April was split and evaluated by both Fritz Meyer at the Hudson Valley Lab and by Julie Carroll in IPM. Counts from both observers were very similar. With additional warm weather during the past week, large spore discharges can be expected with the next warm rains both in the Hudson Valley (where spore maturity last week already exceeded 30%) and in western NY.

Read the Labels!

When applying pesticides, remember that "the label is the law." Pesticide labels frequently change from year to year, so it is important to review labels each year, even for old products that have been used for many years.

Some labels, such as the label for Sovran fungicide, prescribe minimum rates that must be applied per acre. When minimum rates are specifically listed on a label, it is a legal violation to apply less than that amount, even when spraying very small trees. If labels do not list minimum rates per acre, then growers can legally use reduced rates for smaller trees as determined by tree-row volume calculations.

Other common label changes include changes in worker re-entry periods and new restrictions on applying some pesticides *close to streams and wetlands.* ❖❖

INSECTS

KNOW YOUR ENEMIES

PUSHING TOWARDS PINK - PART I

(Art Agnello & Harvey Reissig, Entomology, Geneva)

❖❖ Arthropod pests during the early season are not terribly numerous, but they do require some form of strategy of attack to properly attend to the worst offenders and avoid wasting time on the lightweights. They include mites, rosy apple aphid, tarnished plant bug, and spotted tentiform leafminer. The key behind all of them depends, at least in part, on being familiar with your own orchards, and knowing whether a given block have a history of or susceptibility to a specific pest. Start with your knowledge of the block, use a sampling procedure where appropriate, and make a management decision.

Mites

If mites normally need attention in a given block, and you're not electing a delayed-dormant oil application as a part of your early season mite management program, you'll be needing to rely on either: one of the ovicidal acaricides (Apollo, Savey) available for use, whether before or after bloom; a rescue-type product (Pyramite, Acramite, Kelthane, Carzol) that can reduce motile numbers if they should begin to lap at the threshold; or Agri-Mek, which falls somewhere between these two strategies. Like the true ovicides, Agri-Mek should also be considered a preventive spray, since it needs to be applied early (before there are very many motiles) to be most effective, generally within the first 2 weeks after petal fall. Also, as a reminder, Carzol is restricted to no later than petal fall, so it will probably be of limited use in most programs. For any of the rescue products, the operational threshold in June is an *average* of 2.5 motiles per leaf (see the chart on p. 69 of the Recommends).

Rosy Apple Aphid

Rosy apple aphid (RAA) will attack all apple varieties, but those such as Cortland, Monroe, R.I. Greening, Idared, and Golden Delicious are particularly susceptible, and those in the McIntosh family are relatively tolerant.

Our control recommendations for RAA cover the period from half-inch green to the pink bud stage, using any of a number of materials: Actara, Esteem, Thiodan, Lorsban, Lannate, Vydate, Supracide, Danitol or Asana, listed roughly in order of increasing disruption of beneficial mites. Pink applications of any of these products should do just as good a job as an earlier spray. Generally speaking, in those cases where aphid populations have built up during early summer on vegetative growth inside the canopy, a pink spray will have done a more effective job of reducing populations than an earlier treatment at half-inch green. From the standpoint of management practicality, it is therefore easier and more natural to consider the need for aphid control at the time of the pink spray. Provado is an excellent RAA material, but it can be applied no earlier than petal fall, by which time much of the fruit damage this insect causes already will have been initiated.

RAA nymphs are of course present at pink, and large enough to see without difficulty, but they do occur on the same tree as, and in the midst of colonies of green apple aphids, which are not usually a problem until the summer. To distinguish among the species, you can use leaf damage as a cue, as well as the insects' color. RAA nymphs are usually pinkish, sometimes varying to a light brown, slate gray, or greenish black, and the body is covered with a whitish mealy coating. Most importantly, they have pronounced cornicles ("tailpipes"), and long antennae (more than half the body length). Green apple aphid nymphs are clearly green, and without the whitish cast. Their cornicles are little more than buttons, and the antennae are clearly less than half of the body length. Also, aphids found inside curled or distorted leaves at pink are almost always rosy apple aphids. If you find ONE infested cluster (1%, or stop as soon as you find one), we would advise including an RAA material in your pink spray.❖❖

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Please note that we have included a predicted degree day accumulation for next week, based on temperature forecasts supplied by SkyBit, Inc.for Geneva, to our degree day table in UPCOMING PEST EVENTS. Using crop phenology and weather data that we have collected over the years, we have used this value to predict about where crops should be next week (in Geneva) in the PHENOLOGIES table.

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–4/21):	165.5	82.4
(Geneva 1/1-4/21/2002):	309.2	168.3
(Geneva "Normal"):	178	78
(Geneva 4/28 Predicted):	210.3	99.4

Coming Events:	**Ranges:**	
Redbanded leafroller 1st catch	32–480	5–251
McIntosh at tight cluster	203–279	87–138
Red Delicious at tight cluster	203–248	89–138
Peach at pink	152–269	67–121
Pear at green cluster	188–282	68–138
Plum at green cluster	137–282	63–138
Sweet cherry at white bud	152–267	75–116
Tart cherry at white bud	203–326	101–168

PHENOLOGIES

Geneva:

	4/21	4/28 (Predicted)
Apple(McIntosh):	half inch green	tight cluster
Apple(Red Delicious):	half inch green	half inch green to tight cluster
Pear:	bud burst	bud burst to green cluster
Sweet cherry:	bud burst	white bud
Tart cherry	bud burst	bud burst
Plum:	half inch green	bud burst to green cluster
Peach:	half inch green	half inch green to pink

Highland:
Apple (McIntosh/Ginger Gold): 3/4 inch green
Pear (Bartlett/Bosc): bud burst
Peach: pink
Plum: green cluster
Apricot: full bloom

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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