scaffolds Update on Pest Management and Crop Development

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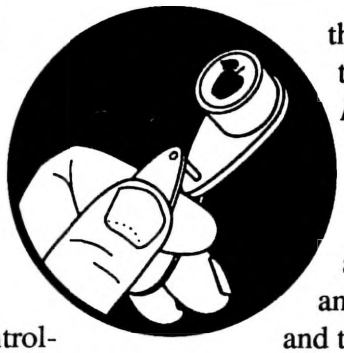
DISEASE

BEFORE THE FALL

## CONTROLLING POSTHARVEST DECAYS ON APPLES

(Dave Rosenberger, Plant Pathology, Highland)



❖❖ Recommendations for controlling postharvest decays on apples remain largely unchanged from previous years and are summarized at the end of this article. Thiabendazole (TBZ, sold as Mertect 340F) and captan continue to be the only chemical fungicides with postharvest labels for apples. Several biocontrol fungicides are registered, but they are either unavailable in New York or ineffective under commercial conditions. Effectiveness of TBZ has been decreasing in recent years because of fungicide-resistance problems. Captan provides good control of postharvest decays when used at the full label rate of 2.5 lb per 100 gallons of drench solution, but use of captan is limited by zero-residue tolerances for captan in some export and US processing markets. In the absence of fully effective postharvest fungicides, sanitation measures become increasingly important for controlling losses to storage decays.

Fungicide resistance problems with apple postharvest pathogens have gradually increased in severity over the past 25 years. Many strains of *Penicillium* and *Botrytis* developed resistance to TBZ and related benzimidazole fungicides (Benlate, Topsin M) soon after these products were introduced in the 1970's. However, the benzimidazole fungicides continued to provide acceptable control of postharvest decays for at least 10 years after resistant strains of the pathogens were present in storages. Research in the mid-1980's showed that most of the benzimidazole-resistant strains of *Penicillium expansum* and *Botrytis cinerea* were unusually sensitive to diphenylamine (DPA), an anti-oxidant used to control storage scald on apples. In commercial practice, TBZ and DPA are usually applied together, and that combination provided adequate control of both benzimidazole-sensitive and benzimidazole-resistant pathogens. Effectiveness of the benzimidazole-DPA combination decreased, however, as strains of *Penicillium expansum* with resistance to both chemicals gradually emerged in the 1990's. These doubly resistant strains have caused up to 15% decay in some lots of Empire fruit held in controlled atmosphere (CA) storage for 9–10 months after harvest.

Several biocontrol fungicides have federal registrations for postharvest use on apples. Biocontrol fungicides are formulations of bacteria or yeasts— living organisms that actually grow on the fruit after they are applied. Biocontrols do not act by killing pathogen spores or by inhibiting spore germination. Instead, they arrest decays by colonizing the wounds on apple fruit where decays are usually initiated. The biocontrol organisms presumably utilize all of the available nutrients in the wounds, leaving nothing to support initial growth of the decay fungi. The decay fungi utilize the apple juice and damaged cells in wounds as a source of nutrients for initial growth of spores. When this "start-up fuel" is consumed by the biocontrol fungi, the pathogens are left without the nutrients needed to initiate growth.

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A series of experiments was conducted with the biocontrol product, Decco I-182, during the 1997 harvest season to determine if it could be used alone or in combination with TBZ to control mixed populations of TBZ-sensitive and TBZ-resistant *P. expansum*. Decco I-182 is a formulation of the yeast *Candida oleophila* that was formerly marketed as 'Aspire'. Results from the 1997 trials showed that although Decco I-182 was sometimes as effective as the standard DPA/TBZ combination, it was never superior and its effectiveness seemed to fade as the duration of storage increased. Furthermore, there was no additive effect or benefit from combining Decco I-182 with the standard DPA/TBZ treatment. With continued research, more effective ways of applying and using Decco I-182 might be devised. In the meantime, however, there seems to be little reason for including this expensive product in postharvest treatments of apples.

Research we conducted over the past 10 years has repeatedly shown that the predominant postharvest pathogen in apples receiving postharvest treatments is *Penicillium expansum*. In apples that are moved to storage without treatment, decays caused by *Botrytis cinerea* often predominate. (Apples with *Botrytis* decay come out of CA storage as firm, tan, completely-decayed fruit that look very much like baked apples.) The biology and epidemiology of *Botrytis* decays in apples has not been adequately researched under east coast conditions. However, it seems likely that *Botrytis* decays are uncommon in fruit receiving postharvest treatments because relatively few strains of *Botrytis* have developed resistance to both DPA and TBZ, whereas such resistance is common in *Penicillium*.

Empire apples from western NY may require postharvest treatment to control the *Botrytis* decays that predominate when Empire fruit are stored without any postharvest treatment. We do not know why *Botrytis* decays are more common in Empire apples from western NY than in those from the Hudson Valley. However, the prevalence of *Botrytis* in western NY may relate to growing conditions in the field. In some other crops (grapes, kiwi), researchers have shown that *Botrytis* infections that occur early in the season remain dormant until fruit begin to ripen. It is quite possible that latent *Botrytis* infections on apples are favored by the cooler summers (and perhaps cooler and damper conditions during bloom and petal fall) that generally prevail in western NY as compared with the Hudson Valley. If early season conditions contribute to latent infections of *Botrytis* on apples, and if these latent infections are a primary cause of postharvest *Botrytis* decays under NY conditions, then 1998 could be a bad year for *Botrytis* decays in stored apples because the extended wet periods that prevailed during and immediately after bloom would have favored higher-than-usual levels of infection.

Following are suggestions for controlling postharvest decays of apples for the 1998 harvest season:

1. Apply postharvest fungicide treatments only when needed. For example, most New York growers have found that Golden Delicious are best stored without any postharvest treatment. Empire produced in the Hudson Valley are frequently stored without any postharvest treat-

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ment, but Empire fruit from western NY may require treatment to prevent *Botrytis*. Fruit held for less than two months in regular cold storage seldom require any postharvest treatment. If DPA must be applied to control storage scald, then TBZ or TBZ plus captan should be applied to control pathogens that will accumulate in the drench solution.

2. Always use DPA and TBZ together because that combination provides better control of both TBZ-sensitive and TBZ-resistant isolates than either product used alone. Follow label recommendations for rates, replenishing solutions, and maximum quantities of fruit that can be treated before the drencher solution must be replaced.

3. Captan used at the full label rate will help to control isolates of *P. expansum* that are resistant to DPA and TBZ. However, captan-treated fruit may be unacceptable in some markets. Furthermore, captan is again under close regulatory scrutiny because of the Food Quality Protection Act. The captan label might be revised in the near future. Using captan might reduce losses to postharvest decays but could significantly limit marketability of treated fruit.

4. Only use application equipment that has an effective agitation system in the holding tank. Otherwise, the fungicide(s) in the drench solution will settle out of solution on the bottom of the tank.

5. Use the cleanest bins available for fruit that is most at-risk for decay. Thus, where possible, use new or sanitized bins for Empire fruit that will be held in long-term storage, and be especially careful of drench-water sanitation when these fruit are be-

## FRUITS OF OUR LABOR

### N.Y. FRUIT PEST CONTROL FIELD DAY - LAST NOTICE

❖❖ Labor Day's late occurrence this year gives us one final opportunity to publicize this annual event, sponsored by the Depts. of Plant Pathology and Entomology, which has been scheduled for September 9–10 this year. All interested persons are invited to attend this preliminary presentation of field efficacy trials on the control of diseases and insects attacking N.Y. fruit crops. Results will be discussed from experiments on tree fruits and grapes. Once again, note the switch in the order of venues. The tour of research plots will start first in **Geneva** this year, on **Wednesday, September 9**, from 8:30 AM until noon. On **Thursday, September 10**, the activities continue at the **Hudson Valley Laboratory**, with presentations on disease and arthropod control in tree fruits. Registration begins at 8:30 at Barton Laboratory, NYSAES, Geneva (Wednesday, September 9) and at the Hudson Valley Laboratory in Highland (Thursday, September 10).❖❖

## UPCOMING PEST EVENTS

| | 43°F | 50°F |
|---|---|---|
| Current DD accumulations (Geneva 1/1- 8/31): | 3285 | 2277 |
| (Geneva 1997 1/1-8/31): | 2744 | 1843 |
| (Geneva "Normal" 1/1-8/31): | 2941 | 2129 |
| Highland (1/1-8/31): | 3696 | 2612 |

| **Coming Events(Geneva):** | **Ranges:** | |
|---|---|---|
| OBLR 2nd flight subsides | 2809-3656 | 1930-2573 |
| Lesser appleworm 2nd flight subsides | 2775-3466 | 2002-2460 |
| Lesser peachtree borer flight subsides | 2782-3474 | 1796-2513 |
| Redbanded leafroller 3rd flight subsides | 3103-3433 | 2013-2359 |
| STLM 3rd flight subsides | 3235-3471 | 2228-2472 |
| Oriental fruit moth 3rd flight subsides | 2987-3522 | 2018-2377 |
| San Jose scale 2nd flight subsides | 2494-3257 | 1662-2302 |
| Apple maggot flight subsiding | 2764-3656 | 1904-2573 |
| American plum borer 2nd flight subsides | 2841-3698 | 1907-2640 |
| Codling moth 2nd flight subsides | 2782-3693 | 1796-2635 |

## INSECT TRAP CATCHES (Number/Trap/Day)

### Geneva, NY

| | 8/20 | 8/24 | 8/31 |
|---|---|---|---|
| Spotted tentiform leafminer | 352 | 107 | 73.3 |
| Redbanded leafroller | 0.5 | 0.1 | 0.3 |
| Oriental fruit moth (apple) | 5.5 | 2.8 | 4.3 |
| Lesser appleworm | 3.0 | 1.5 | 0.7 |
| Codling moth | 2.2 | 1.4 | 6.4 |
| San Jose scale | 1.3 | 0.6 | 2.9 |
| American plum borer | 0.3 | 0.9 | 0.4 |
| Lesser peactree borer | 0.3 | 0.4 | 0.9 |
| Obliquebanded leafroller | 0.3 | 0 | 0 |
| Apple maggot | 0.1 | 0 | 0 |

### HVL, Highland, NY

| | 8/25 | 8/31 |
|---|---|---|
| Spotted tentiform leafminer | 11.3 | 15.3 |
| Redbanded leafroller | 3.6 | 4.3 |
| Oriental fruit moth | 0 | 0.1 |
| Lesser appleworm | 0.9 | 1.4 |
| Codling moth | 1.0 | 0.1 |
| Obliquebanded leafroller | 0 | 0 |
| Variegated leafroller | 1.0 | 0.5 |
| Tufted apple budmoth | 1.1 | 0.7 |
| Fruittree leafroller | 0 | 0 |
| Sparganothis fruitworm | 1.6 | 1.7 |
| Apple maggot | 0.3 | 0.14 |

(Dick Straub, Peter Jentsch)

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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