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Update on Pest Management
and Crop Development

FRUIT JOURNAL

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INSECTS

ON THE RUNWAY

ORCHARD RADAR DIGEST

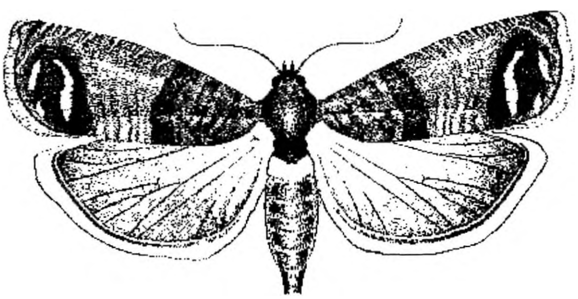
Geneva Predictions:

Codling Moth
Codling moth development as of August 15: 2nd generation adult emergence at 88% and 2nd generation egg hatch at 60%.

Highland Predictions:

Codling Moth
Codling moth development as of August 15: 2nd generation adult emergence at 98% and 2nd generation egg hatch at 83%.

❖❖



DISEASES

DON'T BE BLUE

NEW FUNGICIDE OPTIONS FOR POSTHARVEST DECAY CONTROL
(Dave Rosenberger, Plant Pathology, Highland)

❖❖ The best option for minimizing blue mold decay in stored fruit involves using clean bins, avoiding drenches after harvest, and storing apples in sanitized storage rooms. This combination of sanitation practices will minimize exposure of fruit to spores of *Penicillium expansum*, the fungus that causes blue mold. Blue mold is the most common postharvest disease of apples and accounts for the majority of postharvest decays in most years, especially in fruit that receive postharvest drenches.

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IN THIS ISSUE...

Although moving fruit into storage without any postharvest treatment can minimize exposure to *Pencillium* inoculum, postharvest treatments with diphenylamine (DPA) may be needed to control storage scald and/or carbon dioxide injury. Unusually hot weather this summer may predispose fruit to carbon dioxide injury this fall! A fungicide should ALWAYS be included in the drench solution when DPA is applied after harvest.

Postharvest fungicide treatment may also be desired to control gray mold decay caused by *Botrytis cinerea*, a fungus that may infect fruit calyces in the field and then invades fruit during long-term storage. When fruit are moved into storage without a postharvest treatment, the incidence of blue mold is usually low but the incidence of gray mold is often higher than in fruit that receives a postharvest fungicide treatment. After CA storage, fruit with gray mold are usually firm and light tan with a "baked apple" appearance, whereas decays caused by *P. expansum* are soft and watery.

Thiabendazole (trade name: Mertect 340F) and captan are still registered for postharvest treatment of apples. Captan is sometimes used in combination with Mertect 340F, but it should never be used as the sole fungicide in a postharvest treatment. Mertect 340F can be used as the sole fungicide in combination with a DPA treatment, or it can be applied with captan. Many storage operators report that the combination of Mertect 340F plus captan is more effective than Mertect 340F used alone, but we have not been able to verify this in controlled trials. In some storages, Mertect 340F is almost worthless because most of the *Penicillium* in these packing houses is resistant to Mertect 340F and the resistant spores cycle from year to year on contaminated field bins.

Two new fungicides will be available for postharvest treatment of apples this fall. Pyrimethanil (trade name: Penbotec) and fludioxonil (trade name: Scholar) are now registered for use in NY. Both of these new products are extremely effective for controlling blue mold and gray mold on apples. Both products are registered for use in drenches and in packinghouse line sprays. Both Penbotec and Scholar are fully compatible with DPA and calcium chloride. Both products are very stable and hold up well in postharvest drench solutions. There is no reason to include captan or any other fungicide in drenches where Penbotec or Scholar is used.

Warning: Residue tolerances for these new fungicides have not yet been established in many apple-importing countries. Before applying these fungicides to apples destined for export, packinghouse operators should verify that the importing country will accept product treated with the fungicide in question. A database of approved MRLs (maximum residue levels) for various commodities and countries can be found at the following web site: http://mrldatabase.com.

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Packinghouse operators choosing to use these new fungicides should use Penbotec one year and Scholar the next year so that *Penicillium* spores that recycle on bins will not be repeatedly exposed to the same fungicide year after year. Penbotec and Scholar have different modes of action, and both of them are distinctly different from Mertect 340F. Alternating annually between Penbotec and Scholar should reduce selection pressure for resistance to both of these new fungicide chemistries. Alternation of chemistries for fungicides applied in packinghouse line sprays is of less concern because the treated fruit are moved into the retail supply chain before any surviving infections can sporulate, thereby reducing or eliminating selection for fungicide resistance.

Because Honeycrisp apples are extremely susceptible to a variety of postharvest decays, Honeycrisp growers may wish to consider a third new option for postharvest decay control. The new fungicide Pristine is NOT registered for postharvest treatments, but there is some evidence that field sprays applied several days prior to harvest can reduce the incidence of decays that develop after harvest. Pristine not only controls *P. expansum* and *B. cinerea*, it is also very effective against black rot, white rot, and bitter rot. All three of those diseases can appear after harvest as a result of infections that were initiated in the field. We do not yet know if a single application of Pristine during the week prior to harvest will be sufficient to suppress postharvest appearance of these summer fruit rots, or whether multiple preharvest applications (perhaps at 20–30 and 2–7 days before harvest) will be required for complete control of these diseases on Honeycrisp. Effectiveness of field sprays will definitely depend on spray coverage, and field sprays are unlikely to provide protection against blue mold and gray mold infections that are initiated at stem punctures incurred during harvest. Nevertheless, considering the high value of Honeycrisp apples, at least one preharvest application of Pristine would be justified.

If Honeycrisp apples are to be stored more than a month or two, then the preharvest spray of Pristine should be followed with a postharvest drench of Penbotec or Scholar. The combination of Pristine before harvest and Penbotec or Scholar after harvest should eliminate most of the postharvest decay in Honeycrisp except in cases where chilling injury causes tissue damage. After investing in expensive new fungicides to protect fruit from postharvest decays, special care should be taken to store Honeycrisp at temperatures that will not cause chilling injury.❖❖

DO IT WITHOUT DECAY

SUGGESTIONS FOR IMPROVING PACKINGHOUSE SANITATION

(Dave Rosenberger & Anne Rugh, Plant Pathology, Highland)

❖❖ Good sanitation is essential both to reduce potential expenses/losses associated with postharvest apple decays and to eliminate possibilities that apples will become contaminated with human pathogens. Sanitation procedures and methods must be custom-tailored for each packinghouse, but some general principles are outlined below.

#1: Chlorinate water dump tanks and flumes on apple packing lines

All packinghouses should use chlorinated water (or some other water sanitizer) to kill bacteria and spores that accumulate in water flumes used to float apples onto the packing lines. In a 2005 survey of New York packinghouses, we found large populations of *P. expansum* spores in the water flumes that were not chlorinated, whereas flumes with detectable chlorine had no viable microorganisms. Apples run through non-chlorinated flumes that contain an abundance of *Penicillium* spores are likely to develop decays on the way to market if any of the apples have stem punctures.

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Non-chlorinated water flumes may also contain coliform bacteria. Coliform bacteria, though not necessarily harmful themselves, provide an indication that human pathogens such as *E. coli* O157:H7 could survive in these water flumes. The scientific literature contains many reports documenting that *E. coli* O157:H7 can survive in apple wounds for extended periods of time. If *E. coli* O157:H7 were introduced into a stem puncture on an apple, that contaminated fruit could conceivably carry the pathogen to a consumer. By chlorinating flume water on apple packing lines, packinghouse operators can minimize the possibility that apples will become contaminated with either human pathogens or with postharvest decay pathogens during the packing process.

The best approach for maintaining consistent chlorine and pH levels in water flumes involves installation of automated feed pumps that continuously monitor water pH and oxidant levels (i.e., free chorine in a chlorinated system). These systems automatically adjust chlorine and pH as needed, thereby ensuring that effective levels are maintained at all times. Automated systems can be purchased for about $5,000 and require minimal attention and maintenance once they are installed.

The advantage of these automated systems is that, because they add chlorine on demand, they can be set to maintain 40–50 ppm free chlorine rather than the 100 ppm free chlorine that is recommended when chlorine is added manually once or twice a day. The lower level of chlorine and the automatic adjustment of pH reduce the likelihood that off-gassing can occur due to low pH (i.e., reduces potential for a strong swimming pool odor). It also reduces the likelihood that pH will rise enough to make the chlorine ineffective.

Hypochlorite, the biologically active molecule in chlorinated water, reacts rapidly with organic matter, so hypochlorite is constantly consumed in flume water that contains organic debris. Centrifugal filters and/or sand filters connected to the water flumes and water dumps can remove organic debris and thereby minimize the need for constant additions of large amounts of chlorine. This is especially critical in presize lines where water is changed relatively infrequently and constant additions of large amounts of chlorine can eventually result in phytotoxic salt levels in the water flumes. However, filtration is recommended even for smaller water dumps. Water that is filtered and chlorinated remains clean even after many bins of fruit have been processed. Fruit that consumers eat with minimal washing should be handled using clean water!

For more information on chlorination of flume water and on systems for monitoring chlorine concentrations, see the recent article on this subject that was posted on-line in the *Cornell Fruit Handling and Storage Newsletter* at <http://www.hort.cornell.edu/watkins/Newsletter2004.pdf>.

#2: Remove all decayed fruit from bins as the bins are emptied

Decayed fruit do not float and therefore must be manually removed from bins after they come out of water dumps. The only alternative to manual removal is an automated bin-washing system that inverts the bins while washing them with water jets. Decayed fruit left in the bin will harbor millions of spores that can then be carried into the postharvest drench water and packinghouse water flumes when bins are reused the following year. Leaving decayed fruit in empty bins will create tremendous selection pressure for resistance to the new postharvest fungicides. Complete sanitizing of bins that contained decayed fruit is the best option, but removal of decayed fruit is essential, even where sanitizing bins may not be feasible.

Bins that contained large numbers of decayed fruit or bins that have visible blue stains due to contact of decays with bin walls should be sanitized by washing with a high-pressure sprayer. When bins are cleaned with a high-pressure sprayer, sanitizing

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can be accomplished by using steaming water (i.e., heat), quaternary ammonium, a chlorine dioxide foam, StorOx applied in a foam, or perhaps by using chlorinated water. Chlorinated water is less effective than the other options because the bin surfaces may not remain wet long enough for the hypochlorite to kill all of the spores. However, the combination of high-pressure washing plus chlorinated water should still eliminate most of the spores because many spores will be washed away by the high-pressure jets of water, even if contact time with the hypochlorite is insufficient for a 100% kill of the spores.

Plastic bins are easier to sanitize and cause less bruising and less fruit injuries where fruit contact the sides of bins than is common with wood bins. Plastic bins also remain free of the wood-decay fungi that are commonly found in older wooden bins and that may contribute to "storage odors" that sometimes develop when fruit are stored in wood bins. Plastic bins still need to be cleaned occasionally as described above, but thorough cleaning will be much easier than with wooden bins.

Growers should consider transitioning to plastic bins as rapidly as possible if they can afford to do so. The cost of plastic bins will probably continue to increase as petrochemical costs continue to increase over the next decade. Therefore, today's prices for plastic bins may look like a bargain in a year or two if fuel prices continue their steady rise.

#3: Sanitize storage rooms at the end of each season

Walls and floors of all storage rooms should be sanitized at the end of each season using either quaternary ammonium sprays or by applying a foam containing StorOx. Both methods will effectively kill spores and eliminate "storage odors". Chlorinated water is less effective than quaternary ammonium sanitizers or StorOx foam, so chlorinated water is not recommended for cleaning storages.❖❖

GENERAL INFO

REVIEW ANEW

2nd NOTICE - TREE FRUIT PEST CONTROL FIELD DAY

❖❖ Please remember to make plans to attend the annual N.Y. Fruit Pest Control Field Day, which will take place during Labor Day week on Sept. 8 and 9, as dictated by tradition. As we have done recently in order to accommodate participants who may wish to attend other area tours earlier in the week, the dates fall on the Thursday and Friday of the week, with the Geneva installment taking place first (Thursday Sept. 8), and the Hudson Valley installment on the second day (Friday Sept. 9). Activities will commence in Geneva on the 8th, with registration, coffee, etc., in the lobby of Barton Lab at 8:30 am. The tour will proceed to the orchards to view plots and preliminary data from field trials involving new fungicides, miticides, and insecticides on tree fruits and grapes. It is anticipated that the tour of field plots will be completed by noon. On the 9th, participants will register at the Hudson Valley Laboratory starting at 8:30, after which we will view and discuss results from field trials on apples.❖❖

PEST FOCUS

Geneva: Redbanded leafroller 3rd flight began today. Degree days (base 43°F) since **spotted tentiform leafminer** 2nd flight began (6/23) = 1674

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UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–8/15):	2826	1991
(Geneva 1/1–8/15/2004):	2542	1660
(Geneva "Normal"):	2602	1795
(Geneva 8/22 Predicted):	3007	2122

Coming Events:	Ranges(Normal± StDev):	
Spotted tentiform leafminer 3rd flight peak	2607–3055	1779–2129
Apple maggot flight subsides	2772–3374	1908–2368
Obliquebanded leafroller 2nd flight peak	2622–3024	1782–2114
Oriental fruit moth 3rd flight peak	2641–3249	1821–2257
Lesser appleworm 2nd flight peak	2315–3295	1554–2292
San Jose scale 2nd flight subsides	2639–3349	1785–2371
Peachtree borer flight subsides	2535–3185	1714–2224
Redbanded leafroller 3rd flight peak	2742–3222	1876–2342

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	8/8	8/11	8/15
Redbanded leafroller	0.0	0.7	1.0*
Spotted tentiform leafminer	39.4	29.3	31.0
Oriental fruit moth	0.0	0.0	0.0
Lesser appleworm	0.3	0.3	0.0
San Jose scale	22.5	20.5	16.3
American plum borer	0.4	0.0	0.0
Lesser peachtree borer	0.5	0.7	0.4
Obliquebanded leafroller	0.1	0.5	0.3
Apple maggot	0.0	0.0	0.0

* = 1st catch

Highland, NY

	8/1	8/8
Redbanded leafroller	0.2	0.7
Spotted tentiform leafminer	43.1	50.7
Oriental fruit moth	0.9	1.2
Lesser appleworm	0.9	0.9
Codling moth	1.1	0.4
Obliquebanded leafroller	0.5	0.5
Apple maggot	0.1	0.1

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