

HOME

WHAT'S NEW

CALENDAR

PRODUCTS

NEWS RELEASES

Orchard Network

Orchard Network



For Commercial Apple Producers



This newsletter is made possible by the generous support of the following sponsors:



ENGAGE AGRO



Apple Valley

Vanden Bussche IRRIGATION
& Equipment Limited
est. 1954 - Delhi, Ont.

N.M. **BARTLETT** INC.

Volume #9

Issue # 1

Editor(s): John Gardner - Apple Specialist/OMAFRA; Dr. Jennifer DeEll - Fresh Market Quality Program Lead/OMAFRA

Creation Date: March 2005

Alternate Format: n/a

[Subscribe to this newsletter](#)

In this issue...

Orchard Management

- [Are You Getting the Pruning Result You Want?](#)
- [Cultivar Update](#)

Crop Protection

- [Fungicide Resistance Management](#)
- [Sheltered Lives](#)
- [What's New in Apple IPM – The Word on the Street](#)
- [Managing Black Rot in Ontario Apple Orchards](#)
- [Remove Fire Blight Cankers in the Winter](#)
- [Obliquebanded Leafroller - A Persistent Pest of Apples](#)

Postharvest

- [Antioxidants in Apples](#)
- [Effect of DPA on *Penicillium expansum* Growth and on Postharvest Control of Blue Mold with Fludioxonil in 'McIntosh' Apples](#)
- [Biocontrol Efficacy of Yeast on Blue Mold in 'McIntosh' Apples](#)
- [Why is Produce Now More Likely to Have Unsavoury Critters On-Board?](#)

| [Top of Page](#) |
| [OMAFRA Newsletters](#) |

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
Email: ag.info.omafra@ontario.ca

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Are You Getting the Pruning Results You Want?

Author: John Gardner - Apple Specialist/OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

Good question! Pruning apple acreage is one of the longest, toughest and most costly jobs in orcharding. As a horticulturist, I am always amazed at where all the growth comes from in orchards from year to year.

Pruning can last for 4-5 months in the dormant season and again for a few weeks during the summer months for some growers and managers. If done well, it will get you on the road to a successful crop. As one grower put it years ago when discussing pruning, "Don't try to manage any more acreage than you can effectively prune".

The cost of pruning can vary considerably with cultivar, tree maturity, planting density, training need and general level of neglect. Cutting corners on good pruning practices will not likely improve profit margins but it will however result in higher cullage rates and loss of fruit bud quality for the short-term.

Spending that extra one or two hundred dollars per acre does not necessarily guarantee a successful result. Some of the indicators of a job well done can be deceiving. Piles of brush don't really tell much other than looking for limb diameters in the brush pile and seeing what is being removed from the canopy. The only thing that really counts in the end is perhaps cullage rates due to size and colour and ultimately recoverable volumes of Fancy fruit per row or cubic foot of managed canopy.

One of the indicators that I like to use this time of year in any given situation is fruit bud distribution and fruit bud diameter. Healthy fruit buds are not produced in areas of the canopy where light is deficient, no matter how well the trees are watered or fed.

Trees that have had an adequate pruning job done during the dormant season respond with well-distributed spurs fed by clusters of large healthy spur leaves in the spring. This usually results in a higher probability for large well-sized fruit at the end of the growing season.

| [Top of Page](#) |

Most apple trees are started well with good intentions by the grower for tree shape and ultimate tree size. Somehow, those cuts that should be made early in the life of the tree often get missed. These are the large diameter tree-like branches that carry in many cases nice looking buds. You cannot afford to grow tree-like branches within a tree canopy in modern high-density plantings.

The greatest temptation by the average grower is to leave strong limbs in the upper canopy area. You can get away with this for a year or two on young trees. However, if the practice is adopted on an annual basis the best fruit on the tree begins to creep up and out of reach until the most economical part of the tree to manage has very few if any good

fruit growing in it. The idea is to keep the tree profile from top to bottom equally productive and equally strong with adequate light distribution.

Most mature trees have one or two offending limbs in the upper middle canopy that prevent up to one third of the light the tree receives from getting to the lower canopy area. The growing season is so short that a few days can make a difference to the formation of fruit buds for the following year. The tree starts to decide very early in the growing season what it do will in the next year in any given part of the canopy.

Look for those offending limbs first when starting in on a tree and see what a difference their removal makes to the look and shape of a tree.

| [Top of Page](#) |

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Cultivar Update

Author: John Gardner - Apple Specialist/OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

Shizuka

It's hard to believe but many cultivars of apple that we consider to be modern were selected decades ago by breeders in other corners of the globe. Take for instance the "Shizuka" apple that was shown at the Brock Conference. This cultivar was selected and introduced in 1949 from Japan.

It is the sister cultivar of "Crispin" ("Mutsu"). We are finding out lots of interesting things about this cultivar and others in the fast moving world of varieties and their distribution, ownership and attributes.

Grown side by side with its sister cultivar "Crispin" in Ontario, "Shizuka" shows only a very minor infection potential to blister spot, which unfortunately prevents "Crispin" from being the apple it should be in some plantings. "Shizuka" is productive and normally has very low cullage rates. Well-grown "Shizuka" is said to be juicier and sweeter than "Crispin" by those who have done side-by-side comparisons. It is also very slow to oxidize or brown when cut surfaces are exposed to air. "Shizuka" stores well and is very difficult to distinguish from "Crispin".



Fig. 1 – "Shizuka" on the left, "Crispin" on the right.

Ambrosia TM

Appears to have a fairly narrow picking window, which appears to be right after “Empire” here in the Northeast. It will store exceptionally well if it is not harvested too late. In the U.S.A., the “Ambrosia” apple will be under the management of McDougall and Sons of Wenatchee, Washington. McDougall and Sons Inc. in partnership with Columbia Marketing have signed an exclusive license agreement with PICO to grow and market this variety in the United States. The acreage allocated to McDougall and Sons Inc. of this cultivar in the United States is reported to be filled.

| [Top of Page](#) |

Pinova

A.k.a. “Sonata” and “Corail” has been renamed by its new owners in the U.S. to Piñata (U.S. Plant Patent #11601). Stemilt has purchased this cultivar and will monitor and limit the production of it. Stemilt is developing promotional programs for this cultivar.

NovaSpy

This is the cultivar that had a lot of attention paid to it in Michigan at their Hort Show last December. Growers in Michigan are looking for grower friendly cost - effective cultivars to produce for the processing market in Michigan. “NovaSpy” is out of the Nova Scotia Breeding program and was introduced in 1986. It has an intense sweet-tart flavour and is highly suitable for baking. The fruit are similar to “Northern Spy”. It is scab resistant and the tree habit is more of a semi spur and quite easy to work with. The tree is moderately productive and an annual bearer. The fruit ripen mid October and have a long storage potential with no major storage disorders.

Bohemia®

A red bud mutation of the winter cultivar “Rubin”, as discovered in 1984 by Mr. Josef Thor in Pencine, Czech Republic 300 meters above sea level. This cultivar performs better in a cooler climate. The scion is considered to be high in vigour. The original “Rubin” is a cultivar that resulted from a cross of “Lord Lambourne” and “Golden Delicious”. “Bohemia” has many of the physical characteristics of “Lord Lambourne”. “Bohemia” is attractive and aromatic, intended for fresh market sales but also useful for cooking. It carries a relatively good tolerance to scab infection and is harvested in the “Empire” season. “Bohemia” stores very well and has a bud sport that produces a yellow apple called “Bohemia Gold”. This cultivar is protected by registration. Propagation of “Bohemia” for commercial production has an attached royalty. This cultivar was added to our Provincial Cultivar Trials during the 2004-planting season.

| [Top of Page](#) |

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
Email: ag.info.omafr@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)

Last Updated: undefined NaN, NaN

HOME**WHAT'S NEW****CALENDAR****PRODUCTS****NEWS RELEASES**

Fungicide Resistance Management

Author: Kathryn Carter - Pome Fruit IPM Specialist/OMAFRA; Wendy McFadden-Smith - Consultant; Dr. Deena Errampalli/ AAFC; Margaret Appleby/OMAFRA; Michael Celetti/ OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

Apple Scab resistance to the Sterol Inhibiting (SI) fungicides (Nova, and Nustar) has been reported in many apple growing regions including New York, and Michigan since the early 1990's. While SI's are still very effective in managing scab in most orchards in Ontario, preliminary research from a small set of samples collected in a few Ontario orchards during 2004, suggests that SI resistant populations of apple scab may be present. Agriculture and Agri-Food Canada, OMAFRA, and private consultants are working together to confirm whether SI resistance is present in these orchards and if so why. Further research is required to verify and quantify the levels of resistance in these orchards, and to determine the extent of SI resistance in Ontario.

So how do apple growers find out if SI resistant populations of apple scab have build up in their orchards? Unfortunately, testing is expensive and not available commercially. As a general rule, in orchards that have had repeated failures from using SI's , which can't be explained by application timing, coverage, rates, calibration, or weather, it would be best to avoid using these materials for the 2005 growing season and in the short term.

If SI resistance has been confirmed in your orchard, you can not rely on the post-symptom protection of fungicides in the SI class and this possibly includes the strobilurin class of fungicides (Sovran and Flint). Scab infections that occur early in the season can explode into major problems during a wet season. This is of concern where highly susceptible cultivars like McIntosh are grown and where inoculum potential is high. Preventing the establishment of scab is critical in orchards with suspected SI resistance. Growers with confirmed SI resistance should avoid using Nova, Nustar to manage apple scab. Although the SI's will still be effective tools for managing powdery mildew in orchards with SI resistance to apple scab, some research suggests that these fungicides may stimulate sporulation in resistant scab lesions when applied to control powdery mildew.

There are several strategies that all apple growers should be implementing regardless of fungicide resistant scab populations in their orchards. These strategies can be used to help growers avoid the development of fungicide resistance.

Always rotate between fungicide families in a control program. Never apply more than 4 applications of SI's or strobilurins/season. Always use full rates of SI fungicides with ½ rate of protectant fungicide. Start fungicide sprays at green tip before the first infection period. As a rule of thumb, apply fungicides preventatively not curatively. Using fungicides curatively, adds selection pressure on the fungus, and you may be selecting for fungicide resistant populations. This means that the orchard floor must be cleaned up (prunings) and made sprayer ready in advance of green tip. Always use full label rates of fungicides. Reducing the rates of fungicides, will likely increase the number of resistant colonies or resistant individuals present in an orchard.

- Alternate row spraying is not recommended, as this technique can leave a shadow of unprotected canopy
- Spray in a light rain (with materials like Captan Sulfur or an EBDC) if necessary to protect new foliage during infection periods lasting more than 2-3 days. SI fungicides and strobilurins should never be applied in the rain because they must dry on the leaf and be absorbed to be effective.
- Don't extend your spray intervals beyond the label recommendations. This could mean a 5-7 day interval in a wet spring like we had in 2004.
- Urea can be applied to leaf litter on the orchard floor in November or early spring to accelerate leaf decomposition and reduce the over-wintering apple scab inoculum. New York recommends 40lb/ac. of urea sprayed onto the ground. Ascospore production can be cut by more than 75% according to Dr. David Rosenberger. Make sure you add in the nitrogen component in urea when tallying N fertility inputs for the treated acreage. Flail mowing may also reduce inoculum levels by destroying leaf litter.
- Re-calibrate your sprayer and check for coverage of the entire tree.

SI's are still very effective for managing scab in most Ontario apple orchards, and they remain an important tool for apple growers to manage other diseases. Implementing a fungicide resistance management strategy will delay or help growers avoid the development of fungicide resistance, and keep our recommended fungicides working effectively.

| [Top of Page](#) |

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

HOME**WHAT'S NEW****CALENDAR****PRODUCTS****NEWS RELEASES**

Sheltered Lives

Author: Neil Carter - Tender Fruit and Grape IPM Specialist/OMAFRA
Creation Date: 15 March 2005
Last Reviewed: 15 March 2005

What do leaf miners, wood borers, shoot borers, and internal fruit feeders all have in common? They all have lifestyles which allow them to be sheltered *inside* their food sources for part of their life cycles. This certainly allows for easy access to their food and also helps to protect them from the extremes of weather. In some cases, this sheltered lifestyle may also help them avoid predators and parasites. However, no matter how protected the shelter, there is always a predatory or parasitic insect that has found a way to break in. There are many species of wasps that parasitize wood boring larvae; determining where their hosts are feeding is no easy matter but on top of that these parasitoids have amazing ovipositors (egg laying organs) with sheaths that can drill through solid wood to the depth of the borers' galleries. The parasitoids of leaf miners don't need such penetrating egg laying equipment, just the ability to find their hosts. Oriental fruit moth larvae are often parasitized during the first and second generation by parasitoids of the genus *Macrocentrus*, but those that escape parasitism early in the year leave offspring that bore into fruit, escaping the relatively short ovipositors of *Macrocentrus* spp. Insects have been at this deadly game of hide and seek for at least 100 million years.

Growers of fruit, do not, for the most part, have the same kinds of tools that allow them to pursue pests with sheltered lives. There are a few insecticides for fruit with some measure of systemic activity (often limited to translocation through the leaf surface) but many available insecticides work only by contact or through ingestion by the target pest. The window of opportunity for contact or ingestion is often very narrow for pests with a sheltered lifestyle. Many of the more persistent insecticides, which in the past permitted a wide open window of opportunity for treatment, are being lost. Restrictions on the use of older pesticides and "re-evaluations" (usually meaning "loss") of persistent products may mean that the sheltered pests are regaining an advantage.

There are some simple steps to ensure that sheltered pests (and other pests) do not gain the upper hand in orchards. The most important step in this context is a cornerstone of integrated pest management (IPM) – monitoring. Knowing when pests are active and identifying that narrow window of opportunity for control of pests with sheltered lives is the key to timely application of products or management strategies. This knowledge can best be gained by contracting with qualified crop consultants to regularly and rigorously monitor orchards. Monitoring puts the advantage back on the growers side by giving them the opportunity to act when the pests are most vulnerable. Most pests are site-specific, meaning that monitoring individual orchards gives you the very best information with which to work. Whether you institute a monitoring program yourself or have a crop consultant do the monitoring, the effort will pay dividends in orchard health, crop quality, and management of pests – including those with sheltered lives.

[| Top of Page |](#)

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)

Last Updated: undefined NaN, NaN

**HOME****WHAT'S NEW****CALENDAR****PRODUCTS****NEWS RELEASES**

What's New in Apple IPM - The Word on the Street

Author: Kathryn Carter - Pome Fruit IPM Specialist/OMAFRA
Creation Date: 15 March 2005
Last Reviewed: 15 March 2005

As every apple grower knows----life in the apple business is always changing, and the same can be said for integrated pest management in apples. Pest management in apples has come a long way over the past 35 years, and it continues to evolve as new chemistries and technologies become registered. Over the past year, I had the opportunity to attend several conferences on integrated pest management in apples to discuss ongoing research and issues relating to apple IPM. So what might the future hold for apple IPM?

Plum Curculio

Currently apple growers in the Northeast rely heavily on the use of broad spectrum organophosphorous (OP) pesticides to manage plum curculio (PC) and key pests of apples. Preliminary results from research conducted at Cornell University's Hudson Valley Lab (R. Straub & J. Jentsch), suggest that Sevin XLR, a fruit thinner commonly used in apple orchards, may provide effective control of plum curculio when used at a specific time. Further research needs to be conducted to verify these results. If Sevin XLR is efficacious against PC, apple growers that use Sevin for fruit thinning may not need to provide subsequent applications of OP pesticides to manage plum curculio.

Dogwood Borer

Researchers at the Appalachian Fruit Research Station in the US have analyzed the pheromone of the female dogwood borer, and have developed a chemical lure that is significantly more attractive to dogwood borer males, than the pheromone that is currently used to monitor for this pest. This new improved pheromone should be commercially available in the near future, and will provide consultants and growers with a better method of monitoring dogwood borer populations in commercial apple orchards.

| [Top of Page](#) |

Obliquebanded Leafroller

Scientists studying pesticide resistance in obliquebanded leafroller (OBLR) populations in Washington have observed a slight shift in the insect's tolerance to spinosad (Success). After 3 years of studies, the insects appear to be slightly more tolerant to spinosad, however this small change is not expected to result in field failures against even the most tolerant insects. Researchers believe that even if spinosad resistance continues to increase, spinosad will remain efficacious for at least 5 years, or perhaps even longer provided resistance management strategies are used. There have been no studies conducted in Ontario to evaluate OBLR resistance to spinosad, as a result Ontario apple growers should continue to rotate the chemical families (Success, Dipel/Foray, Confirm/Intrepid) to avoid the development of pesticide resistance.

Stink Bug

Stink bug damage has become a concern in many US apple orchards in recent years. In 2004, USDA initiated a research project to evaluate the susceptibility of various apple cultivars to stink bug damage. The results of this research suggest that "Jonagold", "Empire" and "Braeburn" apples are highly susceptible to stink bug injury. In comparison "Honeycrisp", "Gingergold", "Golden Delicious", and "Red Delicious" apples are moderately susceptible to stink bug injury, while "Gala" is considered to exhibit very low levels of damage from stink bugs. This information is very useful in orchard monitoring, since it will allow scouts to focus on varieties that are susceptible to attack by stink bugs.

Codling Moth

Over the past few years, researchers have been studying the potential for using a pear ester, one of the chemicals responsible for the pear's odour, to attract codling moth (CM) adults and larvae. Unlike pheromones, which are only attractive to males, the pear ester is attractive to both females and males, and has the potential to be a useful tool in monitoring and managing codling moth populations. Researchers have already shown that the use of pear esters can increase trap catches of CM adults in walnut, apple and pear orchards. This technology may also be useful in controlling CM populations, since improved timing of sprays and the use of mating disruption and or bait stations could allow growers to eliminate female CM and prevent them from laying their eggs.

| [Top of Page](#) |

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate. Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Managing Black Rot in Ontario Apple Orchards

Author: Kathryn Carter - Pome Fruit IPM Specialist/OMAFRA; Michael Celetti - Plant Pathologist - Horticultural Crops/OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

Black rot is an important and troublesome disease in Ontario apple orchards. This disease can go unrecognized. The disease is caused by the fungus *Botryosphaeria obtusa* (Schwein), which overwinters on dead limbs, twigs, cankers (Fig 2), and mummified fruit. During the season, the fungus releases ascospores during rainstorms that are rain splashed, washed or blown onto fruit and foliage. Often the first symptoms of black rot appears as small purple lesions on leaves shortly after petal fall. The lesions eventually expand to form tan coloured spots surrounded by purple margins (Fig. 3). Severely infected leaves become discoloured and may drop prematurely.



Fig 1 - Black rot canker on limb, OMAFRA, 1999.



Fig. 2 - Frog eye leaf spot on leaves, OMAFRA, 1999.

Fruit can become infected early in the season, however, infection may occur at any time throughout the season. Black rot infections commonly appear on fruit that are in close proximity to infected fruit mummies or cankers. Initially small reddish dots appear on infected fruit that develop into purple slightly raised pimple-like spots (Fig. 4). These spots expand over the season, rotting the fruit and eventually forming alternating black and brown concentric rings (Fig. 5). Late season infections often appear as black irregularly shaped dots, surrounded by a red halo. These infections are likely initiated early in the season, however, they remain quiescent throughout the summer as their fungal growth is suppressed by natural inhibitors in the green fruit (Rosenberger, 2000). Unfortunately as the fruit ripens, these natural inhibitors decrease in concentration and the symptoms of the disease become more apparent. Black rot infections that are initiated in the orchard can increase storage decays after harvest, frustrating growers and packers alike. In fact, black rot has been reported to cause 25% to 50% fruit losses, in some areas in southeastern US (Jones and Aldwinckle, 1990).



Fig. 3 - Early symptoms of black rot on fruit, OMAFRA, 2004.



Fig. 4 - Late symptoms of black rot on fruit, note concentric circles, OMAFRA, 1999.

A recent study in the U.S. indicates that apple varieties differ in their susceptibility to black rot (Biggs and Miller, 2004). Among the twenty-three varieties evaluated for black rot susceptibility, these researchers found that “Pristine” and “Sunrise” were most susceptible to black rot; whereas “GingerGold”, “Senshu”, “Honeycrisp” and “Pioneer™Mac” appeared moderately susceptible, and “Golden Delicious”, “Enterprise”, “Golden Supreme”, and “Fuji” were the least susceptible. In Ontario, we commonly find black rot infections on “Idared”, “Northern Spy”, “Golden Delicious”, “Honeycrisp” and “Gala”.

Removal and burning of infected wood and mummified fruit will help to reduce the spread of the disease throughout orchards. Early season fungicide sprays of Captan (3.75 kg/ha), can also help to manage black rot. Fungicide sprays should begin as early as petal fall, and 2–3 applications should be applied 7–10 days apart. Strobilurin fungicides, such as Sovran and Flint, also have activity against black rot. The EBDC and sterol inhibitor fungicides do not have effective activity against black rot.

Biggs, A. and S.M. Miller. 2004. Relative susceptibility of selected apple cultivars to fruit rot caused by *Botryosphaeria obtusa*. Hortscience 39 (2): 303-306.

Jones, A.L. and H.S. Aldwinckle. 1990. Compendium of apple and pear diseases. APS Press, St. Paul, Minn.

Rosenberger, D. 2000. Disease developments. Scaffolds Fruit Journal Vol. 9, No. 12, June 5, 2000.

| [Top of Page](#) |

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Remove Fire Blight Cankers in the Winter

Author: Michael Celetti - Plant Pathologist (Horticulture Crops)/OMAFRA;
Neil Carter - Tender Fruit and Grape IPM Specialist/OMAFRA

Creation Date: 22 September 2004

Last Reviewed: 22 September 2004

Fire blight is one of the most serious diseases of apples and pears worldwide. Over wintering cankers are the primary sources of fire blight bacteria for subsequent infections. During the spring under warm, humid conditions, the pathogenic bacteria multiply on the edge of cankers formed the previous year and are disseminated by insects, wind, and rain splash to susceptible tissue.

Removing cankers as well as severely infected trees and blighted limbs is the first step to reduce over wintering bacteria. Late winter, when temperatures are still cold but not cold enough to cause winter injury, is the best time to remove over wintering cankers. The bacteria are still active in the fall, so pruning too early can spread fire blight, rather than remove the disease. What you can do in the fall is take a walk through the orchard and mark obvious fire blight strikes and cankers with spray paint - that will make your winter pruning job easier.

It is particularly critical to prune out cankers formed the previous year on the larger susceptible trees. These cankers generally have smooth margins and are the ones most likely to become active in the spring. When removing cankers, it is important to cut well into healthy tissue so that all of the infected tissue is removed. The bacteria in prunings cut in the winter will probably die, but it is still a better strategy to remove all fire blight prunings from the orchard and burn them. Disinfecting pruning tools between cuts is normally recommended when pruning for fire blight but is probably not as critical when doing winter pruning because the bacteria is not active at that time.

Pruning out cankers on the main trunk or large limbs may not always be practical or pruning may significantly alter the structure of the tree. Often these types of cankers develop where a blighted spur or smaller branch meets the main trunk or large limb. If the canker does not surround more than half of a large branch or trunk, it may be removed by scraping. In this situation, it is best to cut off the blighted branch or spur flush with the larger branch or main trunk. Using a pruning knife, scrape away all of the bark in the canker area as well as the surrounding healthy bark at least to 2 cm (approximately 1 inch) from the margin of the canker. The bark should be scraped or cut perpendicular to the branch to encourage rapid healing and callus formation. When done properly, the scraped area will appear as an oval with the points orientated longitudinally with the axis of the large branch or limb. Swab the wound with either a 70% denatured alcohol or 10% bleach solution and cover with tree paint or a commercial wound dressing.

If fire blight was encountered in the orchard last season, you may have used what is known as the "ugly stub" method for pruning it out. This method required the fire blight strikes to be cut out when symptoms first appear last season and before extensive necrosis developed. The cuts should have been made about 12 inches or more below the visible symptom, into 2-year old wood or older, leaving at least a 5 inch naked or "ugly" stub. If you notice a small canker on the ugly stub, don't worry, the tree usually confines the disease to the ugly stub. Winter is also the time to remove all ugly stubs from the orchard when temperatures are too cold for the bacteria to be active.

Good fire blight management is a multi-phase and year long program that begins with the removal of all infectious tissues regardless of how insignificant they may appear. There is no better time than winter to start implementing the first phase- removal of over wintering cankers. For more information on fire blight management, see OMAF factsheet "Fire blight of apple and pear in Ontario".

Related Links

- [Fire Blight of Apple and Pear in Ontario](#), OMAFRA Factsheet Order No. 02-011

| [Top of Page](#) |

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [Crops Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Obliquebanded Leafroller - A Persistent Pest of Apples

Author: Kathryn Carter - Pome fruit IPM specialist/OMAFRA; Margaret Appleby - IPM Systems Specialist/OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 Mach 2005

Most apple growers agree that obliquebanded leafroller (OBLR) has been one of the top five pests of apples over the past few years. So what is it about OBLR, that makes it such a challenge to manage in apple orchards? Unfortunately there is no easy answer to this question, but there are several different issues that likely effect OBLR management strategies.

Biology and monitoring

Unlike many other lepidopteran pests of apple (codling moth, oriental fruit moth), OBLR larvae emerge in the spring and begin feeding on the foliage of trees. Growers who are unaware of the biology of this pest may not be monitoring for the larvae, so early season damage may go unnoticed. Orchards with a history of OBLR damage should be monitored carefully in the spring, and insecticide sprays should be applied if populations are above threshold (12-15 larvae in 100 terminals inspected). The summer generation of OBLR can be very difficult to monitor due to the small size of the young larvae. This could lead some growers to believe that this pest is not a problem in their orchard, when there may be many tiny larvae present. In order to prevent unexpected OBLR outbreaks, the crop should be monitored closely for 1 to 2 weeks once 240 degree days Celsius (DDC) has been reached.

Timing of insecticide application

There is a relatively narrow window for targeting OBLR using insecticides, so the timing of insecticide applications is critical in managing this pest. Although insecticides against the overwintering generation of OBLR can be applied as early as pink, growers will get the most "bang for their buck" by waiting until petal fall. Often the emergence of overwintering larvae in the spring occurs over an extended period of time, so delaying sprays until petal fall will likely increase the number of insects that have emerged and are at the stage of development where they are susceptible to insecticides. For the summer generation initiating sprays at 240 DDC (when larvae are present in the orchard), optimizes the efficacy of the pesticide and may reduce the need for repeat applications.

Product choice

Proper choice of products is essential in managing OBLR effectively. In most commercial apple orchards, OBLR populations are resistant to organophosphates (Imidan®, Guthion®). More recently, researchers have shown that insect

growth regulators such as Confirm®, and Intrepid® may not be as effective against organophosphate (OP) resistant OBLR populations. (Brunner, 2005). Growers have several options for managing OBLR, however, regardless of the product used, growers should always keep several important points in mind:

1. Good coverage is essential for good control, so keep sprayers calibrated and prune to keep the canopy open.
2. Understand the strengths and weakness of the products you are using. Many of the newer chemistries need to be consumed by insects, and although the insects may have ceased feeding they may not appear to be dead for up to 1 week.
3. Researchers have shown that the use of some products (Confirm, Intrepid) early in the season can cause sterility in insects from subsequent generations. The use of *Bt* early in the season has been shown to delay the development of OBLR, potentially affecting degree day models (Knight and Cockfield, 1997).
4. Use resistance management strategies, such as using the same chemical within a generation and rotating chemistries between generations. It wasn't long ago that apple growers had no products that were effective in managing OBLR, so let's be careful not to misuse the tools that we have now.
5. In Ontario, Dr. Pree (AAFC) has shown that resistance to OP in OBLR populations is unstable and that the use of reduced risk programs can result in reversion to susceptibility to OP insecticides.

Brunner, J., M. Doerr, J. Dunley. 2005. Insecticide resistance in obliquebanded leafroller, 1997-2004. Proc. 79st Annual Western Orchard Pest and Disease Management Conference. Jan 5-7, Hilton Hotel, Portland, OR. Published by Washington State Univ., Pullman, Washington, pp 12.

Knight, A., S. Cockfield. 1997. *Bt*s change the leafroller time clock in apple. Proc. 71st Annual Western Orchard Pest and Disease Management Conference. Jan 8-10, Imperial Hotel, Portland, OR. Published by Washington State Univ., Pullman, Washington, pp 93-94.

| [Top of Page](#) |

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

HOME**WHAT'S NEW****CALENDAR****PRODUCTS****NEWS RELEASES**

Antioxidants in Apples

Author: Jennifer DeEll - Fresh Market Quality Program Lead/OMAFRA
Creation Date: 15 March 2005
Last Reviewed: 15 March 2005

Apples are a significant dietary source of antioxidants and have been associated with a reduced risk of chronic disease. Most of this protective quality in fruits and vegetables has been attributed to phytochemicals, which protect against oxidation. Oxidative damage plays a role in cancer and heart disease, and as oxidative damage accumulates it plays a role in the overall aging process. Flavonoids are a major class of phytochemicals found commonly in fresh fruits and vegetables.

Boyer and Liu (2003/04) found **apple to have the second highest level of antioxidant activity**, compared to other commonly consumed fruits. Cranberry had the highest level of antioxidant activity, while apple was followed by red grape, strawberry, peach, lemon, pear, banana, orange, grapefruit, and pineapple in decreasing order.

A **wide range in antioxidant content among different apple cultivars** has also been found (Boyer and Liu, 2003/04). Fuji had the highest level of flavonoids, followed by Delicious, Northern Spy, Fortune, Gala, Liberty, Rome Beauty, Golden Delicious, Jonagold, Idared, Cortland, and Empire in decreasing order. Fuji also had the highest level of phenolics, followed by Delicious, Gala, Liberty, Northern Spy, Golden Delicious, Rome Beauty, Fortune, Jonagold, Idared, Cortland, and Empire in decreasing order. Similarly, MacLean, Murr, and DeEll (2003) showed that the antioxidant capacity of Empire was half that of Delicious apples.

Lee, Rupasinghe, and Jackson (2004) investigated the major phenolic profiles of eight Ontario-grown apple cultivars and found that the total antioxidant capacity, total phenols content, and flavonoids levels were the highest in Honeycrisp and Delicious, moderate in Idared, Spartan, Granny Smith, and Cortland, and the lowest in Crispin and Empire. Furthermore, **apple peel contained 2 to 10-fold higher levels** than the core and flesh tissue.

In general, the **phytochemical content of fresh apples is not significantly affected by storage** (Boyer and Liu, 2003/04). However, **1-MCP treatment improves the retention of antioxidant levels during storage** (MacLean, Murr, and DeEll, 2003). On the other hand, **processing can reduce the phytochemical content**. Apple juice obtained from Jonagold apples had only 3-10% of the antioxidant activity of fresh apples.

References

Boyer, J., and R.H. Liu. 2003/04. Antioxidants of apples. New York Fruit Quarterly 11(4):11-15.

Lee, V.W., H.P. Rupasinghe, and C-J. Jackson. 2004. Bioflavonoids of Apples: Effects of Genetic Variability, Fruit Parts and Processing. HortScience 39:829.

MacLean, D.D., D.P. Murr, and J.R. DeEll. 2003. A modified total oxyradical scavenging capacity assay for antioxidants

in plant tissues. Postharvest Biol. Technol. 29:183-194

| [Top of Page](#) |

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)

Last Updated: undefined NaN, NaN



HOME

WHAT'S NEW

CALENDAR

PRODUCTS

NEWS RELEASES

Effect of DPA on *Penicillium expansum* Growth and on Postharvest Control of Blue Mold with Fludioxonil in 'McIntosh' Apples

Author: Dr. Deena Errampalli - Research Scientist/AAFC; Dr. Jennifer DeEll - Fresh Market Quality Program Lead/OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

Penicillium expansum is one of most the important pathogens that cause blue mold in stored apples. Due to the development of resistance to the postharvest fungicide, thiabendazole, an increase of blue mold has been observed in apple storages. The sensitivity of three thiabendazole-sensitive and three thiabendazole-resistant isolates of *P. expansum* to diphenylamine (DPA), an antioxidant scald inhibitor, was tested in vitro. All six isolates were found to be resistant to DPA. To manage the fungicide resistance, a reduced-risk fungicide, fludioxonil, was tested against blue mold caused by thiabendazole-sensitive and -resistant *P. expnasum* on 'McIntosh' apples treated with or without 1000 ppm of DPA. Fruit were assessed for disease and scald incidence during storage. Fludioxonil was effective against blue mold caused by thiabendazole-sensitive and -resistant isolates of *P. expansum*. DPA controlled superficial scald in treated fruit. Higher disease incidence of blue mold was observed in apples treated with DPA and low concentrations of fludioxonil (3, 5, and 75 •g ml⁻¹). DPA neither positively nor negatively affected the control of blue mold when DPA was applied together with 600 •g ml⁻¹ of fludioxonil.

| [Top of Page](#) |

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate. Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Biocontrol Efficacy of Yeast on Blue Mold in 'McIntosh' Apples

Author: Dr. Deena Errampalli - Research Scientist/AAFC; Dr. Wojciech Janisiewicz - Research Scientist/USDA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

A yeast antagonist, *Metschnikowia pulcherrima*, was tested for efficacy against blue mold caused by *Penicillium expansum* on 'McIntosh' apples in 2003-04. The trial was conducted on commercially ripe apples. Apples were disinfested in 10% household bleach (5% sodium hypochlorite) and 0.01% Tween 20 (Fisher Scientific) for 4 min and rinsed in reverse osmosis water for 4 min. After disinfestation, apples were placed on plastic packing inserts contained in plastic boxes. The apples were punctured and inoculated within 45 min of wounding with a 20 micro litre (1,000 micro litres = 1 ml) drop consisting of one of the three concentrations of *M. pulcherrima* with *Penicillium expansum* isolate PS-1R. Treated apples were incubated at 4°C for 3 months. Apples in each of the experiments were evaluated for decay after the respective incubation periods. To determine the efficacy of the biocontrol agent on fruit shelf-life, after the first fruit decay evaluations following incubation at 4°C, the fruit were moved to 20°C, 85% RH and incubated for 6 days. The fruit were again evaluated for blue mold incidence. The data obtained were analyzed with SigmaStat statistical package. The results indicate that initial low decay incidence increased with time. After 28 days of incubation, 28% blue mold infection was observed in the inoculum only treatment, while the treatments with combination of *M. pulcherrima* and the pathogen ranged between 0 to 8%. Better control was achieved with the lower concentrations of the pathogen inoculum. The combinations of *M. pulcherrima* at 1.6×10^7 CFU/ml and 1×10^4 conidia/ml of *P. expansum* resulted in no decay and only 2.8% decay after 28 and 58 days of storage, respectively. Control declined to 39% after storing for 86 days. A second year study is in progress.

[| Top of Page |](#)

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)

Last Updated: undefined NaN, NaN

[HOME](#)[WHAT'S NEW](#)[CALENDAR](#)[PRODUCTS](#)[NEWS RELEASES](#)

Why is Produce Now More Likely to Have Unsavoury Critters On-Board?

Author: Sandra Jones - On-Farm Food Safety Program Lead/OMAFRA

Creation Date: 15 March 2005

Last Reviewed: 15 March 2005

Recently, it has been reported that fresh produce is responsible for an estimated 12 percent of foodborne illness outbreaks annually in the United States. That number has increased significantly over the last decade. U.S. federal recalls of fruit and vegetable products due to bacterial agents (e.g. *Salmonella*) have increased by 33 percent between 2001 to 2003.

What is going on? We have known for a long time that there is a possibility of people becoming sick from eating uncooked food. We've also realized that the health of people who handled food was important, too. Typhoid Mary, for example, caused several typhoid outbreaks because she worked as a cook and had poor hygiene practices.

So if we know it can happen, why are we seeing this increase? There are several reasons why we are seeing more fresh fruit and vegetables outbreaks – and it is not necessarily due to deteriorating production practices that is causing more bacteria on the produce. Some of the reasons are listed below and are in no particular order.

For starters, consumers are eating more fresh fruit and vegetables as they are becoming better educated on the health benefits. As the percentage of fruit and vegetables in the consumer's diet increases – even if contamination were the same as 20 years ago – you would expect to see more outbreaks. Moreover, food systems are changing and distribution is widening. Consumers are able to enjoy a wider selection of fruit and vegetables from all over the world, year round. If a product is contaminated, the scope of an outbreak intensifies due to the products' wider distribution.

Additionally, science is getting better at diagnosing and reporting outbreaks. Widespread use of computer linked databases such as FoodNet, and PulseNet has resulted in more efficient surveillance systems. As well, more sensitive and faster diagnostic times give health officials better opportunities to trace illness back to the source.

Shifting health and age demographics in today's population also plays a role. Everyone is potentially at risk; however, the elderly, the young (under five), pregnant women and chronically ill people have always been more susceptible to food borne pathogens. Statistics Canada reported that the fastest growing segment of our population is aged 80 and over. People dealing with a weakened immune system including those undergoing cancer treatment, organ transplants, Crohn's Disease, Lupus, rheumatoid arthritis and peptic ulcer disease to name a few are more susceptible. Some estimates have up to 20 percent of the population in North America considered immune compromised.

As fresh fruit and vegetables are often eaten raw, the lack of a kill step (e.g. cooking) for fresh produce makes attention to food safety important. Furthermore, fresh produce is typically thought of as generic – and not a branded product – which makes the impact of a food borne illness even more devastating to the industry. It is like the "one bad apple" scenario. An outbreak that was sourced back to one producer can affect the entire industry. Adhering to good

agricultural practices can significantly reduce the risk of contamination. Keeping the documentation shows your customer that you consider food safety a top priority in your operation.

| [Top of Page](#) |

For more information:

Toll Free: 1-877-424-1300

Local: (519) 826-4047

Email: ag.info.omafra@ontario.ca

| [OMAFRA Home Page](#) |

| [Central Site](#) | [Feedback](#) | [Search](#) | [Site Map](#) | [Français](#) |
| [Home](#) | [What's New](#) | [Calendar](#) | [Products](#) | [News Releases](#) |



This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

© Copyright 2007 [Queen's Printer for Ontario](#)
Last Updated: undefined NaN, NaN