ORCHARD NETWORK

For Commercial Apple Producers

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ORCHARD MANAGEMENT

Heading into Summer

John Gardner, Apple Specialist, OMAF, London

What a spring we had with a memorable battle against scab. I don't recall seeing as many infections as we had the last few weeks in any of the last 10 years of growing apples here in Ontario. I do recall one year when many got away with the most minimal of fungicide expenses based on only one or two actual infection periods during the primary season. It really does remind me of just how difficult things can get even with the best of plans. For many, keeping the scab off the fruit will be the challenge for the summer.

Winter injured trees started to show up in the Province during the later stages of spring. Many growers have made plans for renovation of various blocks of trees. Some of the varieties

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This issue of the Orchard Network Newsletter was compiled by Client Service Representatives, Marian Desjardine, OMAF, London and Leslie Musikov, OMAF, Simcoe.

hit were the same ones that had a rough time coming out of the winter of 1993-94 when Crispin (Mutsu) and Spy looked very weak in some blocks and eventually some trees died in many orchards.

The mechanism of hardening off and going into dormancy is not a predictable type of event even for winter hardy species like apple. Although our minimum winter temperatures last winter were not all that impressive when considering apple hardiness, the lack of soil moisture during the summer coupled with the apparent regrowth (absence of leaf abscission) in the fall after some pretty good rains was enough to seal the fate of some trees. Trees that are weak from winter injury should not be cropped, as they would be under normal conditions.

Cell division in apples more or less stops around the two-month period following petal fall when cell expansion takes over. Fruit buds are initiated in early summer and cell differentiation in these buds continues right up and into the fall. Summer is characterized by the swing from nutrient based feeding to feeding of trees with carbohydrates and water. The elements of carbon, hydrogen and oxygen more or less take over the primary role of finishing the crop. Although the role and importance of other nutrients is some what diminished, they still play a critical role in fruit finish and quality.

Look for our OMAF factsheet on Bitterpit Control in Apples. The problem with bitterpit can be exacerbated by excessive use of nitrogen resulting in too large an apple and the dilution of calcium within the fruit. Calcium is unique because of its general immobility in the tree as compared to other essential nutrients. Calcium picked up in the soil can sometimes take 2 years to reach an apple.

Physiologists explain that calcium is critical for the lignification process in the tree. So it gets used up for wood, roots, leaves and fruit. Sometimes the fruit gets what's left over and it isn't enough. Bitterpit can show up on the tree or after the crop is harvested and in storage.

Potassium, if it's in excess, can also make the problem worse as does a general lack of boron as a trace element. Light crops from excessive thinning or poor seed count can also make this problem worse. Now is a good time to cut fruit and assess viable seed numbers. Evidence exists that relates seed count to a fruit's ability to draw nutrients like calcium. With variable pollination results this year on some cultivars, growth and development of the fruit may be inhibited in spite of good soil moisture regimes and adequate feeding of trees.

When using calcium sprays, aggressive treatment regimes will result in advanced maturity on cultivars like Spy and McIntosh. This results from an apparent stimulation in canopy ethylene. We don't have a lot of experience yet in Ontario with treatment regimes for bitterpit in Honeycrisp, although calcium sprays do help in other areas where this cultivar has been grown for a number of years. Bitterpit problems in Honeycrisp should diminish as the trees mature.

Field trials done a few years ago demonstrated that several evenly spaced treatments (2-week intervals) at high rates starting in mid-July with various calcium formulations on McIntosh resulted in maturity advancements of a week to 10 days ahead of controls. The colour was there on the treated fruit but overall the apples were ready to abscise or drop well in advance of the check trees. Treated fruit exhibited starch tests of 4 and 5 while controls were still at a number 2. The other factor is loss of the extra fruit size from premature ripening and abscission. Caution should be exercised when using foliar applications of calcium for bitterpit control.

Water Conservation in Apple Orchards

John Gardner, Apple Specialist, OMAF, London

After a month of pretty steady rains from mid - May to Mid - June this spring you would think we were pretty well set up for moisture in the orchard. I used to be surprised at how quickly reserves can disappear, but not any more. Even our deepest and heaviest soils can hold only so much moisture. From field capacity, two to three weeks seems to be about the limit once we move into the heat of the summer. An acre of mature orchard can loose the better part of a centimeter of moisture per day in July and early August during peak demand. That equates to 3000 to 4000 gallon imperial through the tree and by way of soil evaporation.

An acre-inch of water is about 23,000 imperial gallons or just a little more than 100, 000 Litres. An inch of rain over 100 acres of orchard is equivalent to more than 2.2 million gallons imperial. There's no question that it's easier to watch an inch of rain come down than it is to pump the equivalent of 1 inch of water over 100 acres.

Not everyone has the option of watering. The basic tools for water management in the orchard in the absence of irrigation or with limited options include the ability to mow or control competing vegetation, crop load management, rootstock choice, summer pruning and mulches. Selective watering is also considered to be a tool by my thinking.

Mowing is one cultural practice which can help conserve moisture. A sod that is well mowed demands less water than a vigorous and actively growing sod because of a shorter root system. This same principle holds true for weeds growing in the tree row. If they are left to thrive they will remove as much water or more water than the trees themselves.

Thinning and back-up hand thinning can make the difference between success and failure for many cultivars. Varieties like Jonagold, Fuji and Goldens will not finish well if there are too many fruit on the tree. The demand for water and carbon throws off the balance. Other cultivars like Honeycrisp and Enterprise do fairly well with larger fruit to leaf ratios and appear to have relatively high yield efficiencies compared to lets say Goldens. Varieties such as McIntosh and Empire are somewhere in between.

It is generally conceded that certain rootstocks do better under dryer conditions than others do. This may also relate to the ability of certain rootstocks to tolerate various soil temperatures better than others. For example, the M9 is generally less tolerant of hot soils than MM106. The M26 is somewhere in between.

Summer pruning is a practice that will reduce whole canopy transpiration in addition to helping fruit gain their share of calcium picked up by the tree. This practice can be costly on an annual basis and some producers may opt for a more thorough dormant pruning regime and skip summer pruning.

Mulches can make the difference between a decent looking crop and one that does not make the grade for finish and volume. It can be costly to move large volumes of various organic materials like straw or spoiled hay into the orchard but the results can be comparable to

supplying minimal amounts of irrigation water. The added advantage of mulching is in soil temperature regulation, which could be critical for some rootstocks.

Mulches can help level out those wild swings in soil moisture, which can contribute to bitterpit problems in cultivars like Honeycrisp or any other cultivar that is especially susceptible.

The concept of partial root zone drying is one that we have not looked at here in Ontario. In the Western U.S. and Australia, researchers claim that this technique provides benefits similar to what we would call a full irrigation program. They are using half the water resources and getting good results on trees and vines. The tree or vine is tricked into believing it's water stressed when it really isn't. As a result there's less stomatal conductance and shoot growth. Irrigation is switched from one side of the tree to the other and back. This maintains the stress signal from the roots.

The other management tool that can help conserve water is the use of selective watering. If the resource is limited then it makes sense to use it where it's going to be most beneficial - premium paying cultivars or young trees of a hot new variety and varieties that need extra size or great finish depending on market.

Newer technologies like sub-surface drip irrigation can help with water conservation. Since the lines are buried, the soil evapouration factor is largely eliminated. Water leaves the orchard ecosystem by way of transpiration only after being picked up by the tree roots or at least that's the theory. The disadvantage of subsurface systems is that you cannot readily see what's going on underground. These systems should not be installed where excessive compaction of soils is likely to occur. Growers using this type of system have to rely heavily on flow meters and pressure gauges to make sure the system is functioning according to design.

Update on the Nutrient Management Act

Jacinta Dano, Nutrient Management Planning Horticulture Crops

On July 1st, the Nutrient Management Regulations became law. The regulations will take effect on September 30, 2003. The Nutrient Management Act sets out a consistent set of rules for farmers to manage nutrients in a way that protects water resources while allowing for the continued growth of the agricultural industry.

The implementation date of **September 30th, 2003** applies:

- if you apply for a building permit for a barn **on or after** September 30th, 2003**,** and
- your operation will generate manure, **and**
- your operation will generate greater than 5 nutrient units, **and**
- the barn is on a separately deeded property on land which the person who owns or controls the site has not previously carried out an agricultural operation that generated manure.

OR

- you are **expanding an existing** operation and will generate 300 or more nutrient units.

The implementation date of **July 1, 2005** applies to your operation if:

- you have an **existing** operation and generate 300 or more nutrient units.

A nutrient unit is a measure of the nitrogen and phosphorous in various types of manure.

Farms which do not fit the definition of "new" and which are smaller than 300 NU will not be subject to the Nutrient Management Act regulations until 2008 at the earliest. The exact phase in date will be decided by the newly appointed Advisory Committee.

Further information is available by calling the toll-free Nutrient Management Information line at: **1-866-242-4460** or by email: nman@omaf.gov.on.ca

The OMAF website is also an excellent source of information related to nutrient management planning at: www.gov.on.ca/OMAF

Surround® WP Crop Protectant OK'd for Sunburn on Apples and Pears

John Gardner, Apple Specialist, OMAF, London

Engelhard Corporation and Engage Agro of Canada have announced the availability of Surround WP Crop Protectant for sunburn control on apple and pear for the 2003-growing season.

By now, most growers will have seen photos or actual tree rows sprayed with Surround Crop Protectant. It's a microfine kaolin clay particle film that provides the barrier to that intense UV and infrared that we experienced during July and August in the Great Lakes region. Handling and spraying of this product is surprisingly easy inspite of large product volumes in the spray tank. Surround goes into suspension rapidly and stays in suspension with a minimum amount of agitation. Nozzle wear is not an issue, as the clay itself is more or less non-abrasive to nozzle parts.

After using this product for a couple of years, I would have to conclude that its full potential as a tool in apple production in the Northeast is only just beginning to be fully explored and documented. In experiments on Mutsu apple over the last two years Surround has demonstrated a significant capability to help with fruit finish and largely control any problems with sunburn or shoulder russet in heat stressed blocks. Positive results have also been observed with insect control, as reported in previous issues of ONNL.

Surround also appears to inhibit the expression of the Blister Spot infection bacterium on Mutsu apples. Although it did not prevent infection in the trials that we have had, it appears to keep the disease at a manageable level and to inhibit the disease from fully expressing itself. We didn't see anywhere near the amount of severe infection when compared to the standard treatment for blister spot.

This leads me to think that it may play a large role in the future on cultivars that are especially sensitive to environmental or physiological disorders affecting the look of the skin at harvest. With meteorologists worldwide calling for more weather extremes and heat with higher UV indices, this product may be very useful in achieving higher recoverable yields in a very narrow or marginally profitable business. They have found this in Western US, with many users reporting higher crop recovery rates where Surround was used. In Ontario, we think of temperatures in the 30s as being relatively brutal.

I have just read a meteorological report describing the South of France as having had record high temperatures for the month of June/03, exceeding 40°C for the most part. This is 5-7°C higher than the long-term average. Parts of India are reporting temperatures in the 45-49°C range in the premonsoon time of year. These temperatures are 2-5°C warmer than the norm. Both these countries are of course in the Northern Hemisphere.

One of the effects of Surround® WP that we felt we observed last year, which has not been well documented to date, is the apparent effect on foliage health and presumably the overall performance of larger better looking leaves during the late summer. In our Mutsu experiment from 2003 we found a lot of leaves that were unbelievably large in the treated bock as compared to the untreated trees. These leaves were up to 18 cm in length excluding the stem of the leaf.

Apples that are maturing in the tree canopy during daylight hours in the summer have a hot side and a cool side. This is a result of exposure to direct sunlight. Temperatures can easily reach into the mid 40s on the sunny side of the apple at high noon. The opposite side of the apple will be 10-15°C cooler. How the fruit adapts to this huge difference in temperature is the key to fruit finish in many cases.

The shoulder russet of fruit skin that is sometimes too prevalent is characterized at a microscopic level by a badly ruptured cuticle and epidermis resulting from excessive heat and UV stress. This phenomenon is highly dependent on cultivar and water status of the tree. If the tree cannot get enough cooling effect from transpiration water then the russet stage will be quickly bypassed and sunburn will result. Sunburn can also result from exposing apples of certain cultivars to sunlight through the practice of summer pruning if high UV conditions persist.

No negative effects were observed when using Surround® WP on total or net photosynthesis by the trees that were studied. No differences were observed between Surround treated Crispin or Mutsu fruit versus controls coming out of 6 months of CA storage.

Managing Summer Populations of OBLR

Margaret Appleby, IPM Systems Specialist, OMAF, Brighton

Where Oblique banded leafroller (OBLR) damage has been a problem in apple orchards, pheromone traps have been set out to monitor the flight of the moths for the summer generation. The first sustained moth catch for OBLR is the biofix and marks the start for calculating degree-days for OBLR development through this generation. OBLR have a lower developmental threshold of 6.1°C and an upper threshold of 29.4 °C. In general moths emerge from mid June to mid July. Egg masses are laid on leaves after mating. The incubation period of the eggs is 10 to 12 days. A female is capable of laying up to 900 eggs in her 7 to 8 days oviposition period.

With weather data and the degree-day model, calculations can be made to determine when is the best time to apply insecticide treatments. For populations of OBLR that are resistant to organophosphate insecticides and other chemistries, Success and B.t products will provide control. While these products are effective, they work as stomach poisons and so, it is important to apply these products when the larvae are feeding. Over the course of the last few years, we have found that is important not to go in too soon with Bt products or Success. The best control is to wait until at least 220 to 260 degree-days and a second application 7 to 10 days may be needed if larval populations are high. For resistance management reasons, always use one chemistry to treat each generation. That is if your first spray for the summer generation is Success, then the second one 7 to 10 days later should be Success as well.

Finally, if using B.t. products the spray solution should be at pH of 7 or less. If using Success the spray solution should be at a pH of 6 or more.

Disease Update for 2003: Apple Scab and Fire Blight

Margaret Appleby, IPM Systems Specialist, OMAF, Brighton

The spring of 2003 has been tough for controlling diseases in apples. With the continuous rain throughout the primary scab season, it has been almost impossible to have an orchard free of scab. With the high number of infections, many of short cuts such as alternative row spraying, cut rates and extended spray intervals that growers have been getting away with in other years did not pan out. Now the challenge will be to keep scab off the fruit. A full fungicide program will be needed for the rest of the growing season. Dr Rosenberger from Cornell University writes in Tree Fruit News of Central New York that “2 applications of captan at the maximum label rate 10 to 14 days apart (shorter if rainfall >1.5 inches) is very effective for protecting fruit especially when combined with high temperatures of 80 to 85 °F. However if cool weather persists into July, then continued applications (more than two sprays) using the high rates of captan may be essential. If weather becomes more normal (hotter and drier) the risk of fruit infection will subside until September when scab might become active again.” Don’t forget that although fruit scab may be under control, the scab on the leaves is the source of inoculum for next year, so plan to be very conservative in your approach to managing scab in 2004.

Although cool temperatures predominated at bloom, there is a surprising amount of fire blight in orchards. The extended bloom period with the rattail blooms on susceptible varieties such as Gala and Gingergold provided excellent sites for late fire blight infections. Streptomycin was used throughout the bloom period up to 14 days after petal fall but may not have been applied for these late infections. With the new restrictions on Streptomycin, which does not allow its use throughout the growing season for trauma blight, we have no chemical tools to control this bacterial disease in the event of hail or high winds.

Where fire blight is present, summer management is very important. Management requires the avoidance of any practice that stimulates growth. Ideally, the faster the terminal

bud sets and the tree shuts down the better. Hot, dry weather would be ideal for this situation. Trickle irrigation should not be used in infected blocks after terminal bud set and allowing the weeds to grow and compete for water and nutrients will help in slowing the growth of these trees. Any orchard work that causes wounds to the tree such as summer pruning, bud pinching and hand thinning should be avoided especially in wet weather. Whether to cut diseased limbs out during the growing season is up for debate. If done, cut back 8 to 12 inches below that the last visible symptom into two-year-old wood. Remove prunings from the orchard. Disinfecting pruning tools is also a debatable point, the late Dr. Paul Steiner felt that disinfecting pruning tools was a waste of time because minute cankers often form on the ends even when pruners were disinfected. His recommendation was to cut all cuts into two year old wood where bacteria is less able to multiply and to use the "ugly stub" technique. Other research has found that pruning tools will transmit fire blight where pruning is done under wet conditions. To minimize the spread of disease by plant sucking insects, especially potato leafhopper, monitor these blocks on a weekly basis and use appropriate control measure where warranted.

Managing Apple Maggot

Kathryn Carter, Pome Fruit IPM Specialist, OMAF, Simcoe

As the summer quickly speeds by us, it is already time for monitoring for apple maggot in orchards in Ontario. Apple maggot adults begin emerging from pupae in the soil from June through until September, with peak flight occurring in August. Generally the male flies emerge earlier than the females. All newly emerged flies are sexually immature and must spend time feeding on honeydew excreted by other insects to acquire the protein needed to mature. Female flies lay their eggs individually, under the skin of the developing fruit. The larvae hatch within 3 to 7 days and begin burrowing into the fruit. After maturing, the larvae will leave the fruit and tunnel into the soil to pupate. These pupae can remain in the soil for up to 5 years if environmental conditions are not favourable for emergence. There is only one generation of apple maggot in Ontario each year.

Apple maggot larvae cause extensive damage to apples. The adult female lays her eggs in the fruit with her ovipositor, creating small stings or pin prick discolourations on the fruit which appear sunken or dimpled. The eggs hatch and the larvae begin tunneling within the fruit. These tunnels eventually begin to discolour, and are subsequently invaded by disease fungi such as *Alternaria* spp. and *Pseudomonas* spp. Heavily damaged apples are often aborted, however apples with only one or two stings will often remain on the tree until harvested.

Figure 1: Apple maggot stings on fruit

Figure 2: Larvae tunneling within fruit causes discolouration

Monitoring apple maggot populations is critical for timing spray applications to ensure effective control of this pest. In Ontario, we use five yellow sticky traps with lures (Figure 3) per site to monitor apple maggot. These traps should be placed in trees along the edge of the orchard. Place the boards on trees that are closest to an abandoned orchard or a stand of woods. If no abandoned trees or woodlands are nearby, use the southern edge of the block. Lures should be attached to the bottom of each of the sticky boards using a paperclip. Place the traps at least 30 feet from each other on the outside edge of the canopy at eye level. Make sure the traps are surrounded by leaves and fruit, but do not come in contact with them. Traps should be checked twice a week for apple maggot flies, which can be distinguished from other flies in the same species by the F banding on its wings (see pg. 134 of OMAF publication #310, *IPM for Ontario Apple Orchards*).

Figure 3: Monitoring boards for apple maggots

Apple maggot is considered to be a quarantine pest and as a result there is zero tolerance for fruit infestation from this pest in Ontario. Insecticide sprays should be applied 7 to 10 days after the first female apple maggot fly is caught on a yellow board. Female apple maggots (Figure 4) can be distinguished from males since they are slightly larger and have a tapered abdomen, while males possess a rounded abdomen (Figure 5). Subsequent sprays should be applied every 14-21 days or as continued trap catches warrant. In orchards where trap catches are continuous and high, spray intervals should be shortened to 14 days. The timing of apple maggot sprays usually coincides with codling moth control applications, and as a result a single insecticide spray can often be used to manage both of these pests. It is important to remember that while some of the newer chemistries (Confirm, Assail) provide effective management of codling moth, they do not provide subsequent control of apple maggot. Currently organophophates are considered to be the most effective products registered for managing apple maggot. Research conducted by OMAF in Ontario (Hannah Fraser, 2002) has shown that Surround® WP Crop Protectant (kaolin clay) is an effective tool for managing apple maggot (along with many other orchard pests). Currently this product is only registered for sunburn control for apples in Canada, however, we are optimistic that this product will receive registration for managing apple maggot in the near future.

Figure 4: Female apple maggot fly - note tapered abdomen

Figure 5: Male apple maggot fly - note rounded abdomen

Frequently Asked Questions About OFM in Apples

Kathryn Carter, Pome Fruit IPM Specialist, OMAF, Simcoe and
Neil Carter, Tender Fruit and Grape IPM Specialist, OMAF, Vineland

As most Ontario apple growers by now are aware, oriental fruit moth (OFM) is a major pest of apples in North America. This pest has come to the forefront in the past few years, but there is still a lot of confusion as to what the damage from this pest looks like, whether sprays should be applied to control it, and how sprays should be timed if needed. We will try to answer some of these questions, however, it is important to keep in mind that researchers and crop specialists are still learning about this insect and its biology in apples, so there are still a number of questions that remain unanswered for now.

How do I know if I have OFM damage in my orchard?

OFM damage is not as obvious to see in apple orchards as it is in peach orchards. However, once you know what the damage looks like, it is easy to monitor an orchard for damage. Growers who had high levels of internal lepidoptera damage (Figures 1 and 2) last year should have a qualified crop consultant monitor their orchard for OFM (using pheromone traps and by conducting damage assessments).

Figure 1: Internal Lepidoptera damage on fruit

Figure 2: OFM tunneling damage in apple

The 1st and 2nd generation OFM will tunnel into terminals (Figure 3), eventually causing the terminals to wilt. First generation larvae generally attack the terminals, however, in some cases they will also attack the fruit - as we have already seen this year.

Figure 3: OFM damage in apple terminal

Should I spray for OFM in my orchard?
Currently there is no economic threshold for OFM in apples in Ontario. Pheromone trap catches do not give an accurate indication of the amount of damage that will be incurred in the orchard. Pheromone trap catches should only be used to monitor the presence of the insect and to determine the timing of sprays. They should not be used to determine if control measures need to be applied.

If low numbers of OFM are being trapped in your orchard, and there is no prior history of OFM damage (or internal lepidoptera damage)

then there is no need to start a management program for OFM. However, if you had internal lepidoptera damage last year, and OFM moths are active in your orchard, you should discuss OFM management options with your crop consultant. Timing of sprays to control OFM is critical in managing this pest. The larvae move into the fruit within 2 hours of hatching, at which point in time they are well protected from any insecticide application.

Are there any models available for predicting the development of OFM?

While models predicting the development of OFM and timing of spray applications have been developed and are being tested in Michigan and Pennsylvania, these models have not been validated in Ontario. As a result, they may not provide accurate timing of sprays. As with other insect models, it is important to remember that models should always be used in conjunction with field data (pheromone trap counts) to time spray applications. Models have been shown to be less accurate in seasons like this year, where we had such a long, cool, wet spring. Using the model alone to time insecticide sprays may result in inaccurate timing and potential crop loss. However, models can be very useful for verifying field observations and validating the timing of insecticide sprays.

If insecticide sprays are necessary, what products are available and when should I time my sprays?

Always discuss with a certified crop consultant whether insecticide sprays are necessary to manage OFM in your orchard, and, if so, which products might work best for you. In orchards where management programs for OFM are necessary, OMAF recommends applying an insecticide at 6 days following the upswing of OFM populations (based on pheromone trap counts), or 3 days following peak flight. In apple orchards where OFM sprays are necessary, OMAF recommends the use of Assail (acetamiprid) to manage 2nd and 3rd generation OFM. (Assail is not currently registered on peaches). The number of applications of insecticide for the 2nd and 3rd generation will depend upon the emergence of adults. If there is a prolonged emergence, a second application of product (10-14 days later) may be required to manage this pest. However, if OFM emerges within a short period of time, one insecticide application may provide adequate control. As a resistance management strategy, always use the same chemistry if multiple spray applications are required to manage the same generation. Assail should be used no more than four times per season. Never use the same insecticide to target more than two different generations of OFM each year. The recommended rates for managing OFM in apples are as follows:2 Assail 240 g product/ha, Decis 250 mL product/ha.

What do I need to keep in mind when using mating disruption to manage OFM?

If you are using mating disruption to manage OFM, your pheromones should already be out in the orchard. If you haven't placed mating disruption pheromones out in your orchard as of yet, I would not recommend using mating disruption for OFM this season. We have already started catching moths from the second generation, so some mated moths are likely already present in your orchard. Mating disruption is not effective if pheromone 'twist ties' are used after flight has occurred. Growers using Isomate M100 should keep in mind that this product only lasts for 75 to 85 days. Growers who applied the product in late May will need to make a second application of twist ties around the last week in July. For more information on using mating disruption to manage OFM refer to the following internet address:
http://www.gov.on.ca/OMAFRA/english/crops/hort/tender_fruit/info_matingdis.htm

How do I monitor in my orchard for OFM damage?

Pheromone traps should be placed in each orchard to monitor OFM populations. Traps should be checked by a crop consultant twice per week on the same days each week. Pheromone lures should be replaced after each OFM generation or every 6 weeks. No moths should be caught in orchards using mating disruption. A few male OFM in traps on the edge of orchards is not unusual but more than 5 moths caught in any mating disruption

area trap is cause for concern. Other moths besides OFM will occasionally be caught in pheromone traps, so you must be able to identify OFM accurately – another good reason for hiring experienced, knowledgeable crop consultants to monitor your orchards.

Damage assessments should be conducted approximately 7 to 10 days after peak flight catch (based on regional trap data). Monitor a minimum of 50 fruit and 50 terminals from 20 trees for OFM damage (paying special attention to varieties such as Gala, Jonagold, and Mutsu).

OFM Projects in 2003

Kathryn Carter, Pome Fruit IPM Specialist, OMAF, Simcoe and

OFM in Ontario Apples, CanAdapt 2003

Purpose: The goal of this CanAdapt project is to compare several different strategies for managing oriental fruit moth and to determine the efficacy in various different apple growing regions in Ontario.

Collaborators: CanAdapt (Agricultural Adaptation Council), Ontario Apple Growers Steering Committee, Ontario Apple Marketers Association, OMAF, Norfolk Fruit Growers' Association, Cargill AgHorizons, AIMS, Dupont, Bayer, Northumberland Durham Fruit and Vegetable Growers' Association, Lambton-Middlesex Fruit and Vegetable Growers' Association, Essex Apple Growers,

Experimental Design: There are eight sites set up across the province (3 sites in Essex, 4 in Norfolk, and 1 in Lambton/Middlesex). Each of the sites will use a variety of insecticide treatments for OFM, which will provide us with more information on the efficacy of the spray program against this pest.

Preliminary Results: Treatments for the 1st generation (Decis, Assail, or Guthion) OFM were applied at petal fall, based on pheromone trap data. Preliminary damage assessments were conducted from June 17 thru June 26. During damage assessments, 50 terminals and 50 fruit were examined on 20 trees in each treated block. The damage assessments revealed extremely low levels of OFM damage in all treated blocks, ranging from 0 to 8 infested terminals (per 1000 terminals examined) and 0 to 1 infested fruit (per 1000 fruit examined.). Based on the preliminary assessments there doesn't appear to be any substantial differences in damage observed between treatments. Insecticide applications for 2nd generation OFM are expected to be applied within the next week and a half (July 9 to July 18). Terminal and damage assessments will be conducted approximately 2 weeks following peak flight.

Mating Disruption in Ontario Apple Orchards

Purpose

The purpose of this project is to get a better understanding of the use of mating disruption in managing OFM in Ontario apple orchards. The following project is aimed at giving more experience to growers, consultants, and specialists in using mating disruption in apple orchards. The project looks at ways of incorporating mating disruption, and chemical controls to manage OFM populations in areas like Norfolk County, where we have very high population pressure.

Collaborators: CBC America, OMAF, Cargill AgHorizons, AIMS

Experimental Design:

Three commercial orchards in southwestern Ontario will apply three different management strategies for apples. The first strategy involves a conventional insecticide, the second strategy incorporates the use of a conventional insecticide program in conjunction with mating disruption, while the third program is a mixed program that relies on chemical control for the 1st and 3rd generation, and mating disruption to control the second generation of OFM.

Testing for the Development of Pesticide Resistance in Ontario Apple Orchards

Purpose: To provide consultants with the tools they need to test for pesticide resistant oriental fruit moth populations in Ontario.

Collaborators: AAFC, OMAF, Norfolk Fruit Growers Association, Cargill AgHorizons, Earthtramper, Essex County Growers, Chudleighs, Golden Town, Martin Fruit farms, Northumberland Durham Fruit and Vegetable Growers' Association

Results:
Consultants have tested 1st generation OFM populations at three orchards in Norfolk, one orchard in Brant, and three orchards in Elgin county for the development of pesticide resistance. Preliminary results suggest that low to moderate levels of OP resistance are present in the orchards studied. Resistance testing will continue for the 2nd generation, and will provide us with more information on the development of pesticide resistance in OFM populations in Ontario apples.

Area Wide Mating Disruption Program for Oriental Fruit Moth

A one-year grant from the Ontario Trillium Foundation to the Ontario Federation of Agriculture to explore the use of Mating Disruption on an area-wide level for Oriental Fruit Moth in Norfolk county apple orchards.

Partners: The Norfolk Fruit Growers Association, EarthTramper Consulting Inc., OMAF, and The Norfolk Field Naturalists.

Results to date:
Currently there are 1400 acres of apple orchards in Norfolk and Brant County participating in area-wide OFM mating disruption. Reports from growers suggest that the placement of mating disruption dispensers (twist ties) has not been an overly onerous experience. Most growers estimated that it took between 30 minutes to 45 minutes/person/acre to place 100 ties/acre. Damage assessments for the overwintering generation included an examination of approximately of 25,000 terminals in 25 orchards for evidence of OFM activity. The large majority of farms had no evidence of any terminal infestations by this pest. Live larvae were found only at three sites and then in very small numbers. The petal-fall Decis sprays seemed to have been highly effective – similar to results we saw last year. This certainly provides grounds for cautious optimism at this early part of the growing season.

Watershed-Based Source Protection Planning

Jacinta Dano, Nutrient Management Planning, Horticulture Crops

With the increasing concern over the quality of our water resources in Ontario, the provincial government is in the process of producing and enacting important legislation and developing programs/policies that pertain to the protection of our water.

Background
In his *Part Two Report of the Walkerton Inquiry,* Justice O'Conner makes twenty-two recommendations related to source protection planning. The Government of Ontario is committed to the implementation of these recommendations. On November 15th 2002, an Advisory Committee to the Minister of the Environment was established to provide advice and direction on a provincial framework for watershed-based source protection planning. The Advisory Committee's 18 members include designates from Conservation Ontario, the Association of Municipalities of Ontario (AMO), industry sectors, academia, environmental groups, health and First Nations. Agriculture was represented by the OFA and OFAC. In April 2003, this advisory committee produced a report titled *Protecting Ontario's Drinking Water: Toward a Watershed-based Source Protection Planning Framework.* This report addressed the roles and responsibilities, the planning process, resources, timing and legislation.

What is Watershed-Based Source Protection Planning?
A watershed consists of all the lands that drain into a particular body of water, which may be large (e.g., Grand River) or small (e.g., Petticoat Creek). By maintaining, improving or restoring the health, diversity and function of key natural features that perform a hydrologic function, water resources within a watershed can be protected. Source protection characterizes potential threats and the vulnerability of different sites in the watershed. The committee has identified that there should be 16 planning areas in Southern Ontario and 8 in Northern Ontario.

Advisory Committee Recommendations
The Advisory Committee report contains 55 recommendations which focus primarily on the

process of developing and approving a source protection plan.

- The committee recommends that a stand-alone piece of legislation for source water protection be developed.
- Where risk to human health is the concern, source protection legislation should supersede other legislation.
- Ministry of Environment has the ultimate responsibility for ensuring source water protection however, wherever possible, conservation authorities will be the organizations responsible for co-ordinating the development of watershed-based source protection plans.
- All planning areas must initiate the planning process within two years of the effective date of the legislation and, once started, plans should be completed within three years. Source protection plans should be in place across Ontario by the end of the fifth year.
- The first step is that a Source Protection Planning Committee (SPPC) be established in each planning area designated by the Minister.
- Implementation and technical issues will need to be dealt with in more detail as the planning process moves forward.

Potential SPP Impacts

- **Water Quantity**
  - More local input into approval process on water taking permits
  - Operations presently exempt may need permits
  - Additional permit conditions

- **Water Quality**

Source Protection Planning could require in vulnerable/sensitive areas

  - Greater focus on storage and land application of nutrients
  - Increased scrutiny of fuel storage and pesticide use
  - Increased treatment of wash waters.
  - Farms requiring farm water protection plans

Watershed-based source protection framework will soon reach onto our farms, particularly in areas where drinking water is vulnerable to contamination. While this framework has the potential to become an important tool in protecting our water supply, its success is equally dependent on ensuring the application of this tool results in minimal conflict. Therefore, it is important for growers to stay informed and get involved throughout this process.

For further information:
http://www.ene.gov.on.ca/envision/techdocs/4383e.pdf

POSTHARVEST

Sanitation of Apple Storages

Dr. Jennifer DeEll, Fresh Market Quality Program Lead, OMAF, Simcoe

The two most important postharvest diseases of apples are blue mold (caused by *Penicillium expansum*) and gray mold (caused by *Botrytis cinerea*). Both *Penicillium* and *Botrytis* are wound pathogens and spores can be found in any apple storage facility. Therefore, sanitation is critical for the control of these fungi. In addition to sanitizing apple bins and packing line equipment, sanitation of all parts of storage rooms is required each season. These include: 1) floors, walls, ceilings, doors, and structural beams; 2) refrigeration system components; 3) electrical wires and light fixtures; and 4) air and water pipes, ducts, channels, grates and drains.

The following summary is modified from the Agriculture and Agri-Food technical bulletin: *Hygiene Measures in Fruit and Vegetable Storage Warehouses*. 1999 E. V. Toussaint, A. Ouimet, O. Carisse, J. DeEll, and C. Vigneault. http://res2.agr.ca/stjean/information/menu/contents-sommaire_e.htm#publications

Cleaning - Debris on the floor can generally be removed by sweeping. However, vigorous brushing may be required for debris that is on the walls and ceiling. Any remaining dirt and organic matter should be removed with water and detergent. It is important to scour surfaces well enough to dislodge any ground-in dirt. High-pressure washing with a non-foaming industrial detergent is often the easiest method. For safety reasons, electrical systems and motors that are not waterproof should be covered. Cleaning is important because organic matter impedes and/or neutralizes the action of disinfectants. In addition, cleaning removes the substrates that can promote the growth of

pathogens in the storage rooms. However, many pathogens will not be removed by simple cleaning and thus disinfectants are required.

Disinfecting – Information on the disinfectants approved for use in Canada is presented in Table 1. Special care should be taken if there is a high rate of contamination, as disinfectants destroy only pathogens on the surfaces. The conditions of application and contact time must be followed exactly in order for any disinfectant to be effective. It is also important to follow the recommended time between disinfectant use, airing of storage rooms, and entry of apples. To give storage rooms a good airing, the doors should be opened and outside air forced in. Storage rooms must be thoroughly ventilated for several days after the use of disinfectants and precautions should be taken to avoid anyone coming into contact with these products by mistake. Disinfectants are often irritating and thus to avoid discomfort and health problems, protective equipment and clothing should be worn when using them, e.g. safety glasses, breathing mask, and waterproof garments. Activated-carbon air filter prevent odors from developing in the storage rooms. It has been suggested that fungicide-based paint be applied to walls for additional protection (Phillips et al., 1979; Lidster et al., 1988). Ozone and UV radiation are not effective at disinfecting storage rooms. Leaving bins, pallets, and other equipment out in the sun and/or strong wind will partially disinfect them. Fumigants can be used to reach the small hidden corners that cannot be reached by conventional methods. However, this method is only effective when used with wet surfaces.

Rinsing - The use of some disinfectants results in off-odors, which may result in unpleasant tasting fruit after storage. In addition, the long-acting effect of certain disinfectants can corrode materials within the storage structure, as well as equipment. Therefore, proper rinsing is essential when disinfectants are used. Rinsing involves thoroughly spraying all surfaces treated with disinfectants, starting with high areas so that the residues run down to the floor. Any stagnant water must be removed and it is essential to use water of drinking quality so that the storage will not be re-contaminated.

Drying - The goal of drying is to eliminate humidity, which provides ideal conditions for the development of molds and storage rots. If the disinfectant used does not require rinsing, then drying takes place immediately after disinfecting. Drying involves removing any surplus water and giving the storage rooms a good airing. If outside conditions are hot and dry, then outside air can be forced inside. Maintaining a high temperature and low humidity in the off-season can help to reduce the growth of pathogens in the storage.

Table 1: Disinfectants approved in Canada for cleaning of fruit and vegetable warehouses (adapted from *Toussaint et al., 1999*)

Compound	Fungicide activity	Inactivated by organic matter	Corrosive	Solution	Exposure time (minutes)	Advantages	Disadvantages
Hypochlorides (Javex)	Effective	Yes	Yes (esp. metal)	10 L per 90 L H_2O	10	Quick action, low cost	Odors, irritant, solution must be changed often, discolors some material, pH sensitive, rinsing is necessary
Quaternary ammonium (10% a.m.)	Effective	Slightly	No	8-24 mL per L H_2O	10	Effective at low temp, can be combined with detergents	Cannot mix with other products, rinsing needed
Phenolic compounds (hospital disinfectant)	Very effective	Slightly	No	See label	10	Residual action	Non-volatile residues, rinsing is necessary
Formaldehyde 37% solution	Slightly effective	Yes	No	4 L per 100 L H_2O	30	Broad spectrum action	Noxious to humans, toxic fumes, must air out room after use, unpleasant odor remains, irritant

Apple Quality, Storage and Washing Effects on Patulin Levels in Apple Cider

John Henderson, Risk Management Specialist, OMAF, Brighton and
Sandra Jones, On-Farm Food Safety Program Lead, OMAF, Guelph

In the last issue of the newsletter, a recent research report in the Journal of Food Protection was mentioned. The report presented information on how apple quality, storage and washing treatments affected patulin levels in apple cider.

One of the areas this study looked at was how apple harvesting methods and culling affects patulin levels in cider pressed from fresh (non-stored) apples.

Seven different apple cultivars were harvested and classified according to method of harvest – tree picked or ground harvested. The tree picked fruit were divided into two groups, culled and not culled. Visibly damaged apples were removed from the culled group (apples showing mold, bird pecks, skin breaks, hail damage or major bruising). In the unculled group, 10 to 70% of the apples were visibly damaged. It is worth noting that no patulin was detected in cider pressed from tree picked fruit (culled or unculled).

In contrast, cider produced from ground harvested fruit contained up to 374 micrograms of patulin per litre and for specific cultivars was significantly higher than the same cultivars of tree picked fruit. The United States Food and Drug Administration (FDA) believes risks are minimal for consuming juice containing patulin if processors control the level to 50 micrograms or lower. These results illustrate a wide variation of patulin levels between varieties, which may relate to the different fruit cultivar susceptibility to P. expansum rot and to contamination with patulin.

Cider samples were also analyzed for bacterium, yeast and mold levels. Microbial levels showed similar trends to patulin levels, with all cultivars of ground harvested apples having nearly a 2 log higher count than cider produced from tree picked fruit. The results of this study illustrate that the patulin level in the cider may be a good indicator of the quality of apples used. Patulin and microbial levels may be substantially reduced when tree picked fruit are used in cider production instead of ground harvested fruit. The findings of this research project and other supporting documentation suggest that dropped fruit should not be used in the manufacturing of all apple products.

For detailed report information and supporting documentation refer to the Journal of Food Protection, Vol. 66, No. 4, 2003, Pages 618-624

"Apple Quality, Storage, and Washing Treatments Affect Patulin Levels in Apple Cider" by Lauren S. Jackson, Tina Beachham-Bowden, Susanne E. Keller, Chaitali Adhikari, Kirk T. Taylor, Stewart J. Chirtel and Robert I. Merker

Food Safety Terminology

Sandra Jones, On-Farm Food Safety Program Lead, OMAF, Guelph

Everyone seems to be throwing around words…HACCP, HACCP-based, GAPs. What does it all mean? The following are a few words that you may hear when discussing food safety.

Codex or the Codex Alimentarius Commission is an organization formed by the World Health Organization (WHO) and Food and Agriculture Organization (FAO). Comprised of representatives from 165 countries, their job is to develop food safety standards. They are in the process of developing basic conditions and practices expected for producing safe, wholesome fresh fruit and vegetables intended for international trade.

Critical Control Point: a point, process step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated or reduced.

Eurepgap: is a management program developed in Europe for fruit and vegetables. It combines Good Agricultural Practices, Integrated Crop Management (ICM) and Integrated Pest Management (IPM) practices.

Good Agricultural Practices (GAPs): are basic environmental and operational conditions that are necessary for the production of safe, wholesome fruit and vegetables. The term includes practices used in growing, harvesting, sorting, packing and storage operations.

Good Manufacturing Practices (GMPs): term used to describe general practices to reduce food safety hazards. Often used simultaneously with GAPs and include practices used in sorting, packing, storage and transportation operations.

HACCP: stands for Hazard Analysis Critical Control Points. It is a management system that identifies, evaluates and controls hazards that are significant for food safety.

HACCP-based program: management system that is based on the principles of HACCP. The key difference between the two is that HACCP-based programs are generic (that is, for a commodity sector) whereas HACCP programs are specific to the site/grower. To give you an example, an apple producer on an HACCP-based program, will have identified for him the majority of hazards associated with apple production. However, there may be a hazard (e.g. a producer has equipment that is not typically used in apple production and it may introduce metal shards) that may not be identified in the generic program but it would be identified if he was on his own specific HACCP program.

Hazard: a biological (e.g. bacteria), chemical (e.g. antibiotic) or physical (e.g. glass) substance that has the potential to cause an adverse health effect if found on or in the fruit or vegetable.

SQF: Safe Quality Food is a management program. It combines HACCP and elements of ISO 9000. It is now an internationally recognized program initially developed by the Agriculture Department of Western Australia.

Traceback: a method used to determine the source(s) and distribution of a food implicated in a foodborne outbreak and to identify the possible points where contamination could have occurred.

ANNOUNCEMENTS

Government Appoints Nutrient Management Advisory Committee

Jacinta Dano, Nutrient Management Planning, Horticulture Crops

The government has announced the formation of the Nutrient Management Advisory Committee, which will make recommendations for the implementation of regulations under the Nutrient Management Act, 2002.

Wayne Caldwell, associate professor with the University of Guelph's School of Environmental Design and Rural Development, will chair the 20-member advisory committee, drawn from a broad range of stakeholder groups. Members of the committee have been chosen from farm organizations, the crop industry, the livestock industry, agribusiness, rural municipalities, the environmental community, and the scientific and academic community.

The committee will examine certain technical issues identified during the consultations; standards for seasonal outdoor feedlots, decommissioning of manure storages, odour-related setbacks and standards, winter spreading restrictions for nutrients from the pulp and paper sector, nutrient application on shallow soils, and nutrient application on tile-drained land. In addition, the committee will provide recommendations on when the regulations would apply to all types of farms except new livestock farms, large livestock farms and those expanding into the large livestock category.

For a full list of Advisory Committee Members http://www.gov.on.ca/OMAFRA/english/infores/releases/2003/063003_1_bkgr.html

Storage Workshop, 2003

Cornell Cooperative Extension in New York State is organizing a Storage Workshop.

Date: July 30th, 2003
Location: Cornell University School of Veterinary Medicine, Tower Rd., Lecture Hall 1 and Atrium.
Registration: Cost of the workshop is $42.00 per person if paid by July 16th. $50.00 after July 16th. $60.00 at the door. This includes proceedings, lunch and parking permit.
Lodging: A block of rooms is being held at the Best Western - 607-272-6100. Please state that you are attending the Storage Worskhop.

Please check out the following website:
http://cuinfo.cornell.edu/cgi-bin/MapMove.x/M4-1-4?475,145

Further Information: Inquiries should be addressed to Max Welcome, Department of Horticulture, 20 Plant Science Building, Cornell University, Ithaca, NY 14853, phone 607-255-5439. Email: mw45@cornell.edu

Unpasteurized Apple Cider/Juice Food Safety and Sanitation Workshops

The Ontario Ministry of Agriculture and Food (OMAF) is in the process of setting up two workshops that will be of interest to the unpasteurized apple cider/juice industry.

Dates and Locations:
Tuesday, August 19
Tyrone Orange Hall and Tyrone Mills
Tyrone, 2656 Concession 7
Bowmanville, Ontario L1C 3K6
Wednesday, August 20
Hergotts Cider Mill, 928 Erb St West
Waterloo, Ontario N2J 3Z4
Time: 10:00 a.m. to 3:00 p.m.

Topics to be discussed include:

- What the Ontario Industry looks like – results of the OMAF 2001 Baseline Study
- Food safety concerns with pathogens and mycotoxins, risks include: E coli. Cryptosporidium and patulin. (presentations from OMAF and the Canadian Food Inspection Agency (CFIA)
- Ways to reduce these risks such as the code of practice, pasteurization, UV treatment, preservatives
- Cleaning and Sanitation – proper methods of cleaning and sanitation, what chemicals and methods to use, and are they working e.g. monitoring methods (test strips, meters). This session will include a hands on presentation by Johnson Diversey in the cider facility.

Detailed information will be mailed to cider producers in July. If you have any suggestions or questions about this workshop please call John Henderson at (613) 475-5175.

Apple Cultivar Showcase & Fruit Growers Meeting

Date: Tuesday, August 26, 2003
Location: Birnam Orchards, Nauvoo Rd., Lambton County
Time: 4:00 p.m. - meet at Birnam Orchards for a 2 hour field program
6:00 p.m. - BBQ Supper

Organized and presented by **the Lambton Middlesex Fruit and Vegetable Growers Association.** (**Sponsored by N. M. Bartlett Inc.)**

Featuring:

- ►apple cultivar trials
- ►storage technology
- ►equipment displays
- ►tree training
- ►Surround® WP Crop Protectant
- ►sprayable reflectants as a light management tool
- ►reduced risk insect and disease control strategies
- ►integration of other cropping systems with apple culture

Researchers, consultants and specialists are expected to be available to speak on the various topics of discussion.

Birnam Orchards is one of the sites where trees have been planted for the last 4 years as part of the Apple Growers' of Ontario sponsored Province wide cultivar trials. Bearing trees of the following trial cultivars can be viewed:

Ambrosia®	Ginger Gold™	Cameo™
Goldrush®	Honeycrisp™	Creston
Silken	Chinook	Enterprise

Plus: Golden Supreme™ & Twin B Gala™

Host Families:
Pete and Debbie Geerts & Bert and Rita Veens

RSVP to Marian Desjardine, London OMAF Resource Centre at 519-873-4077.