

ORCHARD NETWORK

For Commercial Apple Producers

VOLUME #12, ISSUE #2 August, 2008

In this issue...

Orchard Management

New Job on the Team

by Leslie Huffman, Apple Specialist, OMAFRA, Harrow

I'm very pleased to continue with the OMAFRA Apple Team as the Apple Specialist, and am looking forward to working with growers, researchers and all players in the Ontario apple industry. Best wishes to John Gardner on his retirement, and thanks for his efforts to improve fruit quality and orchard performance over the past eight years as OMAFRA Apple Specialist.

2008 has proven to be the year of weather challenges, with many growers enduring the wettest conditions in recent memory (hard to believe that the far southwest is bone-dry with no significant rain since July 2nd!). Frosty

This Newsletter is brought to you by the Ontario Apple Team:

Leslie Huffman, Harrow
ONNL Editor
Apple Specialist
(519) 738-2251, ext. 499

Dr. Jennifer DeEll, Simcoe
Fresh Market Quality Program Lead
(519) 426-1408

Dr. John Cline
University of Guelph, Simcoe
(519) 426-7127, ext. 331

John Henderson, Brighton
Risk Management Specialist
(613) 475-5175

Kathryn Carter, Simcoe
Pome Fruit IPM Specialist
(519) 426-4322

Margaret Appleby, Brighton
IPM systems Specialist
(613) 475-5850

Michael Celetti, Guelph
Plant Pathologist, Horticultural Crops
Program Lead
(519) 824-4120 ext. 58910

For complete list of Crop Technology Staff with OMAFRA, visit the OMAFRA website at:
http://www.omafra.gov.on.ca/english/livestock/directory/staffdirectory.htm#Hortcrops

OMAFRA Contact Call Centre, Guelph
(1-877-424-1300

This issue of the **Orchard Network Newsletter** was compiled by Client Service Representative, Marian Desjardine, OMAFRA, London.

nights during bloom hurt blossoms in Middlesex and Norfolk areas, and poor pollination conditions left some areas with low seed counts and concerns about fruit size. Record numbers of hail storms has caused varying levels of damage across the province, even hitting some orchards several different times.

Still, I see some notes for optimism for Ontario apples. The marketplace seems hungry for good quality apples, and with the adoption of good orchard practice and the optimum use of SmartFresh technology, our fresh and storage apples are being sold to happy consumers. The interest in local foods has potential for helping Ontario apples, and most growers are hopeful that they will see improved sales for local fruit. Over 1200 acres of apple orchards have been removed under the Orchard and Vineyard Transition program, and many growers have replanted or are planning new intensive orchards of cultivars in demand. Interest in "new" cultivars like Honeycrisp, Ambrosia, and Aurora, and discovery of "old" cultivars like Empire seems to be happening among consumers that I've chatted with.

For this Harvest issue, we've pulled together some information to help you through the harvest and storage season. Best wishes for a safe and efficient harvest season, and watch for upcoming winter programs.

When Will Apples be Ready to Pick?

by Leslie Huffman, Apple Specialist, OMAFRA, Harrow

Will wet soils bring the crop on sooner? What effect will cloudy skies have on maturity? Are we ahead or behind last year? One way to monitor the maturity development and answer these questions is using the starch-iodine test.

What you need: Assemble a testing kit to carry with you to evaluate your apples. You will need:

- A shallow dish to hold the iodine solution
- A sharp knife to cut apples
- A squirt bottle of water to rinse off treated apples
- Starch-sugar conversion charts for each cultivar (see below)
- Paper towels and garbage bag
- Paper & pen to record dates and results

Prepare the iodine solution: Contact your pharmacy to prepare a fresh batch – it's best to make fresh solution each harvest season. Store the solution in a dark coloured (or foil-wrapped) bottle, away from light.

Caution: Remember that iodine is poisonous. Correctly label the bottle and keep away from children and pets. Consider treated apples poisonous - do not feed to animals or use in composting. Prevent pets from licking the treated fruit.

Here's the recipe to give to the pharmacist:

1. Dissolve 8.8 grams of potassium iodide in approximately 30 ml of warm water. Gently stir the solution until the potassium iodide is dissolved.
2. When it is properly dissolved, add 2.2 grams of iodine crystals. Shake the mixture until the crystals are thoroughly dissolved.
3. Dilute this mixture with water to make 1.0 litres of test solution. Mix well.

Starch-iodine charts: Here are several online sources of maturity charts:

Empire, Idared and Spartan
www.omafra.gov.on.ca/english/crops/facts/00-027.htm

McIntosh and Red Delicious
www.omafra.gov.on.ca/english/crops/facts/00-025.htm

Gala
www.umass.edu/fruitadvisor/clements/articles/gala.jpg

Liberty
www.umass.edu/fruitadvisor/clements/articles/liberty.jpg

Cortland
www.umass.edu/fruitadvisor/clements/articles/cortland.jpg

Mutsu
www.umass.edu/fruitadvisor/clements/articles/mutsu.jpg

How to do the test: Slice apples across, dip cut edges in solution, rinse with water, and compare to the charts. A simple test to determine how much starch has changed to sugar – and if apples are ready to pick.

Stuck in a Rut Again?

Anne Verhallen, Soil Management Specialist (Hort.), OMAFRA, Ridgetown

Harvest conditions in 2006 were less than ideal for much of the fall. In some places firm laneways and access roads gave way to ruts. Ruts and wet conditions put stress on both equipment and people. 2008 is shaping up to be another wet harvest, let's look at what can be done to manage the situation.

Apple orchards are perhaps the ultimate in controlled traffic. All traffic is confined to set tracks, generally, this results in a fairly narrow lane of packed soil with little rutting. The tree row retains lovely soil structure which supports good root growth. This packed traffic area will tend to shed rainfall due to the tighter soil structure unless there is a depression or an area that collects water. Much of the rutting observed in 2006 occurred in these low lying areas where water was trapped or on the sides of hills. The other key area where a lot of rutting occurred was on the access lanes throughout the orchard. The problem is not so much the weight and axles under any one load. It is the sheer number of trips under wet soil conditions that eventually causes the soil structure to fail.

Observations since fall 2006 suggest that we can expect the ruts to rebound slowly due to the soil freezing and thawing. The sod cover in an orchard insulates the soil and slows the freezing in the fall reducing the degree of lift and soil improvement. It is a slow job waiting for Mother Nature to fix the ruts.
If 2008 is another wet harvest there are some things that can be done that may help to reduce rutting:

1. Give the soil as much time to drain after a rain as possible before going back into the orchard, even if this means just waiting until after lunch to start rather than first thing in the morning after a rain.
2. Be strategic in your harvest if you can. Field vegetable growers often try to save a better drained area to move to under really wet conditions in order to allow harvest to continue. On rolling land consider the direction of your harvest. Side hill seep will tend to make the tires spin a bit more, creating more of a rut.
3. Reduce the load weight. This means perhaps fewer bins on a wagon. Switching to a bin on a tractor is not necessarily better. The weight per axle is going to be higher and you will have more trips through the row.
4. Take a look at your tires. Compaction work with field crops has shown that if the tire pressure can be reduced to 10-15 psi, that there will be less compaction. However, check your tire specifications and consult your dealer first to maintain the tire warranty.

Best wishes for a safe and dry harvest!

Figure 1. Side hill seep contributed to this rutting in 2006. Consider grading and further drainage to reduce the problem for the future.

Recommendations for Use of ReTain

by Leslie Huffman, Apple Specialist, OMAFRA, Harrow

ReTain is a plant growth regulator and an effective preharvest drop control. It inhibits the production of ethylene in maturing apples. ReTain may also increase soluble solids, colour, fruit size, fruit firmness and reduce water core.

The following comments are extracted from Publication 360, Fruit Production Recommendations. The complete version can be found online at http://www.omafra.gov.on.ca/english/crops/pub360/7groreg.htm#retain

- Apply Retain 4 weeks before anticipated harvest.
- Use a starch-iodine test to determine optimum harvest maturity. Expect up to 7 to 10 day delay in maturity from ReTain.

Recommended use 4-5 weeks before anticipated harvest

- Use one, 333 gram pouch (50g active ingredient) of ReTain/ 0.40 ha (1 ac). Use with Sylgard 309 (surfactant) at 0.5-1.0 L/ 1000 L of water.
- Apply four weeks before anticipated harvest. It is better to be early rather than late. Once ethylene production has begun, it is difficult to suppress.

Precautions

- When you mix ReTain with the surfactant, keep agitation to a minimum because Slygard 309 has a tendancy to foam.
- To minimize foam, add Slygard 309 last, when the tank is full.
- Slygard 309 is the only surfactant registered with Retain in Canada. If the rate of ReTain is reduced, maintain the Slygard rate at 0.05%- 0.1% v/v.
- Discard any unused spray material at the end of each day.
- Do not tank-mix with other products except Dipel or Foray.
- Do not overhead irrigate for eight hours after applying.
- Adjust spray water volumes based on tree size and spacing. Do not apply to the point of runoff. Apply under slow drying conditions. 1000L water/ ha is usually adequate.
- For best results, maintain a spray water pH of between 6 and 8.

Note: Segregate ReTain-treated fruit in storage to reduce exposure to ethylene.

Additional Considerations When Using ReTain

- Spray only trees that are healthy and not under severe drought, insect, disease, or nutritional stress.
- Gala strains, Golden Delicious types and Honeycrisp appear to be more responsive to ReTain compared to McIntosh - crop maturity and development may be impeded.
- For multiple pick cultivars such as Royal Gala, for best results time application four weeks from the second harvest pick date.
- The harvest window for treated cultivars is shorter but delayed, resulting in fewer pickings and increased harvest efficiency.

Postharvest

Harvest Maturity Affects Storability of 'Ambrosia' Apples

Jennifer DeEll, Fresh Market Quality Program Lead, OMAFRA, Simcoe and Behrouz Ehsani-Moghaddam, Research Assistant, Simcoe

As part of a larger project, 'Ambrosia' apple maturity was again monitored during the 2007 harvest season. Fruit maturity was evaluated on 10-apple samples twice a week from two commercial orchards in the Simcoe area of Ontario.

Similar to the results in year 1 of this study, 'Ambrosia' apples produced very little ethylene during maturation on the tree (Table 1). As the starch degraded and color changed, there continued to be only trace amounts of internal ethylene present (<1 ppm). This makes IEC a difficult indicator of fruit maturity for 'Ambrosia', but at the same time makes 'Ambrosia' an ideal candidate for postharvest SmartFresh (1-MCP) treatment.

Sample of 50 apples were also harvested from each orchard during each week of maturity evaluation, starting on Sept. 21st. These fruit were held in air storage at 0.5^{o}C for 4 months and then evaluated for quality during 14 days at 21^{o}C, to determine the effect of harvest maturity on storability.

Overall, harvest time significantly affected ($P<0.01$) firmness, internal ethylene concentration (IEC), acidity, and greasiness of 'Ambrosia' apples after 4

Table 1: 'Ambrosia' maturity from two orchards near Simcoe, Ontario – 2007[1]

Orchard	Date	Fruit diameter (cm)	Yellow[2]	Red[2]	Firmness (lb)	Soluble solids (%)	Starch[3]	Internal ethylene (ppm)
1	Sept. 11	6.6	1.0	2.8	21.1	11.0	0.5	0.01
	Sept. 14	6.8	1.8	3.8	22.4	11.6	0.6	0
	Sept. 18	6.6	3.4	5.1	22.4	13.0	1.0	0.02
	Sept. 21	6.8	2.9	5.3	22.4	12.4	1.1	0.01
	Sept. 25	6.9	3.0	5.4	21.1	12.2	2.0	0.10
	Sept. 28	7.2	3.0	5.5	21.2	13.2	2.5	0.23
	Oct. 2	7.2	4.8	5.7	19.9	13.4	3.4	0.69
	Harvest[4]	-	-	-	-	-	-	-
	Oct. 5	7.0	3.9	4.6	18.7	13.4	4.3	0.58
	Oct. 9	6.9	4.0	5.0	18.4	14.5	4.8	2.20
	Oct. 12	7.0	3.7	5.2	17.5	14.5	7.1	0.22
2	Sept. 11	6.8	1.5	1.2	19.3	10.5	0.9	0.01
	Sept. 14	6.8	1.8	2.4	19.8	10.5	0.9	0
	Sept. 18	7.1	1.6	3.7	19.7	12.0	1.5	0
	Sept. 21	7.1	2.2	3.0	19.1	11.2	1.4	0
	Sept. 25	7.0	2.6	4.3	18.7	11.5	4.0	0.23
	Sept. 28	6.9	2.6	4.4	18.0	11.4	3.8	0.17
	Oct. 2	7.1	3.3	5.3	19.1	12.2	4.9	0.84
	Oct. 5	7.0	3.2	3.8	18.4	10.8	6.0	0.28
	Oct. 9	7.2	3.1	3.4	17.9	11.9	8.5	0.82
	Oct. 12	7.3	2.9	5.3	15.8	12.2	8.9	0.01

[1] Values are the average of 10 apples
[2] BC 'Ambrosia' color chart
[3] BC 'Ambrosia' starch chart
[4] Harvest for the storage experiments

months of storage in air at 0.5°C. 'Ambrosia' fruit harvested on Sept. 28th or before were less greasy after storage than those harvested on Oct. 5th or after. In Orchard 2, apples harvested on Sept. 28th or before were firmer than those harvested on Oct. 5th or after (2+ lb difference). This effect was also observed in fruit from Orchard 1, but only after 14 days at 21°C.

The above storage trends suggest that optimum harvest should have been somewhere between Sept. 28th and Oct. 5th in 2007. In Orchard 1, there was a notable increase in yellow color, fruit softening, starch index values, and IEC during this time. These changes were more subtle in Orchard 2, as the variation in fruit maturity was greater, which was likely due to orchard management and more canopy growth.

Trends in apple maturity can vary enormously year-to-year. Therefore, these evaluations need to be continued for additional growing seasons before confident conclusions can be made. More data and replication is needed in order to reduce the large variations and standard error.

Research Updates Related to Apple Quality from the 2008 ASHS Meeting

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

The following research summaries contain relevant information related to apple quality and postharvest physiology. These were recently presented at the

annual meeting of the American Society for Horticultural Science (ASHS) in July 2008.

Effects of Delayed CA Storage of Apples after Rapid 1-MCP Treatment (*C.B. Watkins and J.F. Nock, Cornell University*)

Recommendations for maximum acceptable delays after harvest for treatment of apple fruit with 1-MCP (SmartFresh^{SM}) vary by cultivar and growing region. However, not all storage operations can fill storage rooms within a short period of time. Therefore, the effects of delayed CA storage after treatment of apples with 1-MCP within 2 days of harvest were investigated. 'McIntosh' and 'Empire' apples were harvested from different regions in New York and treated with 1 ppm of 1-MCP after cooling overnight at 2^{o}C. Fruit were stored in CA ('McIntosh', 2% O_2 + 2% CO_2 and 5% CO_2 after 5 weeks; and 'Empire', 2% O_2 + 2% CO_2) after 2, 7 or 14 days. Internal ethylene concentration (IEC) remained low and firmness was maintained in 1-MCP-treated fruit even if CA storage was delayed for 14 days. Variations in responses after 1-MCP treatment were related to fruit maturity at harvest, as indicated by IEC. In a follow-up experiment, 'Empire' apples were treated with 1 ppm of 1-MCP after cooling overnight at 2^{o}C, 8^{o}C or 12^{o}C. Fruit were kept at those temperatures for 0, 7 or 14 days before being transferred to 2^{o}C and CA storage applied. After 10 months of CA storage plus 7 days at 20^{o}C, apples treated with 1-MCP had no decay, but higher incidences of flesh browning and external CO_2 injury, irrespective of pre-storage treatment. However, the incidence external CO_2 injury increased with increasing delay at warmer temperatures, and was higher at 12^{o}C than at 8^{o}C. Overall, the results show that storage of apples in CA can be delayed after treatment with 1-MCP close to harvest, but that slower cooling of fruit may increase the risk of external CO_2 injury.

Flesh Browning Disorder of 'Cripps Pink' Apples (*H. James and J. Jobling, Hort Research, Australia*)

The flesh browning (FB) disorder of 'Cripps Pink' (a.k.a. 'Pink Lady') apples rapidly became a significant international problem after its initial observation in the year 2000. In this 4-year research study, a combination of pre and postharvest factors were examined over multiple seasons and in several districts to determine their influence on the development of the FB disorder during long-term storage. Following four consecutive seasons of research, the factors responsible for predisposing 'Cripps' Pink' apples to the FB disorder have been identified and management strategies have been developed. The FB disorder has been classified into three unique disorders based on contrasting mechanisms of physiological damage resulting in the development of FB. Climatic conditions during fruit growth and development were found to predispose apples to developing FB during subsequent long-term storage. 'Cripps' Pink' apples grown in cool climates were found to develop a chilling injury described as diffuse flesh browning (DFB). DFB was found to be primarily related to the storage temperature; however, it was also influenced by nutrition. Apples grown in warm districts were found to develop the senescent disorder described as radial flesh browning (RFB). RFB was found to be caused by a combination of factors including the storage temperature, composition of the storage atmosphere, fruit maturity at harvest, and tree crop load. The third classification of FB, CO_2 injury, was not found to be associated with climatic conditions during fruit growth and development. The development of CO_2 injury in 'Cripps' Pink' apples was observed as the formation of lens shaped pits and cavities in the flesh of the fruit when stored in an atmosphere high in CO_2.

Effect of Extenday on Fruit Characteristics and Light Level and Quality of 'Honeycrisp' Apples (*Crassweller et al., Penn State University*)

The influence of the woven plastic reflective cloth "Extenday" (RF), placed beneath 'Honeycrisp'/M.9 apple trees, was investigated in 2007. The reflective cloth was placed in the herbicide strip on either side of the trees about 2 weeks after full bloom. Experimental plots consisted of three tree units with either the RF or just bare soil (BS) with the middle tree as the data tree in a completely randomized design. There was no difference in percent fruit set between treatments. Fruit density was significantly higher on limbs in the RF treatment. At harvest there was no difference in number of fruit per tree, yield per tree or fruit weight. Tree efficiency and crop load were higher for RF plots. Fruit were harvested on four dates based upon fruit color. The percentage of fruit harvested by treatment on any given date tended to be higher from RF trees harvested on the first three dates. Maturity starch index was significantly higher for fruit from Extenday treatments, with no difference in firmness or soluble solids for fruit harvested on the second harvest. Percent full sunlight (%FS) reflected from BS and RF was determined on three separate dates. On 12

June, reflected %FS at the mid-canopy was greatest for RF treatment. On July 13 at all positions measured in the tree %FS reflected was significantly greater in the RF trees. On 24 July, %FS reflected was significantly greater in the RF trees at 3 out of 4 positions within the canopy. On 19 Sept., spectroradiometer readings indicated that reflected blue light (400-500 nm) from the RF trees was higher than either the BS or from adjacent grass drive row. The Red/ Far-Red ratio was also higher in the RF than in the BS or from adjacent grass drive row.

NAA, 1-MCP and AVG Differentially Alter Fruit Abscission and Fruit Ripening in 'Delicious' Apples (*J. Li and R. Yuan, Virginia Tech.*)

Expression of genes for ethylene biosynthesis, ethylene perception, and cell wall degradation in fruit and fruit abscission zones was examined in relation to fruit abscission and fruit softening after spraying with naphthaleneacetic acid (NAA, Fruitone-N), aminoethoxyvinylglycine (AVG, ReTain), 1-methylcyclopropene (1-MCP, Harvista), or the combination of NAA and AVG in 'Delicious' apples. The AVG or 1-MCP spray reduced fruit ethylene production and delayed fruit abscission and fruit softening; whereas NAA reduced fruit abscission, but enhanced fruit ethylene production and fruit softening. The combination of NAA and AVG delayed NAA-enhanced fruit softening and resulted in much lower fruit abscission than did either AVG or NAA alone, although there was no significant difference in fruit ethylene production among these treatments. Overall, the data suggests that NAA, AVG, and 1-MCP differentially affect fruit abscission and fruit softening through differentially affecting the expression of different members of certain genes in fruit abscission zones and in 'Delicious' apples.

Performance of Air-Induction Nozzles in Medium-Density Apple Orchards (*S. McArtney and J.D. Obermiller, North Carolina State University*)

A series of experiments was undertaken to compare the performance of an axial fan air blast sprayer equipped with either air induction (AI) or conventional (C) nozzles in medium-density apple orchards. Performance was compared by assessing 1) spray coverage within the canopy at four levels across-row wind speed, 2) ground deposits from airborne drift under still conditions, and 3) biological efficacy of a post-bloom thinning spray. Spray coverage was reduced as across-row wind speed increased, with the most dramatic reduction occurring between 0 to 4 miles per hour (mph) and at heights greater than 8 ft in the canopy. AI nozzles increased spray coverage in the row immediately adjacent to the sprayer compared with C nozzles, regardless of across-row wind speed. AI nozzles resulted in significantly less drift compared with C nozzles under still conditions both in an open field and within a mature 'Cripps Pink'/M.7 orchard planted in rows 20 ft apart. Sprayer efficiency, measured as the proportion of total spray volume that was intercepted by the tree canopy, was higher with AI nozzles (38%) compared with C nozzles (26%). The efficacy of a post-bloom thinning spray of 6-BA+carbaryl applied to 'Morgan Spur Red Delicious'/M.111 trees planted at a between-row spacing of 15 ft was slightly greater when applied with AI nozzles compared with C nozzles. Nozzle type, row spacing, and canopy density were major determinants of spray deposition and therefore biological efficacy. AI nozzles should provide equivalent or even improved coverage and biological efficacy compared with C nozzles in well-managed orchards planted at distances of 18 ft or less between rows. However, when orchard rows are spaced greater than 18 ft apart, then AI nozzles will result in reduced spray coverage and chemical efficacy compared with C nozzles because of a reduction in spray carry-over to adjacent rows as a result of reduced airborne drift.

Performance and Economics of High Density Apple Planting Systems for the Processing Market (*Robinson et al., Cornell University*)

A 5-acre field comparison of 4 orchard systems (Central Leader/M.7 – 385 trees/ha, Vertical Axis/ M.7 – 840 trees/ha, Vertical Axis/M.26 – 1196 trees/ ha, and Vertical Axis/M.9 – 1656 trees/ha) with 7 cultivars (NY674, 'Liberty', 'Fortune', 'Jonagold', 'Mutsu', 'Northern Spy', and 'Fuji') was conducted on a commercial farm in Marion, New York from 1994 to 2003. Cumulative yield in the first 5 years and over 10 years was positively related to tree planting density. Yields between cultivars varied widely, with NY674 yielding the most and 'Northern Spy' yielding the least. Biennial bearing was high with 'Northern Spy', 'Jonagold', 'Mutsu', and 'Fuji', and lower with NY674 and 'Liberty'. Pruning requirements were highest for the Vertical Axis/M.7 followed by the Vertical Axis/M.9. The first year establishment costs were linearly related to tree planting density. After planting, the low density Central Leader system continued to have a negative cash flow for 8 years, whereas the high density Vertical Axis/M.9 system had a negative cash flow for only 4 years. Thus, the

total establishment costs over 6 years were similar across all planting densities. None of the systems had a positive net present value after 20 years, but by 30 years the two highest density systems were positive. Profitability was linearly related to tree density and depended strongly on fruit price, yield, and initial tree price. The optimum planting density appears to be about 1600 trees/ha. This analysis revealed that new processing orchards in New York must have high early yield and mature yields of 60 t/ha and a fruit price of $0.22 per kg to be profitable. For established processing orchards, the minimum profitable yield was 35 t/ha when price was $0.22 per kg.

Water Use, Growth, Nutrients, Yield, and Fruit Quality of 'Fuji' and 'Gala' Apples (*Fallahi et al., Idaho University*)

An increasing trend in water shortage and needs for high density orchards mandate the use of more efficient methods of irrigation and rootstocks. In this long-term experiment, effects of seven irrigation systems for 'Fuji" and two systems for 'Pacific Gala' on four rootstocks on tree growth, water use, fruit quality and mineral nutrients were studied. All forms of drip systems used less water than the full micro-sprinkler. Partial root drying sprinkler used 50% less water than the full micro-sprinkler. Trees with partial root drying drip and deficit drip received 65% of full drip. The amount of water used in July was higher than all other months. When tree were completely mature, each tree with the full micro-sprinkler system used about 6673 L, while full drip used 4118 L per season, which was equivalent to 1010 mm and 624 mm, respectively. Therefore, full drip resulted in as low as 38.3% and as high as 58.3% water savings compared to the sprinkler system. 'Fuji' yield and fruit quality, particularly starch degradation pattern (SDP) and size, were affected by irrigation treatments. 'Fuji' trees with water deficiency had lower leaf and fruit potassium. 'Gala' on B.9 rootstock had more bourse shoots with fruit than those on other rootstocks. 'Gala' trees on B.9 ceased terminal growth and formed terminal buds before the trees on other rootstocks. 'Gala' fruit from trees on G.30 and B.9 had higher SDP than those on RN-29 and Supporter 4, where trees on RN-29 had higher fruit weight than those on B.9 and Supporter 4. 'Gala' on G.30 had more fruit cracks than those on any of the other rootstocks. 'Gala' on B.9 had higher leaf nitrogen than those on Supporter 4 and G.30. Trees on B.9 had lower leaf potassium than those on other rootstocks. In contrast, trees on B.9 and RN-29 had higher leaf magnesium, and trees on B.9 had higher leaf calcium, than those on the other rootstocks. Overall, RN-29 and B.9 were found to be suitable for 'Gala' in this experiment.

1-MCP Concentration and Timing of Application Alters the Ripening of 'McIntosh' Apples during Storage

Jennifer DeEll, Fresh Market Quality Program Lead, OMAFRA, Simcoe; Jennifer Ayres, Research Assistant; and Dennis Murr, University of Guelph

This study evaluated the effects of 1-methylcyclopropene (1-MCP; SmartFresh^{SM}) concentration (1000 vs. 625 ppb) and treatment delays (3, 7, and 10 days after harvest) on the ripening and incidence of storage disorders in 'McIntosh' apples from three harvest times. Apples were stored in air at 0-1^{o}C for 3 and 6 months or in controlled atmosphere (CA) storage at 3^{o}C for 6 and 9 months.

Apples treated with 1-MCP and held in air or CA storage were firmer than those not treated, but **this difference in firmness was less with later harvests, more delay before 1-MCP treatment, and longer storage time**. Apples treated with 1000 ppb 1-MCP were often firmer than those treated with 625 ppb after 6 months of storage and/or 7 d at 22^{o}C. These results show the importance of 1-MCP concentration and time between harvest and application. Since a specific amount of 1-MCP is utilized for a range of commercial room sizes (SmartFresh^{SM} application by AgroFresh Inc.), in certain commercial situations the concentration of 1-MCP can be less than the expected 1000 ppb and for cultivars like 'McIntosh' this can reduce the beneficial effect on firmness. The SmartFresh^{SM} label in Canada states that application must be made within 3 days of harvest, whereas the window for treatment in the USA is 7 days. Firmness retention in 'McIntosh' apples due to 1-MCP would be better with application closer to harvest, as indicated by the results of this study.

Ethylene and respiration were reduced in apples treated with 1-MCP, especially in fruit from the first harvest and those treated 3 days after harvest. Fruit treated with 1000 ppb 1-MCP showed a slower increase in ethylene production than those treated with 625 ppb during 14 days at 22^{o}C after storage. Storage disorders were most prevalent in 'McIntosh'

apples stored for 6 months in air at 0-1°C, while fruit from the first harvest treated with 1-MCP 3 days after harvest developed the fewest disorders. 1-MCP reduced the incidence of superficial scald, flesh browning, core browning, and senescent breakdown, while 1-MCP concentration and treatment delay had varying effects.

The research described here has provided the basis for the Canadian SmartFresh℠ label and the recommendation by AgroFresh Inc. that 'McIntosh' apples should be treated within 3 days of harvest. The importance of minimizing 1-MCP treatment delays becomes greater as storage time increases and apples are pushed to their maximum life span. 1-MCP concentrations less than 1000 ppb due to application methods can also reduce the beneficial effects in 'McIntosh' fruit, especially with treatment delays or long-term storage periods. Therefore, storage operators should take care as to when and how their apples are treated with 1-MCP.

Anyone wanting the complete scientific paper (in HortTechnology, 2008) can contact the author at Jennifer.DeEll@ontario.ca

Reminder: Best Practices for Producing Sweet Apple Cider

by John Henderson, Risk Management Specialist, OMAFRA, Brighton

Chemical and microbiological contaminants can be introduced in sweet apple cider at any step during the production process. Pasteurization and UV treatment can reduce microbiological contamination but will not prevent post-treatment contamination. Studies have shown that a "kill step" alone may not always prevent contamination with microorganisms, and food-borne illnesses.
Apple cider for children, the elderly, or immuno-compromised people should be pasteurized or UV-treated. Untreated cider should be clearly labeled **Unpasteurized**.

The following are best practices all cider pressers should follow:

Fruit Quality
- Check all fruit for quality; cull out damaged, rotten, soiled or wormy apples
- Custom pressers should enter into a Grower's Agreement

Fruit Sorting
- Use only sound, whole apples
- Use only food-grade surfaces to inspect apples
- Check apples before they enter the flume or wash-water

Fruit Cleaning
- Wash, brush and rinse all fruit to eliminate foreign material
- Use potable water for washing and rinsing
- Wash water should be at least 5°C warmer than the fruit to be pressed
- Do not recycle flume, wash and rinse water

Premise
- Press cider in an enclosed area
- Adopt good manufacturing practices (clean facilities, properly sanitized)
- Exclude animals from the processing facility

Equipment
- Use stainless steel or food-grade equipment for food-contact surfaces
- Clean, rinse and sanitize all equipment and utensils, at least daily

Water Supply
- Use potable water for processing
- Provide hot and cold water at adequate pressure
- Avoid connections between potable and non-potable water systems

Personnel
- Ensure good employee hygiene and behaviour
- Provide proper washroom facilities
- Exclude ill workers from the processing operation

Fruit Processing
- Keep processing area clean
- Clean and sanitize all equipment and press cloths after each batch
- Keep records of all microbial testing
- Dispose of pomace after each day's run
- Keep records of ingredients (eg. preservatives) added during processing

The complete article can be found *on the OMAFRA website: http://www.omafra.gov.on.ca/english/food/inspection/juice/cider_production.htm*

Here are some additional references for cider producers:

Cider Productions Workbook
www.omafra.gov.on.ca/english/food/inspection/juice/cider_producer_manual.pdf

Blank Cider Forms
www.omafra.gov.on.ca/english/food/inspection/juice/blank_cider_form.pdf

Recommendations for the Production and Distribution of Juice in Canada
www.cfis.agr.ca/english/regcode/hrt/juprode.shtml

Best Practices for the Production of Sweet Apple Cider - Apple Management
www.omafra.gov.on.ca/english/food/inspection/juice/apple_management.htm

Best Practices for the Production of Sweet Apple Cider Labelling and Storage
www.omafra.gov.on.ca/english/food/inspection/juice/cider_labelling.htm

Prevent Lead Contamination in Apple Cider
www.omafra.gov.on.ca/english/food/inspection/juice/prevent-lead-apple-cider.htm

Foods of Plant Origin - Inspection Programs
www.omafra.gov.on.ca/english/food/inspection/fs_food_plant.htm.

Crop Protection

It's the Year of the Survey!

by Denise Beaton, OMAFRA Crop Protection Program Lead

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) is conducting another pesticide use survey for the 2008 year. OMAFRA has surveyed Ontario agricultural growers every five years since 1973 to compile a record of the use of pesticides in Ontario agricultural production.

If you were one of the lucky randomly-selected growers asked to complete the 2008 OMAFRA pesticide use survey, you will receive your reminder package soon in the mail with a postage-paid return envelope. Participation in this survey is voluntary, but strongly encouraged. You will not be asked to identify yourself or your farm operation, just the county. The information you provide is compiled at the University of Guelph (Ridgetown Campus) and is strictly confidential.

Why does Ontario collect pesticide use information? What are the benefits for growers?

Ontario is one of the few provinces in Canada that collects this information. It helps to track changes in the pesticide products used in various crops. Also, OMAFRA has used this information to support and justify work that directly benefits Ontario growers:

- applied research projects for many commodities, geared toward pesticide reduction and integrated pest management
- minor use pesticide registrations, and
- policy decisions.

Remember that it is important to document all unsprayed acreage as well.

If you have any questions, please call the Ontario Pesticide Education Program at 1-800-652-8573. Thank you in advance for participating in this important survey.