

ORCHARD NETWORK

For Commercial Apple Producers

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In this issue…

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Orchard Management

What is the Soil Health Assessment & Plan (SHAP)?

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Soil health describes how soil functions respond to applied management practices interacting with inherent soil properties. Healthy soil functions contribute to improved tree productivity and resilience. There are a variety of functions provided by healthy soil including aeration, water drainage & availability, and nutrient cycling & availability. Measuring soil health enables farmers and farm advisors to identify areas for improvement. A comprehensive approach has been developed to assess soil health in Ontario within orchard crop systems. These soil health assessments are best completed in late Spring (June).

The simple answer

SHAP is a new tool from OMAFRA that allows you to measure soil health on your farm. At its core is a laboratory soil health test (SHAP Test) that evaluates key physical and biological indicators of soil functions. Optional modules can be added on to further evaluate management and assess risks, including compaction, erosion, tillage intensity, living roots, and soil structure. SHAP guides users through sampling, evaluation, and interpretation of results to come up with a tailored soil health management plan.

Figure 1. Soil Sampling Tools - Soil Probe, bucket, sample bag

A little more information

While samples can be sent to the lab along with a simple paper submission form, SHAP is designed to be completed through Survey 123, which can be used as an app or through a browser. Survey 123 simplifies data entry, performs calculations, and can automatically pull information from soil maps based on a GPS location (Figure 2).

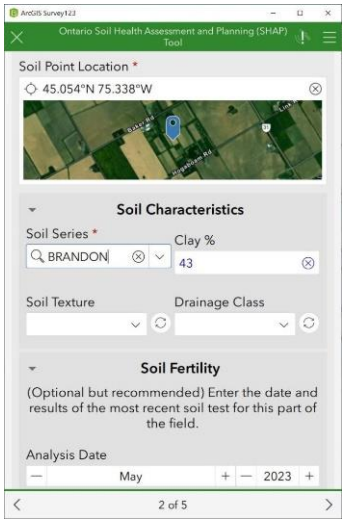

Figure 2. Screenshot from Survey 123. Soil characteristics automatically load in app.

SHAP is divided into two parts. The Soil Management Survey collects background information about the soils, current management practices, soil health issues and goals for the field to be tested. The In-field Data Collection form guides the sampling process and collects information on the time, specific location, and texture of the sample.

In the field, composite samples from 15-20 regular 6" (15 cm) cores are collected within a 3-meter radius of the point selected for assessment. Point sampling is recommended over zone or traditional composites for better consistency with future re-sampling. Inherent soil characteristics like texture and drainage are automatically collected by the Survey 123 app from soil map data of the sample location, or paper submission forms can be used instead. The soil sample is then sent to a laboratory using the standard SHAP package, which includes:

- Soil organic matter (SOM)
- Active carbon (POXC)
- Soil respiration
- Potentially mineralizable nitrogen (PMN)
- Aggregate stability

Soil health indicators from each sample are scored (0-100) according to how they compare to The laboratory measured values are scored against other similar textured soils in a growing database of over 1500 results from samples of fields across southern Ontario (**Error! Reference source not found.Error! Reference source not found.**).

Good Yield Region

Indicator	Measured Value	Score
SOM (%)	4	63
Aggregate Stability (%)	91	80
Active Carbon (ppm)	470	21
Respiration (mg CO2)	18	32
Potentially-mineralizable Nitrogen (ug N / g dry soil /week)	7	32

Poor Yield Region

Indicator	Measured Value	Score
SOM (%)	3	27
Aggregate Stability (%)	88	65
Active Carbon (ppm)	400	10
Respiration (mg CO2)	18	32
Potentially-mineralizable Nitrogen (ug N / g dry soil /week)	2	6

Figure 3. Example SHAP test measurements from a good yield vs poor yield region and their corresponding score (100 = Best)

The full story

Choose your own adventure

The modular design of SHAP makes it possible to use it as a simple test, a comprehensive assessment, or to select only the evaluations most relevant to your situation. Your own goal(s) for performing SHAP will determine how and where to sample, and which modules to add. Common goals include:

- setting a benchmark to compare to future assessments for identifying trends
- understanding the most important limitations and risks to soil productivity
- comparing zones or good and poor areas in a field

Add-on modules

There are several optional modules which can be added on top of the SHAP Test. These provide additional information and a more in-depth view of soil health challenges and options for improved soil management. Current modules include:

- **Tillage disturbance index** – rates the tillage system by the intensity of soil disturbance
- **Living roots index** – measures the proportion of the year with living roots in the soil
- **Water erosion risk assessment** – calculates risk of water erosion across a field based on landscape, tillage, and cropping factors
- **Compaction risk assessment** – estimates risk of subsurface compaction based on equipment and soil characteristics
- **Soil structure assessment** – scores the quality of the soil surface and of topsoil structure in the field (Figure 3)

Figure 3. An example of a soil being evaluated using the visual evaluation of soil structure (VESS) within the soil structure assessment module.

These modules will require additional user inputs. They provide different types of information, different ways to assess soil health, and different spatial scales than the SHAP Test. Combined, they address soil health issues that can't be evaluated in a lab and allow for greater detail and specificity in the management recommendations resulting from SHAP.

Interpreting and using results

The Soil Health Management Plan (Figure 4) is the key to providing value from the results of SHAP to the farm operation. It recommends specific management actions that should be taken in the immediate, short, and long-term to address any concerns identified over the course of the assessment. A good plan integrates knowledge of the operation's current management and objectives, and includes enough detail in the considerations to ensure successful implementation.

Soil Health Management Plan

Refer to this table for management practice recommendations to address your most-limiting soil health factors.

	Recommendations	Factors to consider	Soil concerns addressed
Early Wins (implement next season)	Identify and set permanent tramlines to control manure tanker traffic	Make sure A-B lines are loaded into each tractor	Soil compaction
	Reduce maturity of soybean varieties to ensure earlier seeding of winter wheat – to achieve improved wheat yields and thicker soil cover over winter	Ensure soybean variety is adapted for your region and strong performance in Ontario variety trials	Water erosion
Short Term (next 2-5 seasons)	Consider replacing tires with higher flexion technology	Upgrade when current tires are replaced (or sooner)	Soil compaction
	Consider investment in a Central Tire Inflation System to optimize tier pressure for both in-field and road conditions	Central Tire Inflation System (CTIS) likely have greatest impact on manure tanker, then sprayer	Soil compaction
	Further incorporate cover crops in your crop rotation	Consider custom application of cereal rye into grain corn in late August-early September prior to soybeans	Soil surface structure Water erosion
Long Term (5+ seasons)	Maintain water and sediment control basin to ensure it continues to function properly	Seed to grasses and keep trim; avoid tree establishment	Water erosion
	Consider a controlled traffic farming system (for all equipment)	Equipment width matching is critical; opportunity to address when there is equipment turnover. Partial controlled traffic system is beneficial if full system not possible	Soil compaction Soil surface structure
	Continue diverse crop rotation and use of annual forages	Continue use of high-yielding, adapted varieties and nutrient planning	All

Figure 4. An example Soil Health Management Plan derived from interpretations of SHAP.

For more information

A SHAP Guidebook has been published by the OMAFRA Soil Team. It contains detailed information and step-by-step instructions for conducting SHAP. You can access it on the SHAP landing page on fieldcropnews.com.

Crop Protection

Talk About Boring! Status of Ambrosia Beetle in Ontario Apple Orchards

Kristy Grigg-McGuffin, Horticulture IPM Specialist, OMAFRA

Ambrosia beetles are a group of wood-boring insects that can attack and kill young fruit trees. Although these beetles typically attack trees under physiological stress such as flooding, drought, winter injury or those weakened by pests, some species in this complex can attack apparently healthy trees. Three species, in particular - *Xylosandrus germanus*, *Xylosandrus crassiusculus* and *Xyleborinus saxesenii*, have been causing substantial damage in high-density apple orchards in New York, New Jersey and Michigan. The species of greatest concern in the United States are the black stem borer - *X. germanus* (Figure 1) and the granulate ambrosia beetle - *X. crassiusculus*.

The Not-So Boring Borers

The adult beetles are very small, about 2 to 3 mm in length. In the springtime, mated females leave their overwintering sites in search of new trees to colonize. Females bore into the trunk or branches to create tunnels and branched chambers called galleries where her developing brood will grow.

Figure 1. Black stem borer, *Xylosandrus germanus* (Photo: Pennsylvania Dept. of Conservation & Natural Resources)

This group of beetles do not digest the woody tissue of host plants. Instead, the beetles have an *obligate mutualistic relationship* – species are entirely dependent on each other – with a group of ectosymbiotic fungi called ambrosia (hence their name – nothing to do with the Ambrosia apple!!). Ambrosia fungi are carried into the gallery on the beetle's body when she colonizes the tree and becomes the food source for both the female and her developing brood. The presence of the fungi disrupts the nutrient and water flow in the tree, causing sap to collect at the gallery surface (Figure 2). The ambrosia fungi alone do not kill a tree; however, the combination of high beetle density and fungal activity can cause wilting and eventual tree death. The secondary introduction of other plant pathogens such as fire blight or black rot into these beetle galleries can also cause tree decline.

Ambrosia beetles have a wide host range that includes many woody plants. Trees near the perimeter of orchards, especially near woodlots, are at greatest risk of attack. While signs of infestation in an orchard can be challenging, common symptoms include small entry holes (1 mm diameter), often with oozing sap, discoloured or blistering bark, and sawdust "toothpicks" from tunnel excavations that protrude from the holes (Figure 3). Some growers have reported that heavily infested trees appear to spontaneously collapse (Figure 4).

Figure 5. Signs of ambrosia beetle infestation can include small entry holes (1 mm diameter) that often ooze with sap.

Status in Ontario

In surveys since 2016 using slow-release ethanol traps along orchard perimeters, several species of ambrosia beetle have been identified in Ontario apple growing districts, including:

- *Anisandrus dispar* (European shot-hole borer or pear blight beetle)
- *Anisandrus sayi* (no common name)
- *Xylosandrus germanus* (black stem borer) **– MOST ABUNDANT!**
- *Xylosandrus crassiusculus* (granulate ambrosia beetle)
- *Xyleborus obesus* (no common name)
- *Monarthrum mali* (apple wood stainer)
- *Xyleborinus saxesenii* (fruit tree pin-hole borer)
- *Xyleborinus attenuates* (no common name)

Depending on the species, activity varied from peak adult emergence in late June to later season flight activity in early August.

It is possible that not all of these beetles are attacking apples, as the ethanol baits may attract beetles from nearby woodlots or adjacent hedgerows. However, *X. germanus* has been consistently confirmed in dead or dying trees collected in Ontario.

Figure 3. Sawdust “toothpicks” protruding from small entry holes caused by ambrosia beetle.

Managing Ambrosia Beetle

Unfortunately, trunk sprays have limited effectiveness since beetles spend the majority of their lifecycle inside the host tree. Preventative application of repellents (e.g., pyrethroids) may deter or kill females as they attempt to find a host and excavate new galleries. However, timing is challenging, particularly if several species are present. Regular monitoring of beetles is required to determine early and peak activity periods of those species causing damage.

In the absence of registered insecticides to target colonizing females, the only management strategy we have available in Ontario is the removal of dead branches and dying trees. Since beetles will complete their life cycle inside the wood of the tree, all infested tissue should be burned. Maintaining tree health, such as proper irrigation and good fertility can prevent beetle colonization as well as help trees with low levels of infestation to recover.

Figure 4. Collapsing apple trees heavily infested with ambrosia beetle.

Want to Learn More?

Join us at the 2024 Ontario Fruit & Vegetable Convention on Thursday, February 22nd when Dr. Justin Renkema from Agriculture & Agri-Food Canada will dive deeper into the world of ambrosia beetle and their management in Ontario.

KOCIDE® 2000-O Fungicide label expanded via Minor Use Program to help manage Apple Scab and Fireblight on Apples in Canada

Josh Mosiondz, Minor Use Coordinator, OMAFRA

The Pest Management Regulatory Agency (PMRA) recently announced the approval of a minor use label expansion registration for KOCIDE® 2000-O Fungicide for control of Apple Scab and Fireblight on Apples in Canada. KOCIDE® 2000-O Fungicide was already labeled for disease control on a wide range of crops in Canada. This minor use proposal was submitted by the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec as a result of minor use priorities established by growers and extension personnel.

The following is provided as an abbreviated, general outline only. Users should be making disease management decisions within a robust integrated disease management program and should consult the complete label before using KOCIDE® 2000-O Fungicide.

Crop(s)	Target	Rate (kg / ha)	Application Information	PHI (days)
Apples	Control of Apple Scab	0.84 – 1.96	Make one application every 5-7 days starting application between silver-tip and green-tip. Apply as a full cover spray for early season disease suppression. Use the higher rate when conditions (site history, cultivar sensitivity, predictive model) favour disease progression. Apply using ground application equipment or airblast only. Note: Moderate to severe crop injury may occur from late application; discontinue use when green-tip reaches 1/2 inch. Do not exceed the maximum annual rate of 11.43 kg/ha.	2
	Control of Fireblight	0.56 – 0.84		

TOXIC to aquatic organisms and non-target terrestrial plants. Observe spray buffer zones specified under DIRECTIONS FOR USE. Toxic to birds and small wild animals.
To reduce runoff from treated areas into aquatic habitats avoid application to areas with a moderate to steep slope, compacted soil, or clay. Avoid application when heavy rain is forecast. Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative filter strip between the treated area and the edge of the water body.

Follow all other precautions, restrictions, and directions for use on the KOCIDE® 2000-O Fungicide label carefully.

For a copy of the new minor use label contact Kristy Grigg-McGuffin, Horticulture IPM Specialist OMAFRA, Simcoe (519) 420-9422, your regional supply outlet, or visit the PMRA label site http://www.hc-sc.gc.ca/cps-spc/pest/registrant-titulaire/tools-outils/label-etiq-eng.php

Note: This article is not intended to be an endorsement or recommendation for this particular product, but rather a notice of registration activity

Pest Susceptibility of Common Apple Cultivars and Rootstocks

Kristy Grigg-McGuffin, Horticulture IPM Specialist, OMAFRA

Pest susceptibility varies amoung apple cultivars and rootstocks. Understanding, selecting and managing for particular characteristics is an important component to a successful integrated pest management (IPM) program. This information can be used when buying new trees, selecting appropriate planting sites or developing a block design, considering a pest control program including resistance management strategies, as well as for scouting or monitoring. With the recent announcement of the Growing Future Opportunities Initiative, a cost-share program to assist growers in replanting, there will be many considering rootstock and cultivar options best for their farm.

Table 1 summarizes some of the more common apple cultivars grown in Ontario. It is by no means an extensive list. For more information on other cultivars, see the reference list at the end of this article. While some cultivars have resistance to a number of the major diseases Ontario growers deal with, those growers who sell to retailers will be largely influenced by market acceptability. For example, organic growers or those who have on-farm markets can have a consumer base for scab-resistant cultivars such as Enterprise, Freedom, Liberty, Prima or Pristine, whereas large-scale retailers would not.

As with every management strategy in an IPM program, use of resistant cultivars is not a stand-alone control. Under high disease pressure, even resistant cultivars can show symptoms. However, incorporating cultural (e.g., orchard sanitation, urea, removal of wild hosts), physical (e.g., pruning) and chemical (e.g., organic, biological or conventional pesticides) controls in disease-resistant plantings will help reduce overall inoculum pressure from these pathogens long-term.

Continue to also monitor and manage other diseases common in Ontario orchards, such as fruit rots, sooty blotch and fly speck. These pests may become an issue if fungicides that normally control them are reduced (e.g., after primary scab infection period or late summer). While there are cultivars that are known to be more susceptible to these diseases, there are no resistant cultivars available.

Table 2 summarizes pest susceptibility characteristics of some apple rootstocks. Similar to Table 1, this list is not extensive nor does it represent what rootstocks are currently available in your area. Speak with your nursery to determine your options. For fire blight and, to an extent, woolly apple aphid, rootstock resistance can be conferred to the scion. Again, similar to what was mentioned earlier, this would be under ideal conditions only. If pest pressure is high, relying on rootstock resistance alone will not provide effective control, especially if the cultivar is susceptible to the pest.

Replant disease complex consists of several pathogens (*Cylindrocarpon*, *Pythium* spp., *Fusarium*, and *Rhizoctonia*), bacteria and parasitic nematodes as well as abiotics factors such as soil pH, moisture stress, soil compaction, toxins, soil structure and nutrient availability. Rootstocks are considered tolerant to replant disease when they show a level of resistance to one or more pathogens. This doesn't account for all factors that come into play with the replant disease complex and may not improve tree vigour depending on the planting site.

The ability of a rootstock to tolerate insect pressure can be considered with woolly apple aphid and borers that prefer burr knots such as dogwood borer. In sites that have a history of pest pressure, rootstock selection may be beneficial. It is important to note however, there are root and aerial populations of woolly apple aphid. If control is limited with the aerial population, tree vigour will still be reduced, particularly on young trees. As well, dogwood borer infests a tree at a weakened site which also includes near cankers, pruning cuts, mechanical damage or winter injury. Management of the population will still be important even if burr knots are minimal.

Table 1. Disease susceptibility ratings of common apple cultivars

Cultivar	Scab	Fire Blight	Powdery Mildew	Rusts[1]
Ambrosia	VS	S	R	S
Belmac	R	–	T	R
Braeburn	S	VS	S	S
Cameo	S	S	R	S
Cortland	VS	S	S	S
Crimson Crisp	VR	T	T	S
Delicious (Red)	S	R	T	VR
Delicious (Golden)	S	S	VS	S
Dayton	VR	R	T	T
Early McIntosh	S	R	T	R
Empire	VS	R	S	R
Enterprise	VR	R	S	R
Freedom	VR	VR	R	R
Fuji	S	VS	R	varied
Gala	VS	VS	S	varied
Ginger Gold	VS	VS	S	VS
GoldRush	VR	T	S	S
Gravenstein	S	S	VS	varied
Honeycrisp	T	R	S	S
Idared	S	VS	S	VS
Jerseymac	VS	S	S	VR
Jonagold	S	VS	S	R
Jonamac	S	S	S	R
Jonathan	S	VS	VS	S
Liberty	VR	R	R	VR
Lodi	S	VS	R	S
Macoun	VS	S	T	R
McIntosh	VS	S	T	VR
Mutsu (Crispin)	VS	VS	S	S
Northern Spy	S	S	S	S
Novamac	VR	VR	VR	VR
Nova Spy	R	–	S	MR
Paulared	R	VS	T	R
Pink Lady	VS	VS	R	R
Pristine	VR	R	R	S
Silken	VS	–	S	VS
Stayman	VS	S	VS	S
Wealthy	S	S	S	VS
Zestar!	S	S	R	S

VS = very susceptible **S** = susceptible **T** = tolerant (moderately resistant under ideal conditions) **R** = resistant **VR** = very resistant

[1] Rusts include cedar-apple rust and quince rust. Resistance in a cultivar may vary depending on type of rust.

Table 2. Pest susceptibility ratings of common apple rootstocks

Rootstock	Fire Blight	Phytophthora	Replant Disease Complex[1]	Woolly Apple Aphid[2]	Burr Knot Formation[3]
Budagovsky series					
B.9	S	T	–	S	medium
B.118	–	T	–	S	–
Malling series					
M.7	T	T	–	S	medium
M.9	S	T	–	S	high
M.26	S	S[4]	–	S	high
M.27	T	T	–	S	low
Malling-Merton series					
MM.106	S	S	–	T	low
MM.111	R	T	–	R	high
Geneva series					
G.11	R	T	T (partial)	S	low
G.16	R	T	T (partial)	S	low
G.30	VR	T	T	S	low
G.41	VR	T	T	R	low
G.202	VR	T	T	R	low
G.210	VR	T	T	R	low
G.213	VR	T	T	R	low
G.214	VR	T	T	R	low
G.222	VR	T	S	R	medium
G.814	VR	T	T	S	medium
G.890	VR	T	T	R	low
G.935	VR	T	T	S	low
G.969	VR	T	T	R	low
Other					
Ottawa 3	S	T	–	S	low
Vineland series	R	–	–	–	low

S = susceptible **T** = tolerant (moderately resistant under ideal conditions) **R** = resistant **VR** = very resistant

[1] Replant disease complex consists of several pathogens (*Cylindrocarpon*, *Pythium* spp., *Fusarium* and *Rhizoctonia*), bacteria and parasitic nematodes

[2] Does not effectively control high pressure from aerial colonies of woolly apple aphid.

[3] Burr knots are common entry points for insect pests such as dogwood borer.

[4] Though moderately resistant to *Phytophthora*, M.26 will not perform well on poorly-drained sites.

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Fungi, bacteria, viruses, oh my! How pathogen diagnostics can inform your disease management

Katie Goldenhar, Pathologist – Horticulture, OMAFRA

Every year seems to throw a curveball at growers and 2023 has been no different. The deluge of rain has increased the presence of many summer diseases and if we know one thing about apples, they can get a lot of diseases. Plant diseases are caused by microscopic organisms, known as pathogens (including fungi, bacteria, viruses, oomycetes, nematodes), making them inherently difficult to confidently diagnose. Symptoms are a plants expression of a pathogen infection, such as wilting, leaf spots, galls, and fruit rot. Disease symptoms can be easily confused with nutrient deficiencies, environmental stressors or even insects. Signs are the actual organism or biproduct of the organism, such as mycelium, fungal fruiting bodies or bacterial ooze, and signs can confirm that a symptom is caused by an infection of a pathogen. In many cases signs are not present, and we are left to figure out what is going on. Some diseases we can diagnose based on the symptoms and signs alone (figure 1), but many diseases, like root rots or cankers (figure 2), can be challenging to diagnose based on symptoms alone.

Figure 6. Bitter rot on apple

Figure 2. Canker on apple trunk

Why does it matter what is causing the disease? Pathogens or causal agents will have different control options. While some management will be effective at reducing most diseases, like orchard sanitization, other techniques like crop protection products vary depending on the pathogen.

To best inform management decisions, diagnosing a suspected disease can require the help of a diagnostic lab. Diagnostic labs have the expertise and equipment to identify these microscopic organisms. This can be done with basic microscopic analysis of physical structures like spores or by using molecular analyses such as ELISA or PCR. There are pros and cons to all methods but in general, a reputable lab will know what methods are needed or not based on the information they receive. For example, if you are concerned about plant viruses, the diagnostician would only use molecular methods to screen for viruses.

Figure 3. (left) a dead tree (right) a tree with early signs of decline

Quality results from a diagnostic lab require quality samples to be sent in and supporting information to help inform the diagnostician of the issue. Figure 3a shows a dead tree that is not suitable for figuring out the primary issue. Dead plant tissue will be colonized by saprophytic (or secondary) fungi who will be detected in the diagnosis but aren't the primary

pathogen causing the problem. Figure 3b shows a declining tree that will have fewer secondary organisms present and the main pathogen will be easier to diagnose.

To learn more about diagnosing diseases and making informed management decisions, register for the Ontario Fruit and Vegetable Convention. In the Thursday afternoon apple session, I will discuss best sampling practices, modern lab diagnostics and report interpretation and limitations.

Announcements

Ontario Fruit and Vegetable Convention 2024

February 21-22, 2022

The Ontario Fruit and Vegetable Convention (OFVC), Canada's premier horticultural event, is returning to the Niagara Falls Convention Centre, Ontario on **February 21-22, 2024**. Registration is now open. For more information on pricing, trade show and speaker program, visit http://www.ofvc.ca.

The Apple speaker program will be an additional half-day session, taking place Wednesday afternoon, Thursday morning, and Thursday afternoon.

Wednesday, February 21

AFTERNOON

2:00 **Expert Thinning Panel**
Dr. John Cline, University of Guelph; Dr. Todd Einhorn, Michigan State University

2:45 **Grower Thinning Panel**
Gerbe Botden, Botden Orchards; Ian Parker, Wilmot Orchards; Leslie Huffman, The Fruit Wagon

3:15 **Round Table with Previous Panels**

Thursday, February 22

MORNING

9:30 **Insight into Cropload Management**
Dr. Todd Einhorn, Michigan State University

10:00 **Ambrosia Beetles in Ontario Apple Orchards**
Dr. Justin Renkema, AAFC

10:30 **Non-fumigant Approaches to Pre-Plant Management of Nematodes and Apple Replant Disease**
Dr. Tom Forge, AAFC

11:00 **Cider Apple Production & Selection**
Elizabeth Garofalo, University of Massachusetts

AFTERNOON

2:00 **Orchard Economics**
Alison DeMarree, DeMarree Farms

3:00 **In Orchard Diagnostic for Soil and Nutrient Management**
Dr. Bernardita Sallato Carmona, Washington State University

3:30 **Fungi, Bacteria, Viruses, Oh My! How Pathogen Diagnostics Can Inform Your Disease Management**
Katie Goldenhar, OMAFRA

Other educational sessions that may be of interest to apple growers include:

- Farming Basics for New Growers Part I & II
- Farming Basics for New Growers: Part I & Part II
- Cider
- Labour
- Managing Soil Pathogens
- Soil Health & Fertility
- Drone Spraying in Canada
- Cost of Production
- What's The Deal With Sustainability?
- Women In Agriculture Breakfast
- Young Farmer Forum

...and more!

For the full speaker program, visit https://www.ofvc.ca/sessions.html.

Agricultural Information Contact Centre: **1-877-424-1300**
E-mail: **ag.info.omafra@ontario.ca**
Northern Ontario Regional Office: **1-800-461-6132**

www.ontario.ca/omafra