



Another month has rolled by and a new year is upon us. With the somewhat extended (for me) holiday season, this edition was basically written as soon as the previous month's edition hit the press. Regardless of when you get to it, here is another edition of Hort Snacks for you to start your year off with.

In this edition, you'll find many, many different things. There are lots of events to consider attending (and more to come). There are some greenhouse pests to wrap your head around, some thoughts on the past year (highlights/lowlights), a bit of information on events and programs, as well as some information on the UN Year of the Periodic Table (with bonus chemistry jokes). Hopefully you'll find something to tickle your fancy and expand your knowledge.

I hope that the holiday season was restful for you and that it was filled with all of the good things that you love. I hope that it was a chance to replenish your batteries, regain some perspective and reposition yourself for the coming year. I wish you, your families and friends, and your farms/businesses, all the very best for the coming New Year. Please resolve to stay in touch. I always welcome suggestions, ideas, questions or simply the chance to sit down and have a nice chat.

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**FEATURED WEBSITE**

**Canadian Horticultural Council (CHC) –  
 Awareness campaign about international  
 foreign workers (videos)**

<https://www.hortcouncil.ca/en/projects-and-programs/awareness-campaign-on-international-farm-workers/>

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## THINGS TO DO / THINGS TO THINK ABOUT THIS MONTH

- Register for relevant winter workshops
- Consider specific training courses for both yourself AND staff (e.g. First Aid, Advertising, Electronic bookkeeping, Record keeping, etc.) – Book it
- Are all of your licenses or certificates up to date?
- Review your insurance coverage. Do you have sufficient for your activities? Are all the things that happen on your farm covered? Has anything changed?
- Review your project-to-do / wish list from the end of last season – What are some of the things that you identified?
- Start thinking about and planning your field layouts for the coming season. Does your current set up work for any new crops? Do you have sufficient space for everything you have planned (headlands, activities, parking, etc.)? Consider field orientation, irrigation systems, shelterbelts and traffic movement (foot, equipment, vehicles, etc.).
- Have you ordered the plant material that you will need for the next season? Planning and ordering in advance can save a lot of headaches in the spring.
- Are you ordering transplants? Growing your own? Cleaning up the greenhouse might also be in order.
- Update / tidy up / repaint sales sheds and signs

## NEWSLETTER USE RESTRICTIONS

Please feel free to share all or portions of this newsletter with other interested parties.

If you want to use content from this newsletter in other media, please request permission before doing so.

## MENTAL SNACKTIME - Resolve

- "Determination gives you the resolve to keep going in spite of the roadblocks that lay before you." – Denis Waitley
- "Divide each difficulty into as many parts as is feasible and necessary to resolve it." – Rene Descartes
- "To make our way, we must have firm resolve, persistence, tenacity. We must gear ourselves to work hard all the way. We can never let up." – Ralph Bunche
- "I believe that my worth is not measured by what I do, by the honors that are bestowed upon me, or by material wealth that I might obtain. Instead, I am measured by the courage I show while standing for my beliefs, by the dedication I exhibit to ensure my word is good, and the resolve I undertake to establish my actions and deeds as honorable." – Burgess Owens
- "The difficulties you meet will resolve themselves as you advance. Proceed, and light will dawn, and shine with increasing clearness on your path." – Jim Rohn
- "There is no scarcity of opportunity to make a living at what you love; there's only scarcity of resolve to make it happen." – Wayne Dyer
- "Wise to resolve, and patient to perform." – Homer
- "Resolve and thou art free." – Henry Wadsworth Longfellow



## Q: What are your business-related New Year's resolutions?

A: While I hope for a busier year I make 0 resolutions preferring to work daily to make life easier

A: Market better. Pull more weeds. Merry Christmas to you and yours and a very Happy New Year.

A: Establish 5 new, active business relations

A: Get my operations up and running

A: Strive to be more efficient

A: To make an 'official' binder full of standard operating procedures. Lol. So everyone performs work tasks the same. This will also include an approximate amount of time allowed for each task

A: I'd like to source a decent amount of funding to allow me to do some useful extension programming, with a focus on new horticulture producers, to help grow the industry. I'd also like to establish a nice, clear plan for the department to support the growth of the horticulture industries in Alberta – R. Spencer (AAF)

Next Month's ? → [What is something that you identified last year as needing a change or an update, which you are planning on implementing in 2019?](#)

## Upcoming Conferences / Workshops

### January 2019

- **Potato Expo 2019**  
Jan 9-10, 2019 – Austin Convention Centre – Austin, TX, USA  
[www.potato-expo.com](http://www.potato-expo.com)
- **North American Raspberry Blackberry Conference**  
Jan 9-11, 2019 – Savannah, GA, USA  
<http://www.raspberryblackberry.com/>
- **Agronomy Update 2019**  
Jan 15-16, 2019 – Sandman Signature Lethbridge Lodge – Lethbridge, AB  
Ropin' the Web ([www.agriculture.alberta.ca](http://www.agriculture.alberta.ca)) – Coming Events
- **21<sup>st</sup> Annual Pacific Agricultural Show**  
Jan 24-26, 2019 – Tradex Exhibition Centre – Abbotsford, BC  
[www.agricultureshow.net](http://www.agricultureshow.net)
- **38<sup>th</sup> Annual Guelph Organic Conference & Expo**  
Jan 24-27, 2019 – Guelph University Centre – Guelph, ON  
[www.guelphorganicconf.ca](http://www.guelphorganicconf.ca)
- **Organic Alberta Conference – *Growing Health Farmers, Fields and Food***  
Jan 25-26, 2019 – Dow Centennial Centre – Fort Saskatchewan, AB  
<http://organicalberta.org/news/2019-central-conference/>
- **Scotia Horticultural Congress 2019 – “Farming’s Impact from Soil to Sales”**  
Jan 28-29, 2019 – Old Orchard Inn Convention Centre – Greenwich, NS  
<http://horticulturens.ca/scotia-horticultural-congress/>
- **Manitoba Potato Production Days**  
Jan 29-31, 2019 – Keystone Centre – Brandon, MB  
<http://www.mbpotatodays.ca/>
- **FarmTech 2019**  
Jan 29-31, 2019 – Edmonton Expo Centre at Northlands – Edmonton, AB  
[www.farmtechconference.com](http://www.farmtechconference.com)
- **50<sup>th</sup> Annual Northwest Agricultural Show**  
Jan 29-31, 2019 – Portland Expo Centre – Portland, OR, USA  
[www.nwagshow.com](http://www.nwagshow.com)

### In the News

- [Robotic hands which could spell the end for fruit pickers developed by Stanford scientists](#) – The Telegraph article
- [How healthy are fresh fruits and vegetables actually?](#) – HortiDaily article
- [Food expiration dates are about to undergo a revolution](#) – Israel21c article
- [Green and edible cling film and food packaging made from plants](#) – Phys.org article
- [How Ergonomics Training Can Improve Your Greenhouse Worker Productivity](#) – Growing Produce article
- [Anthocyanin: This Purple Pigment Fights Disease](#) – ProHealth.com article

## Upcoming Conferences / Workshops

### February 2019

- **34<sup>th</sup> Annual North American Farm Direct Marketing Association (NAFDMA) Convention**  
Feb 1-7, 2019 – Indianapolis, Indiana, USA  
<http://www.farmersinspired.com/Convention/>
- **9<sup>th</sup> North American Strawberry Symposium**  
Feb 3-6, 2019 - Wyndham Orlando Resort – Orlando, Florida  
[www.nasga.org](http://www.nasga.org)
- **Fruit Logistica 2019**  
Feb 6-8, 2019 - Berlin ExpoCenter City & CityCube Berlin – Berlin, Germany  
<https://www.fruitlogistica.com/>
- **2019 Manitoba Direct Farm Marketing Conference (Joint Prairie Fruit Growers Association / Direct Farm Manitoba)**  
Feb 8-9, 2019 – Canad Inns Destination Centre Polo Park – Winnipeg, MB  
<https://www.directfarmmanitoba.ca/news/direct-farm-marketing-conference-2019/>
- **Ontario Fruit & Vegetable Convention**  
Feb 20-21, 2019 – Scotiabank Convention Centre – Niagara Falls, ON  
[www.ofvc.ca](http://www.ofvc.ca)
- **Pre-Conference Workshop – Introductory Berry Production**  
Feb 27, 2019 – Nisku Inn – Nisku, AB
- **Alberta Farm Fresh School 2019 – Farm to Market to Table Conference**  
Feb 28 – Mar 1, 2019 – Nisku Inn – Nisku, AB  
[www.albertafarmfresh.com](http://www.albertafarmfresh.com)

### March 2019

- **2019 Canadian Horticultural Council (CHC) Annual Meeting – “Growing our Competitiveness”**  
Mar 5-7, 2019 – Westin Nova Scotian – Halifax, NS  
[www.hortcouncil.ca/](http://www.hortcouncil.ca/)
- **Canada Blooms 2019**  
Mar 8-17, 2019 – Enercare Centre – Toronto, ON  
[www.canadablooms.com](http://www.canadablooms.com)
- **Biocontrols USA West Conference and Expo**  
Mar 14-15, 2019 – Marriott Portland Downtown Waterfront – Portland, OR, USA  
<https://www.biocontrolsconference.com/usa-west/>

### In the News (continued)

- [IKEA: Furniture, meatballs... and vertical farms?](#) – HortiDaily article
- [Is digging down the future of vertical farming?](#) – HortiDaily article
- [The Anatomy of a Low-Effort Farmstand \[Infographic\]](#) – Growing produce article
- [The robots are coming, but will they take over?](#) – HortiDaily article



# FARM to MARKET to TABLE

## **A conference for**

Farm direct marketers

Farmers' market vendors

Farmers' market managers

Agri-tourism and Local Foodies

***February 28 – March 1, 2019***

***Nisku Inn & Conference Centre***

Nisku, Alberta

For more information including topics

Visit [www.albertafarmfresh.com](http://www.albertafarmfresh.com) or

[www.albertafarmersmarket.com](http://www.albertafarmersmarket.com)

***Eat, Drink, Play, Shop Local***



# Farm to Market to Table – tentative agenda

Thursday, February 28, 2019 – Day 1				TRADESHOW	NEW VENTURE CONSULTATIONS
<b>REGISTRATION and TRADESHOW</b>					
Welcome & Opening Remarks					
<b>PLENARY – A Farm to Table Story – North 49 Fruit Corporation</b>					
Improvement of fruit production potential, Prairie research	Distributors' Forum – Getting your products to expanded markets	A Farmer-Owned & Operated Licensed Abattoir	Waste Free Dreams for Your Farmers Market		
<b>LUNCH / Annual General Meetings – AFFPA</b>					
Dealing with Severe Weather: A Cool Head in the Aftermath	Demands of the Valley-Banff/Lake Louise	Revitalizing Your Pasture	Creative Ways to finance your Business		
Farm Safety Plans/OH&S - Requirements and Regulation	A CSA Story: Cropping Plans & Strategies to Keep Customers Coming Back	Livestock Nutrition and Nutrient Welfare	Managing Vendorship Issues		
CAP Programming– What's In It For The Farmer	A Taste of the Farm- Bridging the Rural Urban Agricultural Knowledge Gap	Changes to Anti-microbial Regulation for Livestock in Canada	How to Answer Your Customers' Socially Conscious Questions		
<b>Networking and Tradeshow</b>					
<b>Evening Program</b>	<b>Dinner, Awards, Evening Speaker &amp; Sips of Alberta Speaker – Gruger Family Fungi</b>				

Friday March 1, 2019 – Day 2				TRADESHOW	NEW VENTURE CONSULTATIONS
<b>REGISTRATION AND TRADESHOW</b>					
<b>PLENARY – Rig Hand Distillery</b>					
Fruit Grower Stories 1. Keeping Weeds at Bay in our Strawberries  2. Winning the War on Critters in Our Orchard	Starting a Market Garden – Production Q&A	From Concept to Commercialization	Innovative Ways to Include Children in the Market		
Equipment for Market Gardens	Getting the Most From Your Soil Fertility Inputs	Tour of the Leduc Food Processing Facility  <b>Pre-registration required</b>	Tips on Setting Prices at the Market - from Horticulture to Food to Crafts		
<b>LUNCH / Annual General Meeting – AFMA</b>					
Using High Tunnels in Alberta: What They Can Do For You – If They Don't Blow Away	Cover Crops for the Prairies	Farm Energy Program and Solar options	Excellent Practices in Market Management - Market Managers meetup		
Packaging Options – Decreasing the Impact of Single Use Plastics	Plant Health Problems of 2018	Herbicides used for Fruit and Vegetable Production	Software for Your Farmers' Market		



# Introductory Fruit Production Workshop



This workshop provides new or potential direct market producers with information and resources on all aspects of fruit production (Saskatoon berries, strawberries and raspberries) in Alberta. Sessions include information on production, including varieties, establishment, maintenance and harvest, as well as economics. The workshop includes time for networking and questions throughout the day.

## Registration Information

**Dates:** February 27, 2019

Nisku Inn & Conference Centre, 1101 4th Street, Nisku, AB

**Registration deadline:** February 20, 2019

**Time:**

8 a.m. to 9 a.m. registration

9 a.m. to 12 noon – Starting a direct market operation / Economics & Pricing / Saskatoon berry production

12 to 1 p.m. – Lunch & Networking

1 p.m. to 4:30 p.m. – Strawberry Production / Raspberry production / Pest Resources

**Cost:**

\$50/person (including GST) - lunch, breaks and resource materials provided

To register online visit:

**Registration link coming soon**

[www.albertafarmfresh.com](http://www.albertafarmfresh.com)



Participants should also consider registering for:



FARM to MARKET to TABLE



## Canadian Agricultural Partnership (CAP) PROGRAMS – “The Partnership”

Have a look at the new Canadian Agricultural Partnership (CAP) Program website ([www.cap.alberta.ca](http://www.cap.alberta.ca)). CAP is a five-year, \$3 billion federal-provincial-territorial investment in the agriculture, agri-food and agri-based products sector. It is the successor of the 2013-18 Growing Forward 2 (GF2) partnership.

In Alberta, CAP represents a federal - provincial investment of \$406 million in strategic programs and initiatives for the agricultural sector. The roll-out of the CAP program suite in Alberta began in April, 2018, and consisted of a phased roll-out of 15 programs over the spring, summer and fall of 2018. Applications and program details consisting of cost-shares and eligible activities and/or items are released with the opening of each program. The criteria for eligibility are made available along with the program details.

Please note, there are some differences between CAP and GF2 programs, including many of the programs being merit-based (as opposed to 1<sup>st</sup> come/1<sup>st</sup> served), with specific intake periods staged throughout the year. Check each program for specifics.

In Alberta, CAP will deliver programs developed in consultation with stakeholders, and is organized under five themes: Environmental Sustainability and Climate Change; Products, Market Growth and Diversification; Science and Research; Risk Management; and Public Trust.

If you had subscribed to receive updates from the GF2 website, you will have to re-subscribe for updates from CAP. Click on the **ORANGE** button in the upper right of the CAP homepage, to subscribe.

[www.cap.alberta.ca](http://www.cap.alberta.ca)

The details on the 5 themes of programs have been released and a number of programs are open. Programs will open and close at different times, depending on intake periods, program capacities, etc. The following programs are included:

<p><b><u>Environmental Sustainability &amp; Climate Change Theme</u></b></p> <ul style="list-style-type: none"> <li>• Environmental Stewardship and Climate Change - Group</li> <li>• Environmental Stewardship and Climate Change - Producer</li> <li>• Farm Water Supply</li> <li>• Irrigation Efficiency</li> </ul>	<p><b><u>Products, Market Growth and Diversification Theme</u></b></p> <ul style="list-style-type: none"> <li>• Products to Market</li> <li>• Value-added Products to Market</li> <li>• Emerging Opportunities in Food and Agri-Processing</li> </ul> <p><b><u>Science and Research Theme</u></b></p> <ul style="list-style-type: none"> <li>• Accelerating the Advancement of Agricultural Innovation</li> <li>• Adapting Innovative Solutions in Agriculture</li> </ul>
<p><b><u>Public Trust Theme</u></b></p> <ul style="list-style-type: none"> <li>• Agriculture and Food Sustainability Assurance Initiatives</li> <li>• Public Agriculture Literacy</li> <li>• Youth Agriculture Education</li> </ul>	<p><b><u>Risk Management Theme</u></b></p> <ul style="list-style-type: none"> <li>• Risk Mitigation               <ul style="list-style-type: none"> <li>○ Animal Health Biosecurity</li> <li>○ Animal Health Traceability</li> <li>○ Animal Welfare Humane Slaughter</li> <li>○ Food Safety</li> <li>○ Irrigation Conveyance Works</li> <li>○ Farm Safety</li> <li>○ Plant Health</li> </ul> </li> <li>• Emergency Preparedness</li> <li>• Surveillance</li> </ul>

## 2018 – A Year in Review

I ALWAYS recommend to people (clients, etc.) that they take some time to look back on the previous year and reflect on what happened, in the hope that they can figure out what worked, what didn't work, and what needs to be changed for the future. While that recommendation is nice, and ideally, it is more efficient to do it all at once, I find that after an entire year, it is hard to remember what happened in any detail. This is complicated by the fact that we spend a lot of time suppressing/repressing the bad stuff. So, maybe write stuff down monthly and do a yearend review. Yeah, that might work.

If I had to quickly summarize 2018 as a year, and have a conversation with it, I'd probably shout "Go home, you're drunk!" to it. While this wasn't one of the worst years ever, I'd say that it was one of the weirdest I've experienced in some time.

- I'd normally start in the winter time, since that is where the year technically starts (and ends) but some of the weirdest stuff happened in spring. Or was it summer? Or fall? It was hard to tell. We went from typically spring-ish weather directly into the deep, intense heat and dryness of mid-late summer, then back spring (minus the moisture), then into hot and dry. Winter arrived before fall did (unless you count the 3 hours of fall that preceded first winter) and hit hard and fast, along with the moisture that had been missing all summer in most areas. Heavy snows and definitely cold weather seemed like it was going to stick around permanently, but then things rebounded and we got late summer/fall in October. And now we are back to winter, just in time for ... more winter. It was not impressive and was definitely challenging for producers to plant, grow and then harvest a crop.
- This year, we avoided the brutal frosts that did a number on many of the crops a couple of years ago, but some of the weird winter weather was damaging for many of the orchard bush fruit crops, particularly in the south and south-central regions. Not a stellar Saskatoon berry and sour cherry crop this year, but hopefully next year will be better.
- Similar to the last few winters, Winter 2017/2018 was a bit variable, with long, cold snaps, with a few mild stretches, just to keep us guessing. The dryness of the winter in a number of areas was suggested as being to blame for some of the orchard issues.
- Stress was a pretty good descriptor of the growing season weather that we had, although that would be the first time I've used that word to describe weather. The hot temperatures of Springummer (spring/summer combo) was quite stressful on the newly awakening plants. I noticed that many of our street trees had thinner canopies this year, and produced a MASSIVE crop of seeds. In my town, the ground looked like it had snowed, the elm seeds were so thick. We also saw the impact of this early heat in some stunting and poor head development of some of the cool season crops, such as Cole crops like cabbage and broccoli. Later plantings were ok, but the early stuff never amounted to anything.
- Depending on where you live, it was probably fairly dry, or it ended up that way. Southern and some central parts definitely started off pretty wet, and most areas finished the season overly wet (usually in the form of solid, frozen wetness). If you had irrigation, that made a dry year bearable. If you didn't, you would have seen sizing issues, and a yield hit.
- Severe weather events seem to be a perennial challenge for producers most of the time now, although it wasn't something that seemed to come up as much this year (thankfully). Hail always hits, but things seemed quieter on that front this year.
- A sneaky (while also obvious) issue this year was the wildfire smoke coming out of the west or the south. While a week or so of smoke isn't all that uncommon in recent years, this year was notable and certainly had an impact on the vigour and growth of crops, due to the reduced light and poor air quality. It was also hard on those working out in it. I tended to limit my efforts outside on really bad days to 1-2 pack-equivalent increments.
- Insects seemed to be a bit quiet this season, which is fine. However, I did hear lots about spruce tree issues, which have been building for the past few years. In this case, the problems aren't insect-related, but it is tough to pin down a culprit (although *Rhizosphaera* is currently the culprit-elect), but there are issues, regardless. Other issues in forestry-type plants included the discovery of Mountain Pine Beetle in municipalities outside of the forested areas, which isn't great. Keep your eyes peeled in the future, as we're going to need to stay sharp to detect and deal with this and other pests.
- We didn't see much in terms of disease issues this year, although there were reports of some soil-borne challenges in carrots, the causes of which are still not completely clear to me. As many (better than me) pathologists have resorted to (with good success), we can chalk it up to a combination of (unnamed) factors, any one of which might have resulted in the resulting damage. Fortunately, the generally dry conditions limited the development of most diseases.
- Continuing some of the previous year's fun, there continues to be impacts from introduced or changed legislation and programs, with some sectors affected more than others. Things like minimum wage, Farm Safety Legislation and other things are taking some adjustment. There are some looming changes to federal legislation (Safe Food for Canadians Act) happening in the New Year, which will have impacts for many.
- Growing Forward 2 programing (and associated funding) wrapped up at the end of March, and this has resulted in some noticeable changes in the amount of programing offered by Horticulture staff. With the newly launched Canadian Agricultural Partnership (CAP), there may be programs available for producers, associations and others to access, to get things done. While we wait for things to shake out, it might be a bit quieter. Reduced resources and staff in my area means I'll have to be creative to do more with less. But plans are underway, so stay tuned.
- While there were a few less events this year, we continue to talk to many people on the phone or via email (and this won't change). It was a rewarding year and I hope that we were able to help out in a positive, impactful way.



## 2019 is International Year of the Periodic Table of Chemical Elements

The United Nations has designated 2019 as the *International Year of the Periodic Table of the Chemical Elements*, to recognize the 150<sup>th</sup> anniversary of the discovery of the periodic system by Dmitry Mendeleev in 1869. If you are like me, the Periodic Table is one of those things that you recognize but that you have a love/hate relationship with. In your early studies of chemistry, maybe it was interesting and exciting to read and learn about some of the building blocks of the things around you. If you struggled through more advanced studies in university, maybe it became something that haunted you. But regardless of how you feel about it, the Periodic Table, and the elements that comprise it (and make up our world), play a big part of our lives.

To celebrate this achievement in my own way, I decided that it might be interesting to reflect on some of the common elements in the table, and share why those elements are important or are favourites of mine. To make it even more exciting, I polled some of my colleagues, to capture which elements are their favourite or those that they feel are most important, and why they think that.

Chemical Element	Its role in plants (if any)	What's the story? (Why is it important to...?)
Nitrogen (N)	This is the driver of vegetative plant growth and is probably the most often recommended fertilizer element. It is a key component in amino acids and proteins.	Almost every soil test I view and every fertilizer recommendation that I've ever given has had some tie to nitrogen. It is the first element I look at for amending and is linked very tightly to general plant health. And I love that it is just floating around out there in the air.
Phosphorus (P)	This is a key part of the new cellular growth and is an essential piece in photosynthetic processes of plants.	This is the 2 <sup>nd</sup> most often recommended element in fertility management, tied with potassium. This one is near and dear to my heart, since I always associate it with rooting and new plants, especially transplants. I love me a good 10-52-10.
Potassium (K)	Similar to phosphorus, K has a big role in the energy pathways in plants	Growing up in Saskatchewan (which is basically one huge potassium (potash) deposit), I have a deep appreciation for this element.
Sulfur (S)	It is a critical component of proteins. Without sulfur, we wouldn't have the volatiles that are such a big part of things like onions and garlic	Despite its stinky reputation, I appreciate it for all the flavour that it brings to the table.
Helium (He)	I don't think that there is one	I always associate helium with laughter, because, whenever helium is present in our home (in the form of balloons, of course), hilarity ensues. Nothing is funnier than saying silly things in a high-pitched voice, at least to kids and teenagers.
Hydrogen (H)	As in individual, standalone element, maybe it isn't as critical, but it is a huge part of important compounds, like water, sugars, etc.	Hydrogen is one of the elements that is a part of everything. Adding or subtracting a molecule of hydrogen from something can have huge implications.
Oxygen (O)	Without oxygen, there wouldn't be life. And oxygen is a key component of many essential compounds, such as water, carbon dioxide, etc.	While I appreciate oxygen and breathing and all of that, my favourite compound form of oxygen is actually ozone (O <sub>3</sub> ). A highly reactive element, with a short half-life, it was the basis of my Masters research. To this day, I can't go past a photocopier without smelling that uniquely fresh (but almost acrid) smell that comes from ozone (produced with a corona discharge) and think about its unique properties.

Carbon (C)	An essential part of plants, and a part of all plant processes (including photosynthesis, respiration, etc.). Without carbon, plants would be, period.	<ul style="list-style-type: none"> <li>Major component of chocolate</li> <li>Life on Earth is almost solely dependent on carbon. Other than silica based life, every living thing on earth is carbon-based. It is an amazing element that can be formed in many different configurations from a benzene ring to bucky balls</li> </ul>
Iron (Fe)	It is an essential part of the formation of chlorophyll	Iron is one of those elements that is conveniently obvious in its deficiency or absence in plants, making diagnosis simpler. Iron chlorosis sounds very official and is suitably impressive to describe to anxious plant owners.
Molybdenum (Mo)	It is an important part of the nitrogen, oxygen and sulfur cycles, helping to change different forms of these elements to more plant-available/useful forms.	It's just hard to spell and funny to say.
Lead (Pb)	Nothing good, really	For me lead always brings an image to my mind of a solid block, unaffected by outward forces. It's heavy and grounding.
Gold (Au)	N/A	One of my colleagues likes gold, and once spent a summer panning for it with her husband.
Calcium (Ca)	Calcium is an important part of the structure of plants, helping to make up strong cell walls.	I appreciate calcium, mostly because it is a big part of our native soils in the Canadian prairies, as well as a big part of dairy products, which I love (but my body does not). I always associate it with strength and durability, in the form of healthy plants and strong bones.
Lanthanum (La)	N/A	Lanthanum is a soft, malleable, ductile, silver-white metal. It is chemically active, it is one of the most reactive of the rare-earth metals: it oxidizes rapidly in air and it reacts with water to form the hydroxide. Lanthanum is easily ignited, its salts are often very insoluble. And a co-worker thought it sounded like her (agreed)
Neon (Ne)	No idea	This one is a favourite of Delburne high school girls because it is easy to deal with...
Titanium (Ti)	N/A	A co-worker expounded on its low density, but high strength, which contributes to its value in the medical field. She also likes the song...

### Some chemistry humor...

- H<sub>2</sub>O is water and H<sub>2</sub>O<sub>2</sub> is hydrogen peroxide. What is H<sub>2</sub>O<sub>4</sub>?
  - Drinking
- I asked the guy sitting next to me if he had any Sodium Hypobromite...
  - He said NaBrO
- Q: What do you do with a sick chemist?
  - A: If you can't helium, and you can't curium, then you might as well barium
- If the Silver Surfer and Iron Man team up, they'd be alloys

### Some chemistry humor...

- Q: What is the most important rule in chemistry?
  - A: Never lick the spoon!
- Silver walks up to Gold in a bar and says, "AU, get outta here!"
- Two chemists go into a restaurant.
  - The first one says "I think I'll have an H<sub>2</sub>O."
  - The second one says "I think I'll have an H<sub>2</sub>O too" -- and he died
- Q: What did the scientist say when he found 2 isotopes of helium?
  - A: HeHe

## Greenhouse Whiteflies

**Causal Organism:** *Trialeurodes vaporariorum* (greenhouse whitefly – GFW); *Bemisia tabaci* (sweetpotato whitefly); *Bemisia argentifolia* (silverleaf whitefly)

- The specific species present may vary by region

**Crops Affected:** Wide host range (250+ species) – a range of greenhouse vegetable crops (e.g. tomatoes, cucumbers), as well as ornamentals (poinsettia, cut flowers, bedding plants, house plants, etc.)

### Life Cycle:

- True bugs – feed on plant sap by piercing and sucking
- May cause a reduction in plant vigour and some secondary sooty moulds (due to sticky honeydew)
- Life stages include eggs, nymphs (crawlers), pupae, adults
- Life cycle is affected by temperatures, with shorter times at warmer temperatures
- Sensitive to cold temperatures
- Adults
  - Small (1.5-2mm), powdery white winged insects
    - GWF has the wings held flat and parallel to the resting surface, and the overall body shape is triangular
    - B have the wings in a tented fashion above the body, and the overall body shape is more linear
  - Difficult to see with the naked eye
  - Adults lay 100-300 eggs (over a 3-5 week lifetime) along the undersides of younger leaves
- Eggs are sometimes laid in circular “fairy-ring” patterns
  - Eggs start off a creamy-white, darkening within a day or so
- Nymphs
  - Eggs hatch in 5-10 days to produce a flat, scale-like, largely immobile nymphal stage, referred to as “crawlers”
  - Nymphs pass through 3 instars before pupation
- Pupae
  - Pupation lasts about 1 week, with no feeding taking place
  - GWF pupae are somewhat raised off of the surfaces of the leaves, and may be surrounded by a fringe of hairs
  - B pupae sit flat on the leaf surface and have no hairy fringe



### Symptoms:

- A decline in plant vigour
- Stunting, yellowing of leaves and premature leaf drop
- The observation of the insects stages may be indicative of presence
- Some species transmit plant viruses, which produce other symptoms

### Management:

- Monitor / inspect plants regularly for pests
  - Quarantine new plants to ensure they are not bringing in a problem
- Use pest-attractive plants as trap or monitoring sites (e.g. eggplants)
- Apply controls quickly to prevent populations from increasing rapidly
- Control alternative hosts (e.g. weeds) in adjacent areas
- Use clean, virus-free plants (to avoid virus transmission)
- Biological controls can be effective at managing populations of whitefly, including specific parasitic wasps, ladybeetles, predatory bugs and a couple of different fungal biocontrol products.
- Yellow sticky traps or yellow sticky tape can be used broadly and/or in population hotspots to draw whiteflies (and other insects) out of the crop
- Vacuuming adults from hotspots can work to quickly bring a population in one area down, however this is not effective in larger areas
- Install fine-meshed screens over vents and doorways, to prevent entry and movement between areas, and from outside to inside a greenhouse
- Registered chemical controls may be applied at specific stages to reduce populations
  - Use these with care to prevent the development of resistance
  - Certain products are more effective on certain life stages (e.g. horticultural oils are best for immobile, immature stages)

**Multiple life stages of Greenhouse Whitefly (*Trialeurodes vaporariorum*)**

Photo by Whitney Cranshaw, Colorado State University, Bugwood.org

**Adult Silverleaf Whitefly (*Bemisia argentifolia*)**

Photo by Scott Bauer, USDA Agricultural Research Service, Bugwood.org



## Cucumber Green Mottle Mosaic Virus

**Causal Organism:** a type of tobamovirus

**Crops Affected:** Cucurbits (cucumbers, melons, etc.) – greenhouse cucumbers = primary concern

### Disease Cycle:

- Highly infective, extremely stable, viral pathogen that can survive for an extended period in the greenhouse environment
- Yields may be reduced by 25% or more
- May be introduced via infected seed (seed-borne)
- Easily spreads between plants through mechanical transmission
  - May also be transmitted by insect pests with chewing mouthparts)

### Symptoms:

- Younger leaves are affected more than older ones, with viral activity reduced as leaves age
  - Leaves will have green, light-green or yellow-green spots
  - Veins may remain green
  - Young leaves may be deformed in heavy infections
- Fruits may abort and drop off
  - Fruit size is dramatically reduced in those fruit that do not abort

### Management:

- Seed (thermal or chemotherapy) treatments may partially reduce transmission
- Ensure that seed lots and new plants are virus-free, either through testing and monitoring
- Monitor the crop carefully for the presence of symptomatic plants
  - Early infection is more serious than infection of an older crop
  - Remove early infected plant material to prevent further spread
- Avoid overlapping crops
- Discard and destroy heavily infected plants
- Remove all plant debris and take it off-site, to avoid re-introduction
- Treat crops with insect pests to reduce spread by insect vector
- Clean and disinfect all greenhouse materials, including all structures, containers, tools, and equipment
  - Ensure that obscure and hard to reach surfaces are also treated (e.g. pipe tops, textured surfaces, structural members)
  - Some disinfection may be done on walkways and corridors during crop production, but cleaning and disinfection must be done between crops
- Place disinfecting footbaths at the entrances of all production bays
- Disinfect clothing, tools and gloves at the end of each row

## Pepino Mosaic Virus (PepMV)

**Causal Organism:** virus

**Crops Affected:** tomato

### Disease Cycle:

- Highly contagious viral disease
- Transmitted via mechanical contact between plants and contaminated tools, clothing, footwear, hands and other plants
  - Infection may also occur through contaminated leachate water
  - Spread via bumblebee pollinators is possible, but less likely than hand pollination
  - Spread may also occur via cuttings
- May remain viable on dry material for several months
  - Clothing can be infective for up to 2 weeks
  - In cool, moist, organic debris, the virus can remain infective for an extended period

### Symptoms:

- More readily observed in fall and winter months during low light and temperature levels
- Plants may appear to have a stunted growing point or “head”
- Distorted growth may be observed, which resembles herbicide injury
- Leaves around the growing point may have dark spots, with necrotic lesions developing further down
  - Scorch-like spots may appear on lower leaves
- Bright yellow spots may appear in some areas
- Stems near the growing point may have brown streaks encircling the entire stem
  - Flower clusters may be affected, resulting in abortion
  - The calyx on infected fruit may be brown
  - Fruit may appear marbled (yellow-red mosaic patterns)
- Plants may be symptomless

### Management:

- Ensure that plants and seed are disease-free
- Sanitation and strict hygiene throughout all stages is key
  - Move from clean to infected areas, not infected to clean
  - Wear clean/disinfected cloths, gloves, boots, etc. when moving into a clean area
  - Have workers and clothing designated for specific areas of the greenhouse
  - Install foot baths at the entrance to different areas
- Power wash and then disinfect the entire greenhouse structure between crops
  - Clean and disinfect all tools and equipment
  - Clean and disinfect or replace irrigation lines
- Dip tools and gloved hands in undiluted skim milk or an appropriate disinfectant between handling individual plants
- Carefully monitor new plants and developing crops, watching for symptoms
  - Mark infected areas and inform workers, visitors, etc. of appropriate steps to take to avoid spread
- Bag and remove plant debris from the space and destroy promptly