## What’s Growing ON? – Episode 3 Transcript

## INTRODUCTION

*Music intro*

***Kristy:*** This is What’s Growing ON? A show where we dig up the latest dirt on Ontario horticulture production, helping producers navigate best management practices and taste the sweet success of a quality crop. My name is Kristy Grigg-McGuffin.

***Cassie:*** And I’m Cassie Russell. Join us as we talk to specialists in the field of fruit, vegetables and specialty crops to find out what’s really growing on.

*Music transition*

***Cassie:*** Welcome to episode 3 of What’s Growing ON. We have two special guests today – first off we have Andrew C. Wylie, one of OMAFRAs new vegetable specialists whose going to give us some more information on stripped cucumber beetle in cucurbit crops. ***Kristy****:* After that, we will be chatting with Kathryn Cater, Fruit Crop Specialist for tender fruit and grapes about factors that impact fruit set in grapes. ***Cassie:*** But first things first, lets cover some crop updates as of Friday June 19th, 2020. Kristy, how are fruit crops coming along this week?

## CROP UPDATES (Fruit)

***Kristy:*** Thanks Cassie. Well, it’s dry out there. Many fruit growing regions are 60-85% below the average rainfall over the last 30 days. Even less east of Toronto with some areas at 40-60% of normal rainfall this time of year. This is a critical timing for many crops as fruit is forming and sizing. Growers are irrigating if they can. Others are hoping rain will come soon.

Strawberry harvest is in full swing. Pick your own operations continue to manage well despite COVID-19 restrictions. Aphids are very active in some fields, including winged individuals. This mobile stage is important to control since they can potentially spread viruses. Raspberry bloom continues as many field progress towards the green fruit stage. Primocane fruiting raspberries are looking good. Raspberry sawfly and raspberry fruitworm have been found. Green berries are present now on blueberries. Petal fall sprays for cranberry and cherry fruitworm are going on which may also have some control on gypsy moth which seems to be having a big year. Phomopsis canker and twig blight can be found in some blueberry fields.

For both berry and tender fruit growers, the first spotted wing drosophila were caught in wild honeysuckle in Essex County early June. No trap catch has been reported yet in other regions but be sure to check out onfruit.ca for regular spotted wing drosophila updates.

Fruitlet thinning is wrapping up in apple orchards. Bloom damage is becoming more apparent from the May frosts with fruitlets dropping, misshapen fruit or signs of frost rings and other russetted markings. With a good number of buds areas started out with this year though, overall a full crop is still expected at this point. Growers are using these dry days to prune out fire blight strikes that have developed. Primary scab period has passed in most areas but programs are being maintained for another few weeks to ensure no scab lesions are present before relaxing rates and interval length. Codling moth sprays are going on across the province. San Jose scale first generation crawler emergence is expected to begin this week in the earlier regions. Dogwood borer adult flight has begun in many orchards with a history of this pest. This activity will continue until September with peak flight typically occurring early July.

Bacterial spot is developing on peach, nectarine, plum and apricots. Fruit are very susceptible to infection as soon as they are exposed at shuck split through pit hardening but new infections can develop until harvest. Severe fruit infections are more common when frequent periods of rainfall or even extended heavy dews and very high humidity occur from late bloom to near pit-hardening

Peaches are most susceptible to peach scab during the shuck-split stage of growth. Because they lack fuzz, nectarine fruit can be infected earlier than peaches:  1–2 weeks after petal fall.  Although fruit may become infected shortly after shuck split and continue to be susceptible to infection throughout the growing season, symptoms are typically not visible on fruit for six to ten weeks so only those infections which are initiated between shuck split and six weeks before maturity will exhibit symptoms before harvest.  Fungicides with activity on peach scab should be used in blocks with a history of peach scab until 6 weeks pre-harvest.

Nectarine fruit are also now susceptible to powdery mildew infection.  High humidity and overcast skies are optimal conditions for powdery mildew proliferation.

Cherry leaf spot and powdery mildew should be managed in tart cherry orchards, even if crop has been lost to hail or frost.  These diseases can defoliate trees and reduce tree cold hardiness and productivity in subsequent years if left uncontrolled.

Sporulating downy mildew has been found on foliage and flower clusters in some vineyards.  Infections this early in the growing season usually mean it will be a challenging one to manage fruit infection as well.  Black rot lesions have also been found in low severity.  Powdery mildew is also likely present in trace amounts but hasn’t been detected yet.  A reminder that Rovral is no longer an option for bunch rot control in grapevines as of June 20, 2020.   Potato, grape, three banded and Virginia creeper leafhoppers are becoming more prevalent in vineyards with the warmer dry weather.

For more detailed information on specific crop updates, check out our ONfruit blog where you’ll find regular posting for apple, berry, tender fruit and grape.

That’s it from my side. What about you, Cassie? How are the vegetables holding up in these dry conditions?

## CROP UPDATES (Vegetables)

***Cassie:*** Thanks Kristy, yeah as of today – still really dry in most regions of Ontario. Not a lot of precipitation across the board, so some vegetables may be undergoing some extra stress from the heat. If you can, try and irrigate where possible.

In brassica crops – Imported cabbageworm and diamondback moth larvae are active . For more detailed information on these and other lepidopteran pest thresholds in brassica crops, see the vegetable crop report from June 17th, 2020. There are some really great photos and charts posted there.

In Garlic, leek moth larvae that are a little ahead of the second flight are starting to show damage. Scaping is a great opportunity to look at your plants in a bit more depth, so try to look at every plant for anything abnormal including cuts, holes, white spots and what appears to be sawdust, and kill any larvae found.

As celery plants establish, make sure you’re scouting for early symptoms of celery leaf curl. If aster leafhopper counts were active in past weeks on celery crops, keep a close eye on plants showing symptoms of aster yellows. Tarnished plant bugs are active and thresholds have been reached in all regions.

In leafy greens, leafminers continue to cause damage and cutworm pressure is high in some areas. Seedcorn maggot is reaching it’s second threshold for Essex county and may be causing poor emergence in later plantings.

Direct seeded onions are reaching the 4th leaf stage in many areas and transplants are starting to take off. Scout for early thrips, especially around fields that border hay that has been recently cut. Scout for wilting and dig up suspect plants to determine if wireworms, millipedes or onion maggots are the cause. Also now is the time to be scouting for stunting caused by onion smut.

On to carrots. Irrigation continues for most carrots as the dry conditions are difficult on the establishing crop. Growers are having a hard time getting good activation of the pre-emerge herbicides and pigweed is thriving in this weather. Carrot weevil is still of concern this week as adults are out laying eggs currently. We’ll be nearing the end off the egg-laying period soon.

For potatoes, leafhoppers are present especially as hay is being cut as mentioned, so scout your fields for any signs of adults of nymphs. Threshold is 20 nymphs/ 50 leaves or 15 adults/50 leaves. Now is also the time to look for Colorado Potato Beetle eggs and hatching larvae to check how the at plant insecticide is holding up.

In beets, cercospora leaf spot has been observed in field plots at Ridgetown campus. The presence of symptoms in the region coupled with the closing of the canopy indicates that preventative fungicide programs should be initiated soon, if they haven’t been already.

Asparagus harvest has mostly wrapped up and ferns should be scouted for fungal diseases and insect pests.

Sweet corn has been growing well throughout Ontario. There has been some armyworm activity, so focus scouting in the evening when the caterpillars are most active.

And finally for cucurbits, cucumber beetle continues to be found in large numbers and some transplants may have been exposed to the bacterial wilt pathogen early in the season due to high numbers of cucumber beetles. We will dive a little deeper into cucumber beetle and bacterial wilt in just a second on our vegetable segment.

***Kristy****:* For more detailed information on these and other fruit and vegetable crops, check out our weekly crop updates at onvegetables.com and onfruit.ca.

## SEGMENT 1: Stripped cucumber beetles

***Cassie*:** Today I am welcoming OMAFRAs acting vegetable crop specialist, Andrew Wylie, who’s joining us to talk about a common pest of cucurbit crops, the striped cucumber beetle. Welcome, Andrew

***Andrew***: Thanks for inviting me, Cassie.

***Cassie*:** Now we’ve been hearing a lot about damage to cucurbits from this striped cucumber beetle, especially this season, is it because populations are just generally higher this year, or… What’s you’re take on this?

***Andrew***: Yes, the striped cucumber beetle has emerged in force this season, and I've seen lots of damage so far. If you've grown any cucurbit crops then you're probably familiar with these beetles, they're really very common, but this year they do seem to have come out in larger numbers than usual. They're not usually a huge problem for commercial growers because there are thiamethoxam seed treatments for them, and in-furrow treatments using imidacloprid that both work to control adult populations for the first four to six weeks after planting, which effectively covers the first emergence in spring. But I have spoken with growers who’ve seen large populations on commercial cucurbits this season so I think it's a good time to focus some energy on scouting for these pests.

***Cassie*:** So tell me about these beetles, if someone hasn’t seen them before, what exactly are they looking for?

***Andrew***: This is a really cool-looking little beetle, it's about 6-7 mm long, or 1/4 inch, with yellow forewings with two black stripes on each forewing: although when they're resting the two inner stripes are touching so to the naked eye they look like they have three black stripes.

Although there are some look-alikes, these beetles are quite distinctive once you get to know them. I’ve actually posted some photos on our weekly vegetable crop report from last Thursday June 18 which you can find at ONvegetables.com. One really distinctive feature of these beetles is that it has black lower legs, so it looks like it's wearing black knee socks. The adults of the Western corn rootworm have a similar appearance to the striped cucumber beetle, but the stripes on its wing pads don't go all the way to the tips of its wings, and it's legs are black so it doesn't look like its wearing socks.

***Cassie*:** Awesome descriptions, and this is a pest that occurs year after year in Ontario, correct?

***Andrew***: You got it,cucumber beetles like to overwinter in wooded areas, or in plant debris. They're not terrible fliers so they can pretty easily move into your crop from adjacent forested areas. They'll come out once temperatures start to rise to about 10C in the spring, so in April or May

***Cassie*:** Now, that's interesting because its quite a bit earlier than we plant cucurbits in ON, so they don't need a cucurbit host to feed on in the early spring?

***Andrew***: They really preferer cucurbits, but when they emerge they'll happily enough eat pollen and flower petals from other species while they wait for you to get your transplants out into the field.

***Cassie*:** And so, I guess since the beetles are present quite early in the spring, you should start scouting as soon as those transplants are in the ground?

***Andrew***: Yes, soon after transplanting is when you should start scouting. And some good tips for scouts are you should look in the early morning , and focus on areas around your fields that are near potential overwintering sites , such as sheltered areas/forests , to get an idea of the population levels of emerged adult beetles.

Once those adults have found your cucurbits, they will lay eggs at the base of the plants, and then when the eggs hatch the larvae will feed on the roots for a couple of weeks before the second generation of beetles emerges later in the season.

***Cassie*:** And is it the adult stage that damages the crop, or the feeding from larvae that is more problematic to growers?

***Andrew***: Adult feeding much more damaging to the crop, the larvae don't seem to have as much of an effect on the overall health of the plant.

***Cassie*:** Now in addition to scouting for adults, should individuals also be scouting for the damage stripped cucumber beetle leave on the plants? Or using other monitoring tools?

***Andrew***: Yeah, that’s a great point. Scouting for damage is helpful too, The damage from cucumber beetles is direct feeding: they chew through the foliage, and can skeletonize leaves pretty quickly. and they'll also feed directly on fruit which can affect marketability. They will feed on flowers too, which can reduce fruit yields obviously.

Some growers also use yellow sticky cards, you’ll want to scout 2-3 x per week because the populations can fluctuate. You should be scouting very early in the morning, because once the day starts to heat up the beetles will hide in the soil.

If you’re scouting the plants there is a threshold of 1/2 to one cucumber beetle per plant on seedlings, up to five beetles per plant on a mature plant.

***Cassie***: And did you want to tell us about some of the management strategies available to control for cucumber beetle if these thresholds are met?

***Andrew***: Yes, these are pretty low thresholds. I mentioned the seed treatments and the neonicatinoid in-furrow treatment early season, and then later in the season the most common treatment is to spray pyrethroid insecticides such as Matador.

There are plenty of integrated pest management strategies that can be used to try to keep the populations low: for example Row covers can protect young plants from the early emergences of beetles in the spring, as long as you get them on before the cucumber beetles start to emerge which can be a challenge if it's windy.

***Cassie***: And it's important to remove the row covers before pollination, right?

***Andrew***: yes, this strategy just targets emergence and protects young plants but you don’t want to have those on for too long and risk blocking out your important pollinators.

Another IPM tool is Kaolin clay which is permitted for organic production in Canada, This is a mineral compound, a really fine clay that’s used in cosmetics, and it coats the plants and discourages feeding. Some things to keep in mind with this compound is that it's not rain-fast, so you'll have to keep applying it, and it leaves a residue which can affect the marketability of cucurbit fruits. It also needs to be applied carefully to get complete coverage, and it does seem to work well.

***Cassie***: Now, something I wanted to ask you about is that I understand that some varieties of cucurbits are more attractive to cucumber beetles...can you talk a bit more about that?

***Andrew***: Yes, cucumber beetles are attracted to chemicals called kairomones such as cucurbitacin which are released by plants. Different cucurbit cultivars release varying levels of these chemicals, so there's a general difference in attractiveness between the large groups of cucurbits, where zucchini is the most attractive to the beetles, followed by pumpkins, then squash, and finally cucumber is the least attractive. There are some really attractive varieties out there, for example we use "Burgess" butternut squash in our trials, to try to attract large numbers of beetles. Other great candidates are turks turban squash, black jack zucchini, Embassy zucchini, and many others.

So the strategy that you can employ with these is to use them as either trap or indicator plants in your fields, if you plant these attractive varieties in between overwintering sites and your main crop, the beetles will go to these first, and you can then deal with the beetle populations on these plants before they get to your crop.

One thing to mention is that if you're removing the beetles, or spraying for them on your trap crop, if any of your trap plants appear to have bacterial wilt, you should remove those plants immediately so that it doesn’t spread to your crop.

***Cassie***: Oh, is that because the cucumber beetles vector bacterial wilt between different cucurbit hosts?   
  
***Andrew:*** yes, exactly. Striped cucumber beetles are the main vector of the Erwinia pathogen that causes bacterial wilt in cucurbits. This can be quite a damaging disease, that's transmitted to the cucurbit plants mechanically by the mouth parts of the beetle as it's feeding. This bacteria can actually be transmitted by the spotted cucumber beetle, and the western spotted cucumber beetle and the banded cucumber beetle too, but in Ontario this season, the striped cucumber beetle is the one that we've been seeing lots of, and is historically much more common than the spotted cucumber beetle in Ontario.

***Cassie*:** So how can I tell if my melons or cucumbers have bacterial wilt, and aren't just wilting from water stress, or some other infection?

***Andrew***: Well, you could always send some tissue to a plant diagnostic lab for an analysis, but there's actually an easy test for infection by the bacterium that causes this wilt, and it is due to the presence of large numbers of this bacterium in the xylem of infected plants. Plants wilt because the xylem is choked by a film produced by this Erwinia species, and if you find a runner on the plant that's wilting, and you cut it close to the crown, just hold the two pieces back together for a second, and then slowly pull them apart. if they are infected, there will be huge amounts of the bacterium in the xylem and you'll be able to see this sticky slime between the two stem pieces when you pull them apart from each other. This sticky film can tell you that your plants are definitely infected with this bacterium, and it's these masses of bacteria jamming up the plant's vasculature, and then the production of resins and gums in response to this infection that cause the wilt.

***Cassie*:** And once you see those signs in the plant tissue, I assume its game over for the entire plant?

***Andrew***: Unfortunately, yes, once your plants are infected there's not much you can do. Controlling bacterial wilt really relies on controlling the cucumber beetle vector. The bacteria can't survive the death of the host plant tissue, so once the plants die, this bacterium will die as well, it's not viable in dead plant tissue for long. It relies on the cucumber beetle for overwintering, and although it can't reproduce in the beetles, its presence on their mouth parts when they're feeding on your plants is going to lead to this disease. This is why thresholds are so low for this pest.

***Cassie***: And on the topic of bacterial wilt, do the cultivars that attract more beetles also have higher instances of bacterial wilt? Cause if that’s the case than maybe planting a trap plant would be a little risky to a grower?

***Andrew***: Actually that's interesting, the order of preference to beetles is exactly opposite to the susceptibility to wilt.

Zucchini are the most attractive cucurbit to these beetles, but it's the least susceptible to bacterial wilt. There are pumpkin varieties that are susceptible, but many are not, and then melons are quite susceptible to wilt, but the beetles are less attracted to them. That said, I just spoke with a melon grower who had left some trays of transplants out in their headlands, only to return to find that the trays were completely infested with cucumber beetles. Interestingly watermelon is not very susceptible to bacterial wilt compared to other cucurbits.

Cucumbers are the most susceptible cucurbit to bacterial wilt, and although they are the least attractive to cucumber beetles, as the name implies they will still be attacked by these beetles so need to be scouted as well.

***Cassie***: Now, that’s funny… maybe we need to rename the cucumber beetle to something like Zucchini beetle that more reflects its preferences

***Andrew***: Yeah, we could call them zucchini beetles, who do you think we talk to about that?

***Cassie***: I guess I’ll have to call up some of my taxonomist friends?

***Cassie:*** Something I did want to ask, is there any new work being done on cucumber beetle control in cucurbit crops that you are involved in?

***Andrew***: There is work going on at many levels on managing these beetles. The standard controls for this beetle, Admire and Matador can be harmful to beneficial insects: Admire is a neonicotinoid, and Matador is a Pyrethroid. We're working with the Trueman lab at U of G to test the efficacy of alternatives to neonics and pyrethroids on cucumber beetle control, looking at some of the Diamide compounds. we're going to be doing trials in the late summer on this out in Ridgetown.

***Cassie*:** That’s awesome, wish you all success with those trials! It’s always great to have more control options in a growers tool box. That being said, what are some places that growers or consultants can go to find out more about cucumber beetle monitoring or control?

***Andrew***: Yes, I do. Our Ontario Crop IPM website has a section on cucumber beetles that has more information and pictures, and Michigan state has a great article about cucumber beetles on their extension page which is a great starting point. Elaine Roddy from OMAFRA wrote a very informative article on cucumber beetle for The Grower in December of 2019, which you can find in the archives at thegrower.org. And I would say that most gardens that have cucurbit transplants in them are probably infested right now, so there's lots of opportunity to go get some hands on experience with identifying these little beetles.

And the new edition of our crop protection pub 838 is available online to download now on the OMAFRA website, that lists some of the products growers have available to them, but keep in mind that its always important to check with the PMRA pesticide label label search at the Health Canada website as well to see about any product updates or revaluations.

***Cassie:*** That’s great, well thank you Andrew for sharing this information and coming on the podcast today. It’s great to have some more information on cucumber beetle and understand the threat it poses to different cucurbit crops grown here in Ontario.

***Andrew:*** Yeah, thanks again Cassie. And for any Ontario growers out there listening, let me know if you are finding any cucumber beetle infestations on commercial acreages, we’re particularly interested here at OMAFRA if you’re seeing feeding on plants that have been treated with any of the imidacloprids such as Admire, Alias, or Grapple. And just a final note that I also cover a variety of other crops such as asparagus, beans, peas, sweet corn, and rhubarb, so, if you have any questions please feel free to reach out.

***Cassie*:** Well, that’s great. Thanks again Andrew, it was a pleasure getting to chat with you.

***Andrew*:** Yeah, thanks again for having me. Always happy to talk about cucumber beetles.

***Cassie*:** That was Andrew C. Wylie, acting vegetable crops specialists for the Ontario ministry of agriculture, food and rural affairs.

*Music transition*

## SEGEMENT 2: Fruit set in grapes

***Kristy:*** On today’s fruit segment, I’m joined by Kathryn Carter who is the OMAFRA Fruit Crop Specialist for tender fruit and grape. Thanks for being here, Kathryn.

***Kathryn:*** Thanks for having me, Kristy.

***Kristy:*** So, I’m going to be honest with you. Working in tree fruit, especially this time of the year, I can get quite the tunnel vision and focus only on what’s going on in those crops at the moment. I’m realizing doing this podcast I’m getting a chance to really get a look at the diversity of horticultural crops grown in the province. I think it is really interesting to hear the differences – or similarities - in production practices between industries and today speaking with you is another chance to highlight this. So that’s a long way of saying I’m really excited to talk to you today.

***Kathryn:*** Oh, I’m happy to talk to you, too.

***Kristy:*** So I’d like to talk with you today about fruit set in grapes and what sort of activities that are happening in a vineyard during bloom.

Now, my understanding is we’re getting close to bloom in some grape cultivars, is that correct?

***Kathryn:*** Yes, you are. Flowering or bloom generally occurs about 4 to 6 weeks after bud break which is usually around June 20, but varies depending on the weather.

***Kristy:*** I’ve heard that grape blossoms are quite vulnerable compared to other blooms. Can you explain why that is?

***Kathryn:*** Grape blossoms aren’t protected by flower petals so once they are open, strong winds can shake the pollen from vines, preventing some flowers from pollinating. Strong rains, hail, and frost present similar risks to disrupting the pollination process.

***Kristy:*** You know, I never thought about the protection that petals can provide. Now in tree fruit, we bring in honeybees for pollination. Do bees play in important role in pollination of grapes?

***Kathryn:*** Although honeybees do visit the vineyard, they are not essential to the grape pollinating process since cultivated grapevines are hermaphroditic, possessing both female ovaries and male stamens. Just by the nature of the plant, nearly 50 percent of the flowers in a given grape inflorescence are likely not to set fruit-which is actually a good thing for the growers.

***Kristy:*** Hold on wait a minute, why it it a good thing that not all of the flowers set fruit?

***Kathryn:*** Excessively high fruit set can delay cluster ripening and result in compact fruit clusters that are prone to disease. Fruit set can be considered a “self-thinning” technique that enables the vine to regulate the crop, by adjusting to the available resources without risking survival of the plant . Individual flower necrosis or death isn’t always a bad outcome as it can actually contribute to better cluster ripening and reduce the possibility disease since looser clusters improve air flow between the berries. The bigger issue is loss of fruit clusters that result in reduced yields.

***Kristy:*** So there is an optimal crop yield that growers should aim for?

Kathryn: That’s a great question Kristy! Although some believe that there are target number of 4-6 tonnes per acre for grape vines to get high quality wine, research shows that in reality the crop yields for optimal quality really vary from site to site depending on the cultivar, and soil type. High yields of grapes on heavier soils, can cause off flavouring of the resulting wine. However, if fruit production is too low on vines that are growing on sandy soils, the vines will become excessively vigour resulting in excessive shading and reducing fruit and wine quality In reality, the focus of grape production should really be on balancing vigour and fruit production to produce a high quality wine. Obviously the number of flowers that set fruit will have an impact on the yields.

***Kristy:*** Quite the balancing act between too much and too little depending on the site.

You said the number of flowers that set fruit. Is there an exact number of how many flowers you need to have a good crop of grapes?

***Kathryn:*** Each grape flower cluster (inflorescence) contains hundreds of flowers, however on average on 50% of flowers within an inflorescence set fruit and become berries. Poor fruit set (less than 30 percent fruit set) can result in clusters with few berries, and/or clusters with small green (shot berries) that fail to ripen and drop before harvest.

As you can imagine, losing entire flower clusters has significant impact on crop yields. Flower abscision can occur before bloom, during bloom, or even after bloom. Fruit set requirements will really vary between cultivars.

***Kristy:*** How does one go about evaluating fruit set?

***Kathryn:*** Fruit set occurs about 10-14 days after full bloom, and the pollinated flowers have begun to form small green berries that will eventually grow into individual grapes. At this time vineyard managers can begin to estimate the percentage of each grape cluster that will grow into fruit. While weather events (hail, drought, excessive rainfall) can still affect the season, fruit set is the first indicator of how abundant (or not) harvest may be. If fruit set is low, the best thing to do is to document and describe your observations, as this may be an indicationthe potential cause of the lack of fruit set. Record the percentage (%) of fruit set which is a measure of the proportion of flowers that develop into berries following bloom.

***Kristy:*** You mentioned that weather can affect the crop yields for the rest of the season, does the weather at bloom also impact fruit set in grapes?

***Kathryn:*** Weather conditions before and during bloom can have a significant impact on fruit set. Cool, cloudy or wet conditions can have a negative impact on flower development, resulting in fewer berries.

Cool or hot temperatures (below 18 ° C or above 38 °C) during bloom can slow the growth of the pollen tube, resulting in reduced fruit set. Cool weather during bloom is believed to be associated with variability in berry size within a cluster (also known as hens and chicks).

Rain during bloom prevents the calyptra (caps for flower petals) from detaching from the flower, resulting in a reduction in pollination. Water stress during bloom can also have a negative impact on fruit set. Some cultivars (ie. Merlot and Gewurztraminer) are more susceptible to weather resulting in poor fruit set. While others such as (ie. Pinot and Chardonnay) may be more tolerant. Although weather has a significant impact on fruit set, unfortunately, there is nothing that grape growers can do change the weather conditions.

***Kristy:*** So weather at bloom and during the season impacts fruit set, but what about springs frosts or winter injury? Can that impact the number of grape clusters?

***Kathryn:*** Yes, frost and winter injury can damage fruit buds resulting in a reduction in fruit clusters and yields. Grapes have primary, secondary and tertiary buds which form the previous year. If frost or winter injury damages the primary fruit bud, and the secondary bud survives it will result in a significant reduction in fruit clusters, which will reduce yields. If both the primary and secondary buds are killed off, and only the tertiary bud survives, the plant will survive, but it will not crop that year. So there won’t be any clusters to set fruit. So I guess you could say that frost and winter injury affect the amount of flowers clusters that are produced and available to set fruit.

Fortunately, this year we were slightly behind normal in grape crop development when the frosts hit around May 9, so most bud burst hadn’t occurred in most grape varieties and we had minimal damage to the grape buds, so we shouldn’t see a lot of impact on fruit clusters this year. This past winter was relatively mild as well, so most grape vines didn’t have issues with winter injury in 2020.

***Kristy:*** You said most grape vines didn’t have winter injury? Does that mean that some did?

***Kathryn:*** Yes there were some reports of winter injury in vineyards on late harvesting cultivars that may not have had the chance to harden off before early frosts occurred in November, 2019.

***Kristy:*** Just switching gears a little here, we talked about how weather can impact fruit set both in season and over the winter, but what about vine health. How much does nutrition also have an impact on fruit set?

***Kathryn:*** Yes, vine nutrition from last season, has an impact on the number of flower clusters in a bud, and on a shoot. Vines with a nutrient deficiency may be more prone to poor fruit set. Prior to bloom, grape vines use their nutrient reserves from last year to support the vine.

Research suggests that boron and zinc are the most important nutrients for fruit set in grapes as they impact early season shoot growth. Boron can have an impact on pollen tube generation which is needed for fertilization. Some work by Tim Martinson showed that both soil and foliar applications of boron before bloom can improve fruit set on Concord in a vineyard where boron is deficient. Keep in mind that these vineyards were all deficient in Boron. Adding some when vines already have an adequate supply can result in toxicity symptoms. Zinc deficiency isn’t a common issue in Ontario vineyards, however if a block consistently shows zinc deficiency and inadequate set, adding a foliar application of zinc may help with fruit set.

The ratio of carbon to nitrogen may also have an impact on fruit set. Vines with an unbalanced C: N status (excessive vigour or weak vines) may be more prone to poor flower development and fruit set. Some studies have shown that nitrogen levels may be the reason for early necrosis of the cluster.

***Kristy:*** So if vine health and nutrition are so important for fruit set, how should growers be monitoring nutrient levels?

***Kathryn:*** Nutrient levels in grapes can be assessed either at bloom or at veraison. Although soil samples provide useful information petiole samples really provide important information on what nutrients the vine is accessing and are helpful in determining nutrient deficiencies.

Collect petiole samples (every other year) to monitor nutrient levels. If petiole samples indicate that boron levels are low, consider applying 1 to 2 sprays of boron before bloom to vines that have low boron levels. Although some studies in California suggest that the application of Boron in the fall, has greater impact on fruit set the following year, this probably doesn’t apply given our cool climate weather conditions.

***Kristy:*** You mentioned sampling every other year. How exactly do you collect petiole samples to monitor vine health?

***Kathryn:*** At bloom collect a total of 100 petioles from leaves located opposite the first or second flower cluster from the bottom of the shoot. Collect no more than 1 or 2 petioles per vine. Dry petioles at room temperature in a brown paper bag for 24 hours and submit sample to lab for analysis. Veraison petiole samples should be collected from mature, fully expanded leaves located five to seven leaves from the shoot tip. Regardless of the timing when the samples are collected it is important to sample throughout the vineyard and collect samples from similar soil types, age, variety, rootstocks and cultural practices. Only sample from healthy shoots that are well exposed to sunlight for sampling (i.e. not damaged or diseased).

***Kristy:*** With tree fruit, it’s often a balancing act between getting the right nutrient levels for good growth but not having an overly vigorous tree that it impacts fruit set. Does the vigour of the vine impact fruit set in grapes as well?

***Kathryn:*** Yes, definitely. Shoot tips compete with blooms for nutrients and resources. An excessively vigourous vine will put more resources into the shoot tips than fruit clusters, resulting in poor flower development and poor fruit set. Weak vines have fewer sources of stored carbon and nitrogen, resulting in a shoots pulling more nutrients from the flowers, leading to poor fruit set.

***Kristy:*** Ok, so it’s clear that weather, nutrition and vine vigour impact fruit set. Are there any other things that can impact this?

***Kathryn:*** The healthier the vine, the better the fruit set. So often vines that have insect or disease pressure are more prone to having poor fruit set. Viruses such as Red blotch also affect fruit set. So if you are seeing poor fruit set in the vineyard, it is important to take a closer look to determine the cause. Water stressed from the previous year has a significant impact on fruit bud development and fruit set.

There is some information from researchers in Michigan suggesting that the application of fungicides at bloom can have a negative impact on fruit set in concord grapes.

***Kristy:*** So now that we know the components that effect fruit set. Are there any things that growers can use to help increase fruit set—especially in those varieties where set may be poor?

***Kathryn:*** Canopy management can be a great tool in helping to increase fruit set. Shoot tipping or removing shoot tips at bloom has been shown to consistently increase fruit set. The removal of the shoot tip alters the competitive balance between the tip and fruit clusters as sinks for nutrients. By removing the pull for nutrients at the end of the shoot, more nutrients and photosynthates can be directed to the flowers. The challenges with this practice include 1) the cost to do it if done by hand (shoots may not be long enough at bloom to be cut by a mechanical hedger), and 2) removing the tip from the main shoot encourages lateral growth, which can cause shading and disease problems if a lot of lateral shoots push.

***Kristy:*** How about options for reducing fruit set?

***Kathryn:*** Early leaf removal before or during bloom may also help to reduce fruit set and reduce the compactness of fruit clusters. Removing leaves from around the cluster zone just prior to or at the beginning of bloom reduces fruit set by removing the source of photosynthates to the flowers, resulting in more of the flowers not fertilizing and reducing the number of berries that can be sustained. This can be an effective solution to reducing compactness in tight-clustered varieties. Removal of the basal 4-5 leaves no later than trace bloom is very effective at reducing fruit set and making clusters less compact, reducing their susceptibility to rots later in the season. One of the challenges with leaf removal is cost, as it is all done manually.

Plant Growth Regulators such as Gibberellic acid (GA) can be used in table grapes to decrease fruit set, and produce longer rachis and larger berries.

***Kristy:*** So what tools do growers have to help reduce yields?

***Kathryn:*** With respect to managing yields there are several options available to growers. Dormant pruning helps to reduce the amount of clusters on the vine and open the canopy to improve sunlight penetration. Around bloom growers use shoot thinning to remove excess shoots and inflorescences. Shoot thinning decreases the shoot density to create a well-balanced canopy with uniform shoots and eliminates weak and unfruitful shoots. Later in the season, high crop loads can create issues with ripening, especially in cool seasons or in summers when vines are stressed due to drought. Fruit clusters can be removed later in season to help balance the vine growth and fruit production. However, keep in mind that many of these tools still rely on the clusters that are present setting fruit, so without a good fruit set, regardless of the number of clusters on the vine, there won’t be a good crop.

***Kristy:*** It all comes down to getting that fruit set in the first place really – as much as you can control at least besides weather. So you’ve already brought up a number of factors involved in fruit set in grapes, but what would you say is the take home message?

***Kathryn:*** There are many factors that impact fruit set in wine grapes including weather, vine nutrition and health, vine vigour/balance and cultivar. If you observe issues with fruit set in your vineyard, document your observations, as this might help to determine the cause of the problem. It is best to evaluate fruit set 10 to 12 days after full bloom to evaluate flower clusters for fruit set estimates.

***Kristy:*** That’s great. Thanks so much for talking with me today. I’m sure this is on the minds of many grape growers across the province right now as we approach bloom. I hope this is a productive year for fruit set.

***Kathryn:*** I do, too! Thanks for having me, Kristy.

***Kristy:*** I was just speaking with Kathyn Carter, Fruit Crop Specialist for tender fruit and grape with the Ontario Ministry of Agriculture, Food *Music transition*

## CLOSING:

***Kristy:*** That brings our episode to a close. This has been Kristy Grigg-McGuffin -  
  
***Cassie:*** - and Cassie Russell, for the What’s Growing ON podcast. For more information on horticulture grown in Ontario, check out the links to our fruit, vegetable and specialty crop blogs in the show notes. 

***Kristy:*** A big thanks again to our guests this week, Andrew C. Wylie and Kathryn Carter. Another big shout out goes to Michael Pupulin for the editing of our episodes. Music from this episode is the track Aspire from Scott Holmes.   
  
***Cassie:*** We will be back in two weeks with an all new episode of What’s growing ON. In the meantime, if you have questions, comments or suggestions for a topic you would like us to cover, Please send us an email us at [ONhortcrops@gmail.com](mailto:ONhortcrops@gmail.com). We would love to hear from you.

*Music fade out*