Small Fruit News

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Clemson University • Louisiana State University • North Carolina State University
The University of Arkansas • The University of Georgia • The University of Tennessee
Virginia Polytechnic Institute and State University

In This Issue

Can You Overcrop Blackberries? I think YES!

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Some of my first experiences with fruit crops were grapes and peaches. With grapes, one prunes the majority of last year's growth off the vines in the dormant season, and often thinning of parts or entire clusters is done to balance final crop load. With peaches, similar extensive pruning is done, then if a normal crop is set one has to then thin about 90% of the fruit mechanically. I have never seen thinning done on blackberries, and after thinning peach trees a few times, I am not about to suggest we get a thinning stick and start whacking blackberries off the plants after fruit set!

Many years ago I had concerns on blackberry yields, mainly because the Arkansas blackberry varieties released in the 1970s and 1980s often yielded about 10-12,000 lb/acre. By comparison the USDA thornless varieties at the time yielded more in the area of 20,000 lb/acre. I was concerned that this yield differential was a disadvantage of the more erect varieties from Arkansas. I put a lot of emphasis on increased yield over the years in breeding, plus our growing techniques including trellising have been improved from years back. Yields are in on average higher with more recent varieties from Arkansas compared to 20 or more years ago.

Photo: *Ouachita planting with poor primocane emergence in mid-summer, 2018 after removal of floricanes.*

I remember back in the 1990s having a thorny selection that I thought was the pinnacle of yield, and I watched it a few years and it pretty much fruited itself to death. What happened? The floricanes overcropped, the fruit was not very good quality with small and limited floricane leaves, and it produced no primocanes. Thus, it died. Or, I think fruited itself to death! We might want high yields, but the plants have to survive first. This showed me that breeding for yield could go too far.

Photo: *Ouachita plant with no primocane emergence in summer, 2018. Note small diameter primocanes on third plant, evidence of possible overcropping and reduced primocane strength.*

Natchez, released in 2007, is a high yielding variety normally. I did not realize its yield full potential until more testing after its release in Arkansas, and watching it perform in commercial plantings particularly in southern Georgia. Grower Steve McMillan in Georgia was the first person to contact me about the plants bearing huge crops, the quality was not high, and the plants often produced no primocanes. It also can produce long primocane laterals and canes are not as erect as varieties such as Ouachita. This growth habit, plus its huge yield potential of season-long large berries, can lead to overcropping evident by the plants having almost only berries and few floricane leaves. Additionally it has a lower chilling requirement than Ouachita, so likely is more prone to crop even heavier than Ouachita in southern Georgia. The resulting berries on overcropped plants are tart and have reduced postharvest storage potential. This led to me stressing to growers to make sure that dormant pruning is done on Natchez to shorten laterals on primocanes, and not allow long laterals, or untipped canes, to be retained and thus balance crop load. This advice seems to have worked well, however Natchez is better adapted in Arkansas and the Carolinas as it exhibits better quality and more balanced cropping (this might be due to it getting some winter or spring freeze injury to reduce crop also) compared with overcropping and challenges in fruit quality for shipping in the warmer Georgia environment.

Interestingly this year I have had two recent contacts about primocane emergence concerns on Ouachita, a rare occurrence in my career. Ouachita has always been a consistent primocane producer no matter where grown or how managed, at least with reasonably good weed control, irrigation and general good planting management. Both growers reported the plants had heavy crops, and one was on second-year plants (in Georgia; or first crop year) and another on third-year plants (in North Carolina; or second crop year). Both used tissue cultured plants for the planting establishment and the plantings were in good health the year prior. The growers asked me why this happened? I think this is due to overcropping, or simply the plants overproduced on the floricanes. Why? I can't say for sure, but my guess is the plants had too much fruiting area, budbreak and cropping conditions were good, and they expressed their full yield potential. The stored carbohydrates in roots and crowns moved to the floricanes with large crop load potential, and not much energy

was left to encourage primocane growth. My guess is these floricanes had small leaves, likely berries on these canes were not as large as normal, and size was reduced later in the season. They were not optimum in sweetness either is my hunch.

What can be done in situations like this? I don't think we need to get the thinning sticks out as peach growers do. But, I think close attention to dormant pruning is warranted. I suggest shortening laterals on primocanes to 15-24 inches long during dormant pruning at least on plants grown in a hedgerow using a t-trellis. I am not sure what to say if the rotatable cross-arm or shift trellis is used, possibly reducing the number of canes retained would work. However, reduction in cane area will help balance the crop, lead to more uniform budbreak, provide for more floricane leaf development, and result in quality berries. If this has never been a concern to you and your plantings are performing well without pruning to this extent, then continue as you have. But, if overcropping on Ouachita or any other variety has been experienced, consider this as an option.

One last item to mention is health of floricane leaves. I focus a lot of attention on floricane leaves in breeding as I believe good floricane leafing is imperative for sweet and high-quality berries. How to attain good leafing? Balanced cropping. Is there anything else to be aware of? Yes, and that is maintaining the leaf health thru controlling leaf diseases. Anthracnose and leaf rust can contribute to unhealthy leaves leading to quality concerns.

It has been an exciting year in 2018 for blackberries in the Southeast. Crops have been good overall, quality has been consistent, and folks tell me the commercial shipping prices are the best they have seen. So, lets rejoice a while with this good news. But also be looking ahead again to further fine tune the management of plantings for balanced cropping and quality berries. And, look forward to high prices again!

High Throughput Sequencing (HTS)

A variety of test methods - biological, serological, biochemical and molecular - are used currently in plant diagnostics and each has advantages and disadvantages. Classic diagnostic methods require prior knowledge of the pathogen in question and in some cases, require 2-4 years to complete. High throughput sequencing (HTS), also known as next generation sequencing (NGS), is a new, efficient method for obtaining nucleic acid sequences. Read More…

Grape Chores

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Grape chores. Most of the below generally applies to both muscadines and bunch grapes. Exceptions are that in muscadines: (1) the only canopy management practice is hedging; (2) crop load is typically not managed after pruning; (3) maturity is generally monitored by primary chemistry while considering fruit firmness and integrity (especially for fresh market); (4) disease management is typically terminated around mid-August; (5) wildlife deterrence is not employed.

1. **Canopy management** is mostly left to remedial fruit-zone leaf removal and hedging at this point. It is never too late to do some selective leaf removal around the clusters to aid in drying and improve pesticide coverage on the fruit. However, leaf removal does little if the canopy is shading out the canopy and fruit-zone. Thus, hedging should continue in the vineyard until strong vegetative growth and canopy self-

shading subsides, which is often not until several weeks after ripening has started.

2. **Crop load management** is commonly practiced before veraison. If you are going to thin your crop, focus your efforts on regions of the fruit-zone that are densely packed with clusters; touching clusters will often develop bunch rots due to the lack of pesticide coverage as well as reduced air movement between them. A past blog post on the UGA Extension Viticulture Blog went in to a bit more depth on when and why one might thin crop in their vineyard (http://blog.extension.uga.edu/viticulture/2017/07/considerations-for-crop-thinning/).

3. Veraison is the transitional period of grape development when grapes begin to soften, and sugars and secondary flavor, color, and aroma compounds begin to accumulate. Grapes are said to be "ripening" starting at veraison. Knowing veraison can help you predict harvest date – especially if you have records. This year has been somewhat late. Reds are roughly 20-30% at 1500-1600 ft. elevations and we are seeing roughly 13 Brix in Chardonnay at those elevations. Since post-veraison weather patterns can drastically change ripening rate, we must monitor maturity and not strictly rely on records (next).

4. Petioles and leaves are often sampled at bloom, but **vine tissue sampling** can be conducted again at veraison. While petioles and leaf blades are sampled from opposite the clusters at bloom, these tissues are sampled from the youngest fully expanded primary shoot leaves – often near the end of the now-hedged shoot. Sampling tissues at veraison allows one to target "nutritional problem areas" of the vineyard that were otherwise not evident at bloom, when the soils were at field capacity and nutritional symptoms were not evident in unstressed vines. Newly-planted vineyards will often show nutrient deficiency symptoms at this time of year; this is typically due to their shallow root systems having limited access to soil mineral nutrient resources.

5. **Monitoring grape maturity** is important to determine harvest date. I would encourage that a combination of chemical and sensory evaluations be used to help determine when to pick. *The chemical and sensory benchmarks that define maturity will vary based on variety and winemaking goals.* For example, if I wanted to make a sparkling rosé out of my Merlot, I would aim for lower sugars and higher acids; the opposite would be true if I wanted to make a full bodied red wine. Soluble solids (Brix) is a ubiquitously used maturity benchmark, likely due to its relative low cost/ease of measurement. Barring special winemaking goals of sparkling wines rosés, and late harvest/dessert-style wines, most will look to harvest somewhere between 20-25 °Brix, and the accompanying acidity and pH will greatly vary by variety. Bear in mind that high pHs (i.e. > 3.8) can put the wine at higher microbial spoilage risk unless post-harvest amendments are made in the winery. As far as sensory evaluation of maturity goes, many will use the color of the seed, the flavor/aroma of white grapes, or the taste and "mouthfeel" of red grapes to aid in maturity evaluation. Please consider the integrity/sanity of the crop as you monitor the quality. Keep in mind that rot tends to increase in severity as fruit maturity advances. Make educated decisions and balance the risk/reward of hanging your crop for extended periods.

It is important to monitor maturity separately for each variety. It is also important to sample grapes in an unbiased fashion by sampling from all parts of the cluster, and across a section of vineyard that represents a separate vinification. For example, samples from blocks A and B should be kept separate if they will be harvested and vinified separately – even if they are the same variety. However, care should be taken to sample across each block to best characterize the average maturity. This may best be done by creating a randomized sampling scheme for each block.

6. **Scouting for fungal diseases and insects**. Downy mildew, botrytis, and sour rot often make unwelcomed appearance from now until harvest. It is important to protect your vines from downy mildew, powdery mildew, botrytis, and ripe, sour and bitter rot by using appropriate pesticides – especially when weather patterns are conducive to disease development. Japanese beetles and spotted wing drosophila are of primary concern in the post-veraison period. I would encourage everyone to scout for and manage these insects accordingly. Read labels and take head of long pre-harvest intervals (*especially products containing mancozeb*).

7. **Take inventory of, and deploy, wildlife deterrence equipment.** You know your vineyard and are thus the best judge of historical wildlife pressures. I have personally seen both birds and raccoons take more than their share of crop from vineyards – please do not underestimate the amount of crop that be lost to wildlife. Bird netting and other scare devices should be going up in vineyards all over the southeastern US over the next month or so. Netting is the best strategy to manage bird pressure. Traps and other vertebrate control measures should be deployed if necessary.

8. **Take inventory of harvest shears, lugs / bins, and other harvest supplies**. Harvest will be here before we know it. Please be prepared to pick your *entire* crop when you or your customer wants. Don't be caught short handed with supplies when you need them most. Make sure tank space is ample to accommodate the amount of crop that will be vinified.

9. For updated and timely information about vineyard management, and information on workshops and conferences, please subscribe to the UGA Extension Viticulture Blog (http://blog.extension.uga.edu/viticulture/).

Summer 2018
Caneberry Chores

This list was developed by Dr. Gina Fernandez, Small Fruit Specialist at NC State University. Chores and timing may be somewhat different in your area or for your cropping system.

Plant growth and development

- Fruit development for floricane-fruiting types
- Rapid primocane growth
- Flower bud development for primocane-fruiting types later in summer
- Floricanes produce fruit and begin to senesce

Pruning and trellising

Floricane-fruiting raspberries:

- May need to adjust primocane numbers if canes are too thick (i.e. remove less vigorous primocanes at their base)
- Train primocanes to grow in the middle of the fruiting floricanes

- Pinch black raspberry primocanes at 2 to 3 ft. to promote lateral growth

Primocane-fruiting raspberries:

- Train primocanes within a trellis to hold canes erect

Erect floricane -fruiting blackberries

- Tip the new primocanes when they are about 6" to 12" below the top wire of the trellis to encourage lateral branching, tipping is better than cutting with a pruners to prevent Cane Blight infection. For more information on Cane Blight: http://extension.uga.edu/publications/detail.html?number=C894&title=Cane Blight of Blackberry
- Continue tipping at monthly intervals to maintain desired branching and height of canopy (laterals should reach top wire)
- Control cane blight after tipping with fungicide treatment
- Prune out spent floricanes after they have produced fruit, do not thin out primocanes until mid-to late winter
- Train primocanes to grow in between the floricane to minimize interference with harvest. Shift trellises or V-trellises make this relatively easy

Trailing floricane-fruiting blackberries

- Train new primocanes to middle of trellis, on the ground in a weed-free area, or temporarily to trellis outside of fruiting area (depends on trellis type)
- Cut back side shoots to 18" (after dormancy in cold climates)
- Remove spent floricanes after harvest

Primocane-fruiting blackberries

- Tip canes twice, soft tip once when they reach 1.5 ft and then soft tip the laterals at 1.5 ft.

Weed management

- Mow along side of row to maintain the width of the bed to 3 to 4 ft.
- Weed growth can be very vigorous at the same time as the crop peaks.
- Weed control is best done earlier in the season before harvest commences.
- Mow middles regularly to allow pickers to move through rows easily.

Insect and disease scouting

- Scout and treat for these pests:
  Insects
  - Spotted winged drosophila
  - Raspberry crown and cane borers (canes girdled and wilt)
  - Psyllid
  - Two-spotted spider mite
  - June beetle
  - Japanese beetles
  - Stink bugs
  - Fire ants

  Diseases
  - Botrytis
  - Rusts
  - Orange felt (orange cane blotch) (blackberry)
  - Sooty blotch (blackberry)
  - Orange rust
  - Powdery mildew
  - Double blossom (blackberry)
  - Cane blight (blackberry)
  - Powdery mildew

If virus symptoms are present, affected plants may need to be rouged to prevent spread

Water management

- Raspberry and blackberry plants need about 1-2 inches of water/week; this amount is especially critical during harvest.
- For blackberries (not raspberries) in warmer climates only, consider installing

an overhead system for evaporative cooling to reduce sunscald. Turn on once or twice a day from 10 am to 3 pm for short periods of time (approx. 15 minutes) at mid day only.
- Give plants a deep irrigation after harvest.

Nutrient management

- Take leaf samples after harvest and send to a clinic for nutrient analysis
- Blackberry growers typically use drip irrigation through the spring and early summer to supply about 50 lb/N acre. Growers should ease off N during harvest, but give plants additional nitrogen (about 10-30 lbs/acre) after harvest. Amounts needed will vary with plant health, crop load and soil conditions. Check with your local Extension agent for recommendations.

Harvest and marketing

- The busiest time of the year for a blackberry or raspberry grower is the harvest season. Each plant needs to be harvested every 2-3 days. For larger plantings, that means fruit is picked from some part of the field every day of the week.
- Pick blackberries when shiny black for shipping. Those that are dull black are fully ripe and suitable for PYO only.
- Pick directly into clamshells with absorbent pads, or for PYO use clean cardboard flats, take-home baskets, or sanitized re-usable containers.
- Keep harvested fruit in shade and move into coolers as soon as possible to lengthen the shelf life of the fruit.
- Use forced-air precoolers for best removal of field heat.
- Store at 32 to 34°F and 95% relative humidity.
- Freeze excess fruit for jam, juice, or wine.
- Keep good records of what cultivars are picked, what fields are picked and when they are picked. Good record keeping will help you predict harvest potential in the future.
- Keep your customers informed with social media.

Upcoming meetings

There will be a field day sponsored by the NC Commerical Blackberry and Raspberry Association Sept 20 at Faith Farms in Cleveland County. Details will be sent out via Team Rubus blog and NCCES later this summer

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FACT SHEET

National Clean Plant Network

Start clean, stay clean.

High Throughput Sequencing (HTS)

A variety of test methods - biological, serological, biochemical and molecular - are used currently in plant diagnostics and each has advantages and disadvantages. Classic diagnostic methods require prior knowledge of the pathogen in question and in some cases, require 2-4 years to complete. High throughput sequencing (HTS), also known as next generation sequencing (NGS), is a new, efficient method for obtaining nucleic acid sequences.

What is high throughput sequencing?

HTS provides the nucleic acid sequences in a sample which are compared with sequences known to be common to pathogens. For example, a **motif** or signature sequence in the family Geminiviridae is a unifying feature that, along with other identifying features, can place other viruses within the same family. Further analysis will determine if this virus is a known or a novel virus. A huge advantage of HTS is that it can identify a potential pathogen without having prior knowledge of that pathogen by using this principle of **conserved sequences** between related pathogens.

A huge advantage of HTS is that it can identify a potential pathogen without having prior knowledge of that pathogen.

Definitions

Motif - a nucleotide or amino-acid sequence pattern that is a defining attribute

Conserved sequence - similar or identical sequences that are indicative of how closely organisms are related

Read sequence ('read') - a nucleotide sequence that may have come from anywhere in the sample

Nucleotides - the four bases guanine (G), cytosine (C), adenine (A) and thymine (T) that make up a DNA strand

DNA library - a collection of labeled DNA fragments to be sequenced

Contig (from contiguous) - a set of overlapping DNA segments that represent a consensus sequence of DNA

Koch's postulates - the criteria to establish a causative relationship between a microbe and a disease

How is it done?

There are many variations of HTS sequencing platforms and different nucleic acid templates, such as small RNA, double-stranded RNA, or total nucleic acid can be used. Amplifying and sequencing purified DNA occurs when DNA molecules are attached to a chip and the sequencer reads millions of sequences per run. '**Reads**' are built one **nucleotide** base at a time during the sequencing operation. One HTS run takes about one day and can produce hundreds of millions of reads. This large-scale simultaneous synthesis of reads is what makes the process high throughput.

Simply, the steps are:

1. Collect the plant samples; extract and purify the total nucleic acid (TNA).

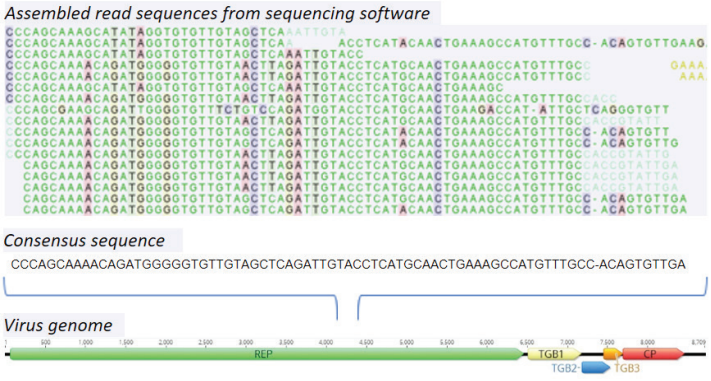
2. Evaluate the quality and quantity of the TNA.

3. Prepare **DNA libraries**; add specific adapters (labels) for each sample.

4. Quantify the libraries, combine, and load into a sequencer.

Preparing the library is an important step requiring 1-3 days.

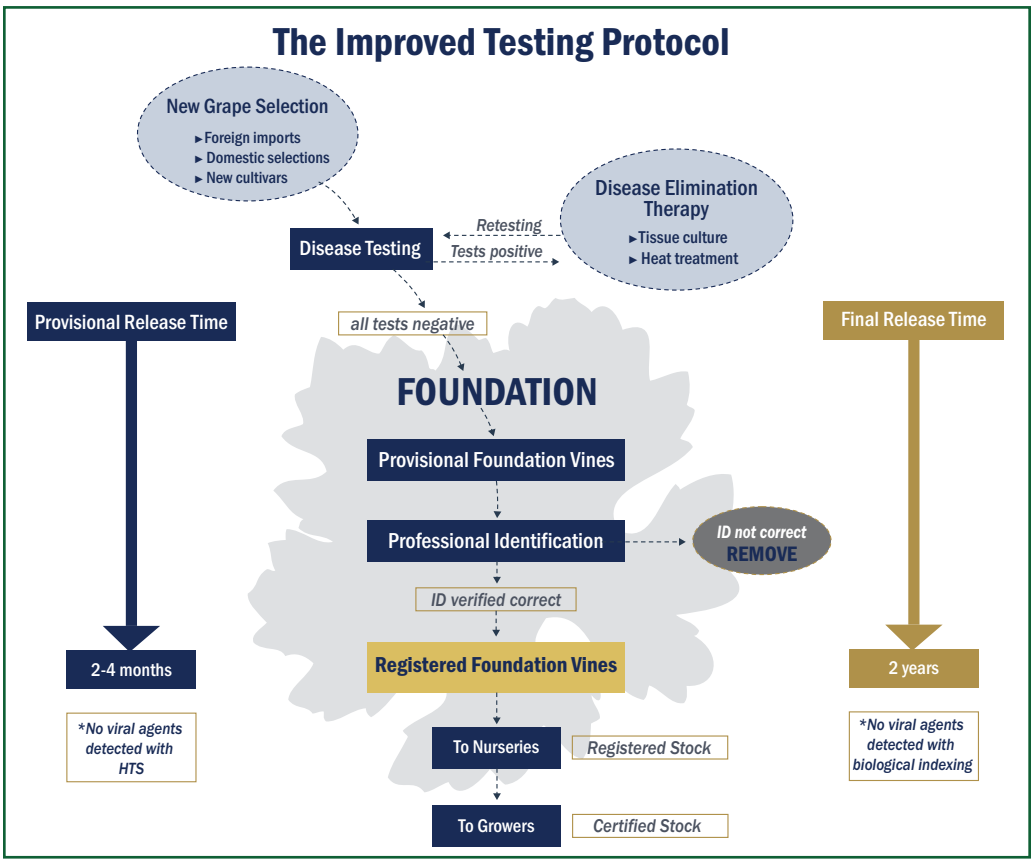
5. For each sample, use bioinformatics software to analyze reads and assemble into larger **contigs**.



Analysis process from read sequences to virus identification.

What are the benefits of HTS?

HTS is rapid, accurate, and efficient in the detection and identification of viral pathogens. It provides a comprehensive picture of the entire microbial profile of a sample. In studies comparing the efficacy of HTS and conventional assays used to detect grapevine and fruit tree viruses, researchers found that HTS was superior in its ability to detect viruses of economic significance (including low titer viruses), comprehensiveness, speed of analysis, and ability to discover novel, uncharacterized viruses. USDA APHIS has recently approved the provisional release of propagative plant material that has been HTS screened for pathogens. This has greatly reduced the wait time for clean plant material as selections under provisional release may be available in only 2 to 4 months.



For example, HTS testing has greatly reduced the time required to test grape selections. If a selection tests clean by HTS, it can be made available in as little as 2 to 4 months vs. 2 years or longer for bioassay results.

What are the limitations of HTS?

While HTS remains a powerful new technology with significant benefits, there are challenges associated with the technology. Due to its sensitivity, microbes of unknown pathogenicity are detected. Detection of a given microbe does not mean that it is responsible for disease. It is essential to establish biological significance to determine if the microbes sequenced are indeed biologically important. Biological significance is assessed by performing graft transmission, fulfilling **Koch's postulates**, analyzing spread and distribution, and assessing economic significance of symptoms.

No detection methodology is perfect. HTS and bioinformatics tools are only as good as the reference databases used. For example, novel virus sequences may be quite different from those deposited in databases. However, new methods that do not depend on sequence similarity are being explored and as knowledge expands so will the ability to identify novel species. In addition, efforts are underway to standardize HTS methodology across laboratories.

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About NCPN

Established in 2008 and supported by the US Department of Agriculture, the NCPN is a national network of clean plant centers, scientists, educators, regulators and industry representatives who are concerned with the health of vegetatively propagated specialty crops.

nationalcleanplantnetwork.org

Start clean, stay clean
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