Small Fruit News
Vol. 19, No. 2 April 2019

Auburn University • Clemson University • LSU AgCenter • NC State University
The University of Arkansas • The University of Georgia • The University of Tennessee
Virginia Polytechnic Institute and State University

In This Issue

'Miss Lilly™': A New Southern Highbush Blueberry Variety for Southeastern US Growers Battling Frost Susceptibility

D. Scott NeSmith

Many of the current southern highbush blueberry varieties being produced in the Southeast flower very early, resulting in a high risk of significant crop loss caused by freeze damage during flowering. Most growers resort to overhead irrigation to frost protect these early flowering varieties since flowering time is one of the most sensitive stages to freeze damage. Irrigation for frost protection is very expensive, and it uses enormous amounts of water. One night of blueberry freeze protection using overhead irrigation can use up to 100,000 gallons of water per acre or 10 million gallons on a 100 acre blueberry farm. Development of blueberry varieties that flower later (thus avoiding freezes) could save up to 6 irrigation events for farmers per year, totaling over 60 million gallons in water saved per 100 acres in some years.

Since 1997 the UGA Blueberry Breeding Program has been aggressively developing varieties to be better suited for southeastern US growing conditions. One of the many targets has been to develop a later flowering variety that could avoid spring freeze risks. However, the later flowering variety also needs to ripen fruit in the early part of the season to reap stronger pricing for the grower. After screening literally thousands of new blueberry selections, UGA has developed a late flowering, early ripening blueberry variety suitable for growing in most of the Southeast without frost protection. The new variety is named 'Miss Lilly™' (patented as 'TH-948', USPP 27,323).

Figure 1: 'Miss Lilly™' southern highbush blueberry plants during ripening.

Figure 2: *'Miss Lilly™' southern highbush blueberry fruit.*

'Miss Lilly™' is a strongly upright, narrow based plant, with large, high quality berries (Fig. 1 and Fig. 2). It has an estimated chill requirement of 500 to 550 hours < 45 F. The new blueberry variety is expected to offer growers fruit that ripens in the main southern highbush season, but without the requirement (and expense) of frost protection. In our south Georgia trials at Alapaha, the new variety flowered very late, 10 to 14 days later than 'Star', yet ripened rather early (Table 1). In Griffin, Ga trials (Table 2), again 'Miss Lilly™' flowered much later than 'Star', yet, ripened earlier than the older variety. 'Miss Lilly™' fruit are large with good firmness (Table 3). 'Miss Lilly™' per plant yield is slightly lower on average; however, yields are steady from year to year due to the later flowering habit that aids in the variety typically escaping cold damage. The lower per plant yield for 'Miss Lilly™' can be compensated for by higher density planting since the plant is very narrow and upright. Higher density planting would achieve comparable per acre yields. Regardless, there are a number of southeastern US growers looking for an easier to manage, early ripening southern highbush. 'Miss Lilly™' can typically be grown without overhead irrigation frost protection. One note is that under extreme freeze conditions such as occurred in 2017 in Georgia, even 'Miss Lilly™' suffered some crop loss. However, it produced more than any other variety on our trial farm that year, having around 40 to 60% of a crop without frost protection, while all other southern highbush had 95% or greater crop losses.

In summary, severe spring freezes frequently occur throughout much of the southeastern US blueberry growing area during southern highbush flowering time. Therefore, growers face potentially heavy crop losses if they do not use overhead irrigation for frost protection for these early flowering blueberry varieties. Irrigation for frost protection is very expensive, however, and uses enormous amounts of water. The UGA Blueberry Breeding Program has been working for more than 20 years to develop more adapted blueberry varieties for Georgia and the southeastern US, and one of the most recently developed varieties, 'Miss Lilly™', is now available to help growers fend off perils of spring freezes. 'Miss Lilly™' flowers 10 to 14 days later than most early

ripening southern highbush grown in the Southeast, yet ripens in the main harvest season. This gives growers an opportunity to grow high quality, timely ripening southern highbush blueberries without the added expense of frost protection.

Table 1: Plant and fruit ratings for the new UGA blueberry variety 'Miss Lilly™' and standards 'Star' and 'Camellia' at the Alapaha, Ga Blueberry Research Farm. Data are 5 Year averages (2009-2013).

Berry and plant attributes	Star	Camellia	Miss Lilly™
Berry size	7.6	8.9	8.4
Berry scar	7.0	7.2	7.4
Berry color	7.1	8.7	7.8
Berry firmness	7.2	7.2	7.8
Berry flavor	7.0	7.8	7.8
Cropping	4.7	5.4	5.2
Plant vigor	6.3	9.8	7.6
Date of 50% flowering	Mar 3	Mar 11	Mar 17
Date of 50% ripening	May 8	May 15	May 11
Fruit development period (days)	66	65	55

Table 2. Plant and fruit ratings for the new UGA blueberry variety 'Miss Lilly™' and standards 'Star' and 'Camellia' at the Griffin, Ga Blueberry Research Farm. Data are 5 Year averages (2009-2013).

Berry and plant attributes	Star	Camellia	Miss Lilly™
Berry size	7.4	8.6	8.7
Berry scar	6.9	7.0	7.2
Berry color	7.1	7.9	7.3
Berry firmness	7.2	7.2	7.7
Berry flavor	7.1	7.4	7.4
Cropping	6.8	7.9	6.2
Plant vigor	8.5	9.8	9.1
Date of 50% flowering	Mar 13	Mar 25	Mar 28
Date of 50% ripening	May 25	May 31	May 21
Fruit development period (days)	73	67	54

Table 3: Yield, berry wt., firmness and Brix for 'Miss Lilly™' and standards 'Star' and 'Camellia' 2010 thru 2013. Data are from the UGA Blueberry Farm in Griffin, Ga.

Year	Star	Camellia	Miss Lilly™
	Yield (lbs/plant)		
2011	12.7	9.7	8.5
2012	11.7	10.5	7.2
2013	3.9	15.9	7.3
Avg	**9.4**	**12.0**	**7.7**
	Individual berry wt. (g)		
2010	1.53	2.94	3.15
2011	1.20	1.97	2.08
2012	1.80	1.60	2.17
2013	1.79	2.56	2.12
Avg	**1.58**	**2.28**	**2.38**
	Fruit firmness (g/mm)		
2010	196	150	165
2011	206	166	188
2012	190	164	186
2013	191	150	188
Avg	**196**	**157**	**182**
	Brix (%)		
2012	13.9	14.5	12.0
2013	13.5	13.3	12.3
Avg	**13.7**	**13.9**	**12.2**

Availability: Blueberry 'TH-948' (USPP 27,323) Miss Lilly™ is owned by the University of Georgia Research Foundation. Propagation rights are controlled by University of Georgia Research Foundation, Innovation Gateway, GSRC Boyd Bldg, Athens, Ga. 30602-7411 (http://research.uga.edu/gateway/). Current licensed propagators for 'Miss Lilly™' are as follows (in alphabetical order):

Cornelius Farms, Manor, GA

Fall Creek Farm & Nursery, Lowell, OR

Farmer John LLC, Alma, GA

Lochloosa Lake Farm & Nursery, Hawthorne, FL

Oregon Blueberry Farm & Nursery, Silverton, OR

The prospects of American Strawberries

Comprehensive review summaries the challenges, needs, and opportunities for strawberry growers

American Society for Horticultural Science

Previously published in AAAS, Feb. 15, 2019

VIRGINIA BEACH, VA—The Prospects of American Strawberries

Photo: *Commercial field production of strawberries.*
Photo credit: *Jayesh Samtani*

A comprehensive review led by Jayesh Samtani of Virginia Tech and Curt Rom of the University of Arkansas encapsulates an understanding of the challenges, needs, and opportunities of strawberry growers across the United States. Samtani and Rom formed and gathered support from a team of 12 researchers from 10 different states as they embarked on an academic journey designed to generate an effective guideline essential for research, policy, and marketing strategies for the strawberry industry across the country, and to enable the development of general and region-specific educational and production tools.

Their findings are summarized in the article "The Status and Future of the Strawberry Industry in the United States", an open-access article published in *HortTechnology*.

The review divides the United States into eight distinct geographic regions, and an indoor controlled or protected environment production system. A common trend across all regions is the increasing use of protected culture strawberry production with both day-neutral and short-day cultivars for season extension to meet consumer demand for year-round availability. All regions experience challenges with pests and obtaining adequate harvest labor.

Increasing consumer demand for berries, climate change-induced weather variability, high pesticide use, labor and immigration policies, and land availability impact regional production.

The United States produces more than 3 billion pounds of strawberries each year, providing almost 20% of the world crop, and is a global leader in production per unit area. The farm gate economic value of strawberries is just shy of $3 billion per year. With that monetary strength, the US production acreage has increased approximately 17% steadily since 1990, with the largest expansion in Florida and California.

US consumption of strawberries has increased significantly during the past 2 decades, from 2 pounds per capita in 1980 to approximately 8 pounds per capita in more recent years. Consumption is expected to continue to increase as a result of increased awareness of the health benefits associated with berry consumption, year-round availability made possible through domestic production and protected berry culture, increased imports, and improved cultivars.

The future of strawberry production will be dictated both by grower production needs and consumer demands for the fruit. The number of growers who have reduced the use of fumigants has increased. In those regions that rely on fumigants to control soil-borne pests and weeds, there is increasing interest in alternative treatments such as the use of

steam, enhanced soil solarization, or hot water treatments.

Until the economic viability of these alternative treatments is determined, growers facing pest pressures at their production sites are continuing to use fumigation, despite regulations against it. Automation and robotics to assist with the more labor-intensive tasks of planting, maintaining, and harvesting will be further developed and used to expand both the regions and seasons of production, thus increasing consumer accessibility and reducing the use of pesticides and the corresponding environmental impact.

Samtani adds, "What started off as a discussion and a general idea between myself and Curt Rom certainly progressed into a benchmark review. From its foundation as a USDA-SCRI planning grant proposal (Planning to Increase the Productivity and Competitiveness of Sustainable Strawberry Systems), the initiative gained momentum over time through our exchanges of ideas and thoughts. This culminated into a workshop at the 2017 ASHS Annual Conference. Speakers were carefully identified, ensuring those with sufficient knowledge, experience, and expertise were chosen to represent the different strawberry production regions of the US. We believe that we have provided a great overview of the different strawberry-producing regions of the United States--a topic that has not been investigated and documented at a national level."

***

The complete article is available open access on the ASHS *HortTechnology* electronic journal web site:
DOI: https://doi.org/10.21273/HORTTECH04135-18. Or you may contact Jayesh Samtani of Virginia Tech at jsamtani@vt.edu or call at (757)617-6990.

Founded in 1903, the American Society for Horticulture Science (ASHS) is the largest organization dedicated to advancing all facets of horticulture research, education, and application. More information at ashs.org.

Label Changes and Restrictions for Paraquat

Wayne Buhler
Pesticide Safety Extension Specialist
N.C. State University

Companies that produce paraquat-containing pesticides (example brand names: Gramoxone, Firestorm, Helmquist and Parazone) are required to have newly labeled product in the market after November 14, 2019 – some may produce and sell newly labeled product before that date. The NEW label will specify that the applicator, mixer, and handler of these products be a certified applicator and have completed a paraquat-specific training program.

- EPA is allowing the sale of paraquat that is already in the channels of trade, so some paraquat sold this growing season may NOT have the new training requirement on the label.
- Growers that currently have a supply of paraquat that DOES NOT have the new labeling listing the required training ARE NOT required to complete the training.

The training is currently available online at www.usparaquattraining.com. Applicators will need to register on the site, watch a 45-minute video presentation, and complete a quiz (final assessment). A certification of completion is awarded with a 100% quiz score (unlimited re-attempts allowed).
Paraquat-specific training is required once every 3 years. The training is hosted online by the National Pesticide Safety Education Center. NCDA&CS will not be conducting this training.

Only certified applicators who have completed the paraquat training can mix, load, handle and

apply paraquat-containing products---not someone working under their supervision.

Other actions EPA has taken to prevent poisonings with new label changes include:

- Clarifying toxicity in English and Spanish language formats
- "DANGER-ONE SIP CAN KILL" and Skull and Crossbones symbol on the container
- A "product package safety requirements sticker" (see attachment) affixed to the container
- A "counter card" (attached) reiterating the same important warning information to be distributed with every container
- **AN IMPORTANT NOTE: Requirement for closed system transfer ("requiring closed-system packaging for all non-bulk (less than 120 gallon) end use product containers of paraquat.") is NOT going to be in place this growing season!**
    - Registrants will submit label changes and new product registrations for the closed system packaging by March, 2019, and will have 12 months from EPA's label approval date to adopt the closed system packaging.

The best advice still remains, read and follow the label directions on the product you are using, keep product in it's original packaging, and NEVER put product in any type of food container - especially a drink container.

For a complete overview of the requirements see: https://www.epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators

Blackberry Fruit Disorders and Crop Development Videos on You-Tube Now!

Dr. Amanda McWhirt, University of Arkansas Horticulture Extension Specialist

The Southern Region Small Fruit Consortium grant program has helped fund our project (#2018 E-02) to develop several crop specific videos. The videos are undergoing final edits and are being uploaded now. Two videos we recently uploaded that will be of interest to blackberry growers are "Blackberry Fruit Disorders" and "Southeastern Blackberry through the Seasons".

- "Blackberry Fruit Disorders" shows what common fruit disorders like white drupe, anthracnose and red cell reversion look like in the field and briefly discusses what causes these disorders. This can be helpful in identifying what is causing oddly shaped or off colored berries.
- "Southeastern Blackberry through the Seasons" shows how blackberry canes develop through an entire season. Ever had a hard time distinguishing between primocanes and floricanes? Or not sure how tipping impacts lateral development? Or confused about when or where bud development starts? This video will show you!

Additional videos will be uploaded shortly as our team, including myself and Drs. Gina Fernandez (NCSU), Elena Garcia (Univ. Of

Arkansas) and Jackie Lee (Univ. Of Arkansas) complete edits.

All videos can be accessed at the UAEX Fruit and Vegetable YouTube page and our Southern Region Small Fruit Consortium Video Playlist found here.

Assessment of Pierce's Disease Resistant 87.5% *Vitis vinifera* (European Grape) Selections in Alabama

Dr. Elina Coneva
Extension Fruit Crops Specialist, ACES, and Professor,
Department of Horticulture, Auburn University

Until recently, commercial grape producers in Alabama and the Southeast have been restricted to growing native muscadines and hybrid bunch grape cultivars due to the looming presence of Pierce's Disease (PD), caused by *Xylella fastidiosa*, an endemic xylem clogging bacterium that is deadly to susceptible European (*Vitis vinifera*) grapevines.

In response to the spreading threat of PD in California vineyards, the U.C. Davis grape breeding program is developing high quality PD resistant European grape selections. Three of their advanced selections were obtained and planted in 2010 at an experimental vineyard at the Chilton Research and Extension Center (CREC) located in Chilton County, AL to examine the feasibility of cultivation within Alabama's high Pierce's disease pressure environment. Detailed research is being conducted to assess the phenological development, vine physiological responses, and fruit quality characteristics for the three experimental selections, namely: '502-10', '502-01', and '501-12'.

A new crop for Alabama, European grapevines are trained in a different manner than muscadine grapes. The vertical shoot positioning (VSP) training system facilitates the upright growing habit of *V. vinifera* cultivars and contributes to efficient pest management practices, while concentrating the crop load within a compact fruiting zone (Fig. 1 A, B).

Figure 1: *Ripening clusters of V. vinifera selection '502-01' within fruiting zone of a VSP trained vine at the Chilton REC, AL.*

Studying the vines' development throughout the growing season allows for development of proper management techniques in a given set of environmental conditions. For the three selections, bud break usually occurs by the first week of April and canopy formation is completed by late April. Flowering is initiated in the first days of May, and full bloom occurs within a week.

Veraison is the stage associated with grape ripening. It starts when the berries start turning their color from green to black or fully colored berry, and sugar accumulation increases. Veraison takes about 40-50 days depending on the particular cultivar and continues until harvest. The three selections vary in season of ripening, with '502-10' maturing early, in mid-August, followed by 502-01 which ripens mid-September. Selection 501-12 has a late ripening and is usually harvested mid-October.

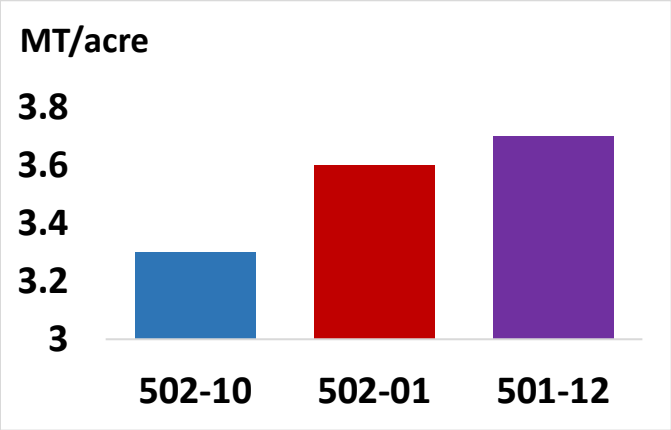

Figure 2: *Annual yield, (MT/acre) of PD resistant V. vinifera selections grown at the CREC, Clanton, AL.*

Based on cumulative yield data (2012-2018), the early ripening selection '502-10' produces an average of 3.3 MT/acre/year, followed by mid-season '502-01' with 3.6 MT/acre/year, and '501-12' with 3.7 MT/acre/year (Figure 2). Crop data indicates all of the tested PD resistant European grape selections are highly productive in Alabama environment.

None of the experimental vines studied under Alabama's high PD pressure conditions have exhibited PD symptoms and currently there are no grapevine losses resulting from other pathogens.

Our results for vine growth, productivity and fruit quality are very encouraging and demonstrate the potential of U.C. Davis developed PD resistant *V. vinifera* selections to improve viticulture sustainability in the southeastern region.

Two More Cents on Cold Protection and the Extreme Value of Experience

Mark Hoffmann
Small Fruits Extension Specialist
NCSU Raleigh NC.
Clyde Gurosik, Gurosik's Berry Plantation
N Augusta, SC.

We all do mistakes. That is true for every aspect of life. And we all will continue to make them. Although we more than often feel ashamed for our mistakes, they also teach us very valuable lessons, if we let them. Experience is the outcome of those lessons and if we embrace a life-long process of learning, we will be able to make more informed judgements and choices. The gift of critical thinking combined with the capacity to accept, embrace and learn from ones mistakes builds up a highly valuable body of experience in all of us over time. Capturing this experience and transition it from one generation to the next is what makes a society grow and prosper. This is especially true for complex topics such as cold damage and cold protection in strawberries.

Without the valuable input of others, it would be much harder for the next generation to learn. This is a first approach to integrate the knowledge of experienced growers, with the aim to help others to succeed and learn from the experience of those who grow strawberries in the Southeast for decades.

Cold Damage:
Two types of cold damage can occur: (1) Cold damage caused by freezing tissue and (2) cold damage caused by frost. The first phenomenon is also called 'Black Frost', although strictly not a frost at all. Under certain conditions, temperatures can fall so low that it will kill or damage the flower from within, but no frost will occur on the surface. We know from our research that if a strawberry flower freezes from within, the receptacle often doesn't freeze above 27 F of surrounding air temperature (see article in an earlier issue).

However, real frost is by far the most common cause for cold damage in North Carolina. Frost is a layer of ice which can build on a solid surface and forms, if water vapor in the atmosphere is coming in contact with a solid surface (flower) below freezing. Frost can build at much higher air temperatures. Generally, frost builds if the surface temperature of the flower is lower or equal to the dew point, and the dew point is below 32F. The amount of vapor in the air (humidity) is extremely important. Warmer air can hold more vapor, especially under generally moist conditions (past rainfalls, higher soil moisture). If the surrounding air is warmer than the flower and holds enough water vapor, frost events are likely to occur, if the flower temperature is at or below the dew point. The most common frost in North Carolina is **'Radiation Frost', also called 'Hoar Frost'**: This happens especially in cold, clear nights with low wind speeds and dew points in the 20s, and air temperatures somewhere between 32-40 F. This can happen at any time during between dusk and dawn, as soon as the conditions are right. In a clear, cloudless night with low wind speeds, frost can build even if the predicted air temperatures are 38 or 40 F. Under clear skies, the high radiation rates cause flowers to radiate heat into the air and drop their surface temperature below the dew point. Water vapor in the much warmer air condensates then directly as lose ice crystals on the surface of flowers and eventually causes damage, even if the receptacle is not frozen at all. Normally row covers frost up 1st, dead grass around fields 2nd, vehicle tops 3rd, PVC pipe 4th, layflat and AL pipe 5th, top strawberry leaf outer edges 6th, overall upper leaves 7th, then lower leaves and bloom 8th. Objects that are inert materials or dead tissue are not alive cool faster than living tissue, when exposed to uniform radiational cooling.

Cold Protection:
Growers must be aware that fields at slightly different elevations and orientations can experience significantly different temperatures. Some fields are typical frost pockets because they are several hundred feet lower than others, and if surrounded by wooded areas that block any prevailing wind or breeze, they can really be 4-6F lower than higher fields near a homestead. If only formal forecasts are available, 5F should be subtracted from forecasted temperature, to get a more reasonable estimate of the surface temperature at the strawberry plant level. There may be a slight breeze on top of a hill and "0" wind velocity 200' lower in a frost pocket field. Different surfaces cool at different rates of radiation. Their inclination to true north and outer space is also important. On a clear, totally cloudless night outer space can be thermodynamically described as a black body, absorbing radiant energy from earth surfaces very rapidly. That is particularly true during late winter and early spring, before forests leaf out. After the forests leaf out, that foliage acts like clouds, buffering energy losses and helping to hold ambient temperatures above freezing.

No weather service is perfect and you always should check several sources and at the end, trust your experience and instincts too. Often the question is what to use to protect, sprinkler or row-covers (or both). Row covers have the big disadvantage that they prohibit pollination and if they are left on for an extended amount of time, diseases such as Anthracnose and Grey-Mold can easily build up under row

covers, being spread when taking them off. While row covers protect down to certain temperatures, blooms that are in direct contact with them can experience damages. Especially wet covers can worsen the situation rather than helping. A wet row cover in contact with tender plant tissue or bloom will cause contact freeze burn, thru conduction, unless supplemental heat is provided constantly (overhead). If a grower waits for a blossom in contact with a wet cover to reach freezing before turning on the overhead, the damage has been done. Although the average temperature under a row cover will usually be 5-8F warmer than ambient temperatures, that temperature is not always consistent and can be 'layered'. Bloom in direct contact with even a dry row cover can be damaged severely as temperatures approach or exceed the cover thermal protection limit. Because of thermal layering, some others may result in seriously deformed fruit, but not be immediately and readily observable as damaged. Protection varies with cover thickness and many field variables, including ground temperature, moisture, soil type, ground cover and hill height.

Overhead irrigation can provide much broader temperature protection (down to the lower teens), and is a good method as long as wind is absent. Costs are higher, and certain risks are associated with overhead irrigation. It alone can be worse than nothing for an Arctic clipper, but when properly integrated with row covers can usually save nearly 100% of the crop. During short duration radiation frosts, overhead protection often can be more cost effective and user friendly. However, wind speeds need to be monitored. Within minutes of system shut down, the field is returned to pollination conditions. However, sufficient amount of water must be available as the number of events and duration varies. The start-up and shut-down times of overhead protection are extremely time critical. It is unwise to delay start-up beyond 32F field temperatures, as mechanical and electrical system issues are exacerbated. When field temperatures drop below 24F, the springs on impact sprinklers can ice up unless wobbler sprinklers are used. Knocking ice off of operating sprinklers at temperatures below 24F can become necessary to save the crop. Growers must be able to accurately predict wind speed extremes, before attempting to use overhead alone. Wind velocities of 8mph or greater result in elliptical patterns with intermittent coverage with extremely high evaporative cooling.
Experienced growers know the limitations and risks associated with row covers and/or overhead protection alone and most routinely successful south-eastern growers use integrated protection methods (covers and overhead).

Grape Chores

Cain Hickey
University of Georgia

Buds are breaking in muscadine vineyards in Georgia's coastal plains. We are likely a week or ten days out from seeing bud break in muscadine vineyards in the Georgia piedmont. We are seeing buds breaking throughout bunch grape vineyards in the piedmont and foothills of Georgia. Bud break is mostly observed in hybrids planted in the piedmont, but bud break is coming on fast in hybrid and V. vinifera cultivars in the foothills around 1200 to 1500 ft. above sea level. Those at higher elevations (Ellijay, Tiger, western NC) will likely be seeing bud break start sometime next week or the week after (obviously cultivar- and site-dependent). Hopefully all are finished pruning at this point. Get ready to implement active frost protection measures, if you have them. Best wishes to all for avoiding frost over the next several weeks. The following grape chores will last through late June/early July, when the next Small Fruits newsletter will be released through the Southern Region Small Fruit Consortium website (www.smallfruits.org).

Photo: *Lomanto bud break in Hall County, Georgia; photo courtesy of Mary Siebenmorgen.*

1. **Service and check active frost protection machines/equipment and be prepared to mitigate spring frost damage.** This is timely, as it may come in handy throughout April and early May. The most ubiquitous active frost protection method in eastern US vineyards is using a wind machine (photo, below) to mix air. Wind machines can protect 10-12 vineyard acres. Fiscal estimations suggest that wind machines can "pay for themselves" if they save the crop on only one acre if that crop is turned into wine and sold. If your site is frequently threatened by spring frost, such an investment may prove to be economically beneficial. Combining air movement with heaters or burning brush piles may offer additional protection when the 1-3 °F of protection offered by air mixing alone is anticipated to ineffective at preventing frost damage. Other methods, such as delayed pruning, spray materials, and irrigation may help in some instances, but each of these methods have drawbacks. For example, highly variable results have been reported regarding the effectiveness of chemical spray materials advertised to lower frost risk through bud break delay, cryoprotection, or preventing ice nucleating bacteria. Delayed pruning requires a final pass through the vineyard to prune to the desired final bud density; such a task may be too much for some enterprises to accomplish in a timely fashion given all that needs done in the vineyard during the bud break and early shoot growth stages.

2. **Weed management.** Depending on your weed management program, you may be needing to apply herbicides before bud break. Wayne Mitchem, NC State/UGA/Clemson Orchard and Vineyard Weed Management Specialist and UGA Viticulture Team member, recently spoke about best herbicide practices in vineyards at a recent vineyard management meeting in Ellijay, GA. Wayne is also a great resource for all herbicide-related questions in the vineyard; his email is mitchem@ncsu.edu. Please also consult your local county agent and/or the Southern Region IPM guides for bunch grapes and muscadines at the Southern Region Small Fruits Consortium's website: http://www.smallfruits.org/ipm-guides.html.

3. **Disease management. This is perhaps the most important "chore" in this list across all southeastern US vineyards given our disease-intensive climate. It is not a question of *if* you should manage for fungal diseases, it is a question of *when and how* you should do it using *what* strategies.** Much of the *when and what* was covered by Phil Brannen, UGA Fruit Pathology Extension Specialist and UGA Viticulture Team member, at a recent workshop in Ellijay, GA. All major fungal diseases of grapevines will need to be managed between now and

the next edition of the Small Fruits newsletter, which will be near July. Before and during bud break, phomopsis is of primary concern, but powdery mildew needs to be managed at very early shoot growth (3”), and downy mildew and black rot need managed very shortly thereafter. The critical period for managing several diseases on clusters begins at bloom and lasts through bunch closure. There are several guides and templates out there for disease management in vineyards. Use these to guide and develop your own program and adjust your program based on weather patterns and growth stage at your own vineyard location. If weather is highly conducive to fungal disease development, then tighten intervals; do the opposite if weather is dry and little precipitation I am not the expert in pathology. Phil Brannen (pbrannen@uga.edu) and Mizuho Nita (Grape Pathology Specialist at Virginia Tech; nita24@vt.edu) are both great resources for grape disease-related questions. Mizuho’s web page is a great resource for regional grape growers (http://grapepathology.blogspot.com/) and I highly recommend all growers use his resources on that page. Please also consult your local county agent and/or the Southern Region IPM guides for bunch grapes and muscadines at the Southern Region Small Fruits Consortium’s website: http://www.smallfruits.org/ipm-guides.html.

4. **Insect management.** Some insects will require management at an earlier calendar date / growth stage relative to others. Few insects are of concern right now (bud break) but climbing cutworms can cause severe shoot damage very early in the season if they are a problem in your vineyard and they are left untreated. My general recommendation is to know the history of troublesome insects at your specific site and to scout before you implement control measures. Regional insect pests include, but are not limited to, *Drosophila* spp., Japanese beetles, mealy bugs, mites, and leafhoppers. Our regional entomology experts include Brett Blaauw (UGA Orchard and Vineyard Entomology Specialist; bblaauw@uga.edu) and Doug Pfeiffer (Virginia Tech Orchard and Vineyard Entomology Specialist; dgpfeiif@vt.edu). Please also consult your local county agent and/or the Southern Region IPM guides for bunch grapes and muscadines at the Southern Region Small Fruits Consortium’s website: http://www.smallfruits.org/ipm-guides.html.

5. **Shoot thinning**. Shoot thinning is the first “canopy management” practice of the growing season. To optimize efficiency, shoots should be thinned by manually by hand removal. This is best accomplished when shoots are roughly 5” long. Inflorescences are clearly visible at this stage, making it easy to retain fruitful, and thin unfruitful, shoots. It is NOT advised to wait on this practice, as it becomes much more difficult to efficiently thin shoots when shoots are approaching a foot in length, and the junction between the spur and shoot becomes lignified. If you need to use pruners to thin shoots you have waited too long. Optimal shoot density is around three to five shoots per linear foot of row for single-fruiting zone systems, such as VSP systems. It is impossible to count to this number throughout commercial vineyards. Thus, it is advised to thin a panel to roughly four shoots per linear foot of row and get crew members to get a mental

image of what this looks like (below); they can then implement in the rest of the vineyard with good precision.

6. **General canopy management.** After shoot thinning, shoots need positioned to accommodate the intended training system. This will require tucking and positioning shoots, which facilitates air movement and sunlight interception by the leaves and ultimately promotes healthier, less disease-prone vines. Fruit zone leaf removal has been shown to optimize wine quality potential and reduce rot incidence and severity. My recommendation is to conduct the "initial leaf pulling" by removing leaves opposite clusters immediately after fruit set and no later than peppercorn berry size. This promotes canopy spray penetration and fungicide coverage on fruit and also acclimates fruit to the ambient temperatures and radiation outside of the canopy, thereby reducing sunburn risk. In fact, over the last five years, I have rarely seen sunburn evidence on highly exposed grapes when I have removed fruit zone leaves immediately at, or before, fruit set; these observations come from all over the southeastern US - from northern Virginia, to North Carolina, and all the way down to northern Georgia. Hedging of primary and lateral shoots should occur as needed through post-veraison. Primary and lateral shoot hedging are necessary for the same reasons that shoot positioning and fruit zone leaf removal. Fruit zone leaves could be removed to optimal specifications, but if primary shoots and laterals shade the fruit zone then there really is no net benefit gained toward promoting a healthy fruit zone microclimate within the canopy. Once pea-berry size and/or bunch closure arrives, then leaf removal maintenance is good practice to maintain open fruit zones that are quick-drying and therefore less hospitable to late season bunch rots such as *Botrytis*. Please see the photo, below, taken from a highly-shaded fruit zone. Nobody wants to make or drink wine from fruit like that – both because of the rot, but also due to the vegetal characteristics imparted to the finished wine product from such unripe fruit.

7. **Fertilization.** Use your soil reports, petiole sample results from current and previous seasons, and your own visual observations to determine where you need to fertilize and what you need to fertilize with. Fertilization should occur in split applications – one at/around bloom and one later in the season, perhaps at veraison. New root growth has been observed to occur primarily at bloom and immediately after harvest. It thus stands to reason that these periods

are associated with optimal nutrient uptake efficiency from the soil. I am a bit reluctant, however, to recommend late season fertilization given all that is happening with harvest logistics as well as the potential for causing a flourish of growth when vines should be acclimating to cooler temperatures and approaching winter dormancy.

8. **Soil and plant tissue sampling for nutrition management.** Soil samples tell us what could be available for vine uptake. Sampling of vine tissues tells us the nutrient status of the grapevine itself. These are not necessarily related as nutrient uptake depends on physical, chemical, and biological properties. At bloom, petioles and/or blades should be sampled from the *primary* shoot at the position that is opposite a flowering cluster. At veraison, petioles and/or blades should be taken from one of the most recently and fully developed leaves on the *primary* shoot (be careful, as hedging will result in lateral shoots coming off at the apex of primary shoots, potentially resulting in difficulty in identifying primary and lateral shoot). There are sufficiency ranges for macro- and micro-nutrients in grapevines, which are dependent on the tissue sampled (leaf or petiole). A very well-written and thorough article on grapevine nutrition and nutrient sufficiency ranges, written by Paul Schreiner and Patty Skinkis, can be found here: http://articles.extension.org/pages/31517/monitoring-grapevine-nutrition . Please work with your local county extension agent to help you collect, submit, and interpret soil and plant tissue nutrient samples in order to optimize your vineyard nutrition program.

Viticulture Management Poster:

Many are aware of the Viticulture Management Poster made possible from grant funding from the Southern Region Small Fruits Consortium. The poster is a collaborative effort between University of Georgia, North Carolina State University, and Virginia Tech. It is a visually-intensive reminder for when to implement cultural and pest management vineyard practices throughout the growing season. Many of the above "chores" are covered in this publication. The poster is available as a UGA Extension Publication PDF here (http://extension.uga.edu/publications/detail.html?number=C1151). Some posters still remain to be handed out at meetings – grab one when you can. We will print more posters, which will be up for sale very soon online; stay tuned to the UGA Extension Viticulture Blog for information.

Events:

The Sparkling Wine Production Conference will take place from 9:30 AM to 4:00 PM on May 22nd at Wolf Mountain Vineyards in Dahlonega, Georgia. The conference will focus on practical and applied sparkling wine production methods and will also feature a presentation on materials and equipment necessary for starting a small sparkling wine production program. A growers/producers panel will enable local industry experts to pour samples of their sparkling wines and share their knowledge gained from years of sparkling production experience. Speakers will be comprised of industry representatives from California and Georgia, and Extension Enology and Viticulture Specialists from the University of Kentucky and University of Georgia. Stay tuned to the UGA Extension Viticulture Blog for information.

If you have not already done so, please subscribe to our UGA Extension Viticulture Blog for updates on timely management, events, regional weather, etc.

https://site.extension.uga.edu/viticulture/

That's about it. We will likely be seeing some berry softening and coloration in more southerly-positioned vineyards across the southeastern US by the time the next "grape chores" list is published in the July edition of *Small Fruits*.

Spring Caneberry (Raspberry and Blackberry) Checklist 2019

Gina Fernandez
Small Fruit Specialist
North Carolina State University

Spring 2019 has been WET. But blackberry plants have broken bud are ready to start the season throughout the regoin. Chores and timing may be somewhat different in your area or for your cropping system.
For IPM recommendations and general production practices, see the 2019 Southeast Regional Caneberry Integrated Management Guide.
http://www.smallfruits.org/assets/documents/ipm-guides/Caneberry-Spray-Guide.pdf

The SRSFC production practices are in the Regional Caneberry Production guide (includes link to PDF format):

- https://content.ces.ncsu.edu/southeast-regional-caneberry-production-guide

Crop phenology for IPM
The IPM guide above lists these stages of growth or planting age. This is the time of year we are now leaving (or have left a while ago!) the dormant period and by the time the next newsletter comes out, we will likely be harvesting in some locations.

- Dormant (prior to budbreak)
- Delayed dormant (swollen buds) to green tip
- Shoots 6 inches long and before blooms open
- Pre-bloom (when flower buds show white)
- Early bloom (5-10%)
- Full Petal
- Cover sprays
- Pre-harvest (14 days before anticipated harvest)
- Harvest

Plant growth and development during the spring/summer

- Plants deacclimate quickly
- Bud differentiation (additional flowers can be formed)
- Bud break
- Flowering
- Primocane emergence

Pruning and trellising

- Finish pruning and make sure all floricanes are tied to the trellis before budbreak
- Remove canes from field to minimize spread of diseases
- Rotate shift trellises to horizontal position before budbreak; rotate to upright position immediately after flowering.
- Prepare for flower to fruit monitoring (see http://teamrubus.blogspot.com/2015/03/monitoring-flower-to-fruit-development.html)

Weeds

- Weed growth can be very vigorous at the same time as the bramble crop peaks
- Weed control is best done earlier in the season, with pre-emergent herbicides before harvest commences
- Hand-weed perennial weeds in and around plots

Insect, disease and crop ripening

- Growers with a history of cane diseases and/or mites often find that certain fungicides and oils are most effective just prior to bud break. The period of

time in the spring when the plant is flowering is the most important season
- for control of insects and diseases. Know what your pests are and how to control them.

Water management

- Test irrigation system and look for leaks
- Caneberry plants need about 1”-2” water/week. This amount will be especially critical during harvest

Fertility management See Caneberry Production Guide

https://content.ces.ncsu.edu/southeast-regional-caneberry-production-guide/fertility-management

Marketing and miscellaneous

- Service and clean coolers
- Make sure you have enough containers for fruit in the coming season
- Prepare advertising and signage for your stand
- Contact buyers to finalize orders
- Hire pickers
- Prepare signage for field orientation; it is easier to tell pickers where to go if rows are numbered
- Check buds and canes for cold damage (27°F is temperature that kills all stages of flower buds see http://teamrubus.blogspot.com/2016/04/damgage-to-blackberry-flowers-at-27f.html
- Monitor and record peak flowering date for each variety every year. Then later during harvest, check your records for peak harvest of each variety. Over time, it will help you to determine when your peak harvest will occur.

Social Media links:
Twitter: @NCTeamRubus
Facebook: Team Rubus
Blogs: http://teamrubus.blogspot.com/

Small Fruit News

Volume 19, No. 1 January 2019

Editor and Contributor Wayne Mitchem

Published is four times a year. Small Fruit News is available on the Southern Region Small Fruit Consortium (SRSFC) web site www.smallfruits.org.

To subscribe to an electronic notification service of new Small Fruit News issues on the web, send your e-mail address to brendaw@uga.edu.