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Comparing Methods of Renovating Rabbiteye Blueberry Bushes

Eric T. Stafne, Mississippi State University and Barbara J. Smith, USDA-ARS Poplarville, MS

Rabbiteye blueberry bushes are relatively easy to grow and commonplace across Mississippi and the rest of the southeastern U.S.; however, if not properly maintained the bushes will decline over time. Renovation pruning is a way to re-invigorate bushes by severely cutting back old growth to promote flushes of new canes that lead to more fruit bearing potential. Producers who purchase old rabbiteye blueberry plantings often have questions on how best to rejuvenate bushes, including how much to cut off and when fruit will be harvested again.

In much of the southeastern United States, mature bushes are sheared or topped immediately after harvest each year which allows sufficient time for cane regrowth and fruiting bud development during the remaining summer period. While this is a common practice on rabbiteye blueberry bushes, a more radical pruning (renovation) is sometimes required to re-invigorate moribund and poorly maintained plantings of southern highbush blueberry and rabbiteye blueberry.

Fig. 1. Declining 'Woodard' rabbiteye blueberry bushes in need of renovation.

When renovation pruning is performed, blueberry bushes are pruned to the ground or close to the ground, resulting in no fruit production the following year or perhaps even longer. However, if plants recover quicker, then an earlier harvestable crop could be gained to offset the costs of the renovation process. We did this procedure with eighteen, aged, low productivity 'Woodard' rabbiteye blueberry bushes which were pruned at two different heights (ground level and 50 cm above ground level) after harvest in July 2017.

Fig. 2. Renovation cuts being done at 50cm and also at ground level.

For two seasons, fruit yields were collected and weighed, bushes were measured for growth parameters, and canes weighed. Bushes pruned at 50 cm above ground level had much higher yields in both 2019 (3.47 vs. 0.63 kg) and 2020 (3.91 vs. 1.23 kg), therefore providing a substantial yield benefit. The 50-cm above ground level pruning treatment bushes produced more canes by the end of the study, thus accounting for more fruiting area.

Fig. 3. Bushes that received the 50 cm cut have more initial growth than those cut at ground level.

In short, pruning old, non-productive bushes at 50 cm above ground level can provide growers with greater potential for early economic returns than pruning at ground level for 'Woodard' rabbiteye blueberry. The entire study can be read here: https://journals.ashs.org/horttech/view/journals/horttech/31/2/article-p188.xml

Sensory and postharvest attributes of four Blackberry varieties

Zilfina Rubio Ames and Taylor Ibibofori, Department of Horticulture, University of Georgia - Tifton

Blackberry production and consumption has increased in the United States in the last ten years. Similarly, blackberry production acreage in Georgia has increased from 300 acres in 2009 to 818 acres in 2017 (USDA-NASSA, 2021). Blackberries are harvested in Georgia from June to mid-July, and the main production area is South Georgia. The most common varieties cultivated in South Georgia were developed by the University of Arkansas blackberry breeding program. Thus, physicochemical attributes of the fruit under Arkansas conditions were previously evaluated by Threlfall et al., 2021. However, no information on fruit quality characteristics of Arkansas cultivars grown under Georgia conditions was previously reported. During the 2022 blackberry season in Georgia, the small fruit program at the University of Georgia evaluated physical and compositional attributes as well as sensory characteristics of the cultivars 'Caddo', 'Osage', 'Ponca', and 'Ouachita.' (Fig.1)

The four cultivars were harvested from a commercial farm in South Georgia. The fruits were harvested fully ripe, and free of damage or deterioration on June 23rd and 29th. There were two sensory evaluations conducted, one for each harvest. A non-trained panel (n=16) evaluated the four cultivars on appearance, texture, sweetness, overall liking, and flavor. The panelist rated each characteristic using a 9-point hedonic scale, in which 1= dislike extremely, 2= dislike very much, 3=dislike moderately, 4= dislike slightly, 5 = neither like nor dislike, 6= like slightly, 7= like moderately, 8= like very much, and 9 =like extremely. Compositional attributes like total soluble solids and titratable acidity were measured using a refractometer and automated titrator respectively. Berry firmness and berry size were measured using a Fruitfirm 1000.

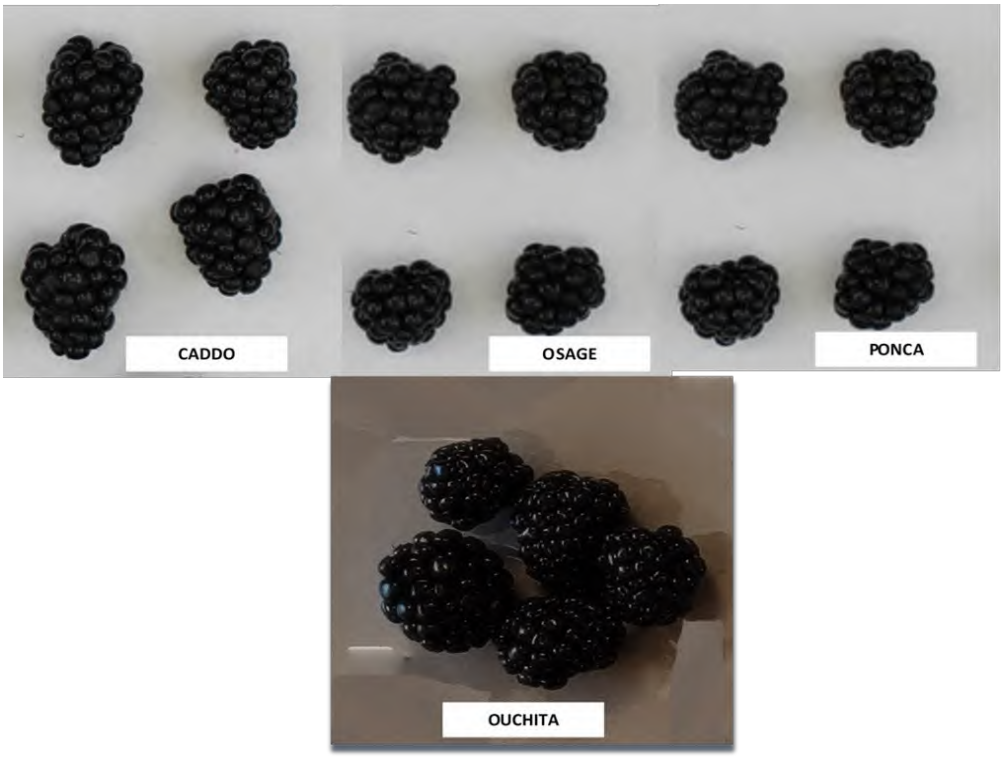


Fig. 1 Arkansas cultivars grown under South Georgia conditions. Each cultivar was evaluated for physical, compositional and sensory attributes.

The cultivar with the biggest berry size was 'Caddo,' while the cultivars 'Osage' and 'Ouachita' had a smaller berry (Table 1). Firmness was inconsistent between the two harvests. However, there were no significant differences in firmness between 'Caddo' and 'Ouachita.' Panelists rated 'Ouachita' as less sweet. The results obtained in the sensory evaluations resemble the total soluble solids content and titratable acidity of 'Ouachita' in the first harvest (Fig.2 and Fig.3). 'Ouachita' flavor was liked slightly by the panelist and 'Caddo,' 'Osage,' and 'Ponca' were liked moderately. 'Caddo,' 'Osage,' and 'Ponca' were rated higher by the panelist on sweetness and flavor. Total soluble solids (TSS), which are expressed as degree brix, are related to the sugar content of the fruit. Thus, it could imply that the higher TSS content the sweeter the fruit. 'Caddo,' 'Osage,' and 'Ponca' had higher TSS than 'Ouachita.' Acid content and volatile aroma compounds also have an important role in overall liking. Citric acid is the acid found in higher quantities in blackberries. However, cultivars differ in the amount of citric acid. 'Caddo,' 'Osage,' and 'Ponca' had a lower content of citric acid in the first sensory evaluation (first harvest) (Figure 2). In the second sensory evaluation (second harvest), 'Ouachita' and 'Ponca' were not significantly different in citric acid content. However, 'Ponca' had higher TSS than 'Ouachita.' The higher acid content and lower TSS of 'Ouachita' could be the reason the panelist like 'Ouachita' less when compared to the other cultivars.

In conclusion, participants liked the sweetness of 'Ponca', 'Caddo', and 'Osage' more than 'Ouachita'. In addition, the overall liking of 'Ouachita' was less compared to 'Ponca', 'Caddo', and 'Osage.' Low scores from the taste panel regarding sweetness and overall liking of 'Ouachita' correlates with this cultivar's low amount of total soluble solids and high titratable acidity value. 'Caddo' had bigger berries compared to the other varieties.

Acknowledgments:

We would like to thank Paulk Farms for donating the fruit for this experiment and Phillip Edwards for helping us coordinate the experiment

References

Threlfall, R. T., Clark, J. R., Dunteman, A. N., & Worthington, M. L. (2021). Identifying marketable attributes of fresh-market blackberries through consumer sensory evaluations. HortScience, 56(1), 30-35.

Noncitrus Fruits and Nuts, National Agricultural Statistics Service (NASS), USDA, 2021.

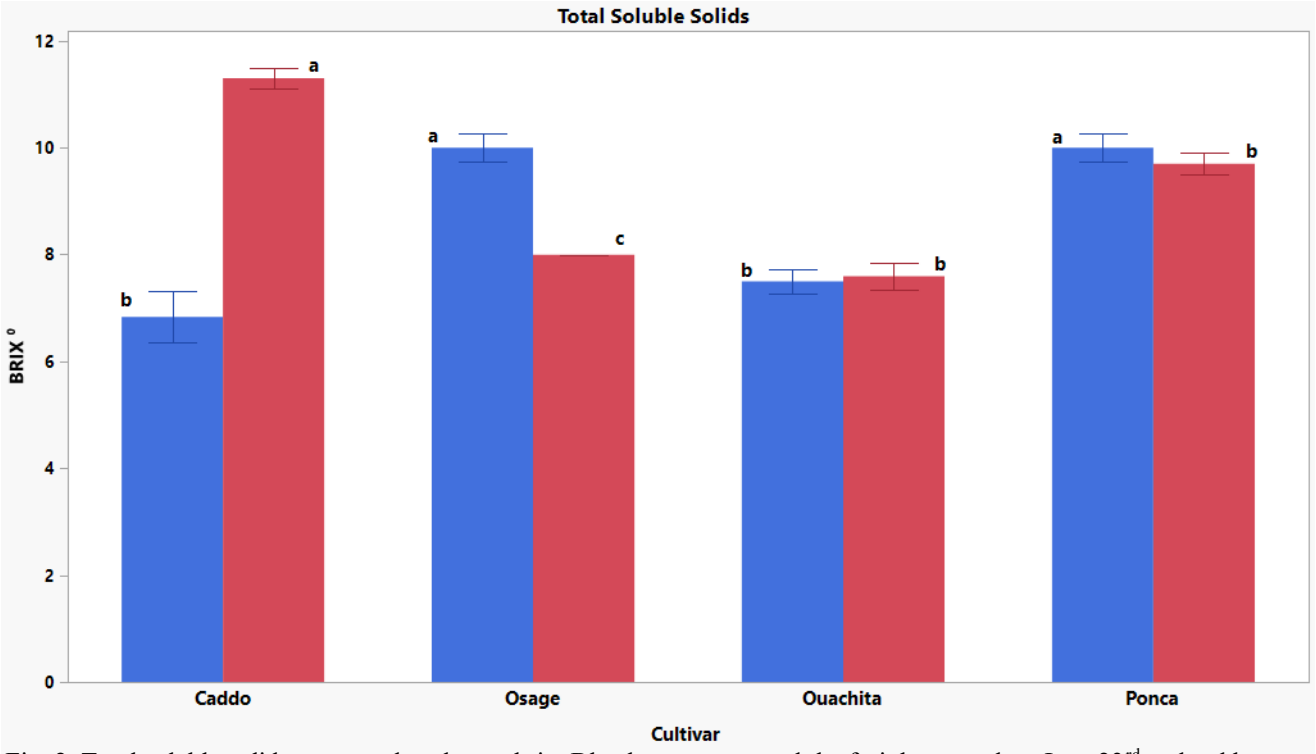


Fig. 2. Total soluble solids expressed as degree brix. Blue bars represented the fruit harvested on June 23rd and red bars represent the fruit harvested on June 29th.

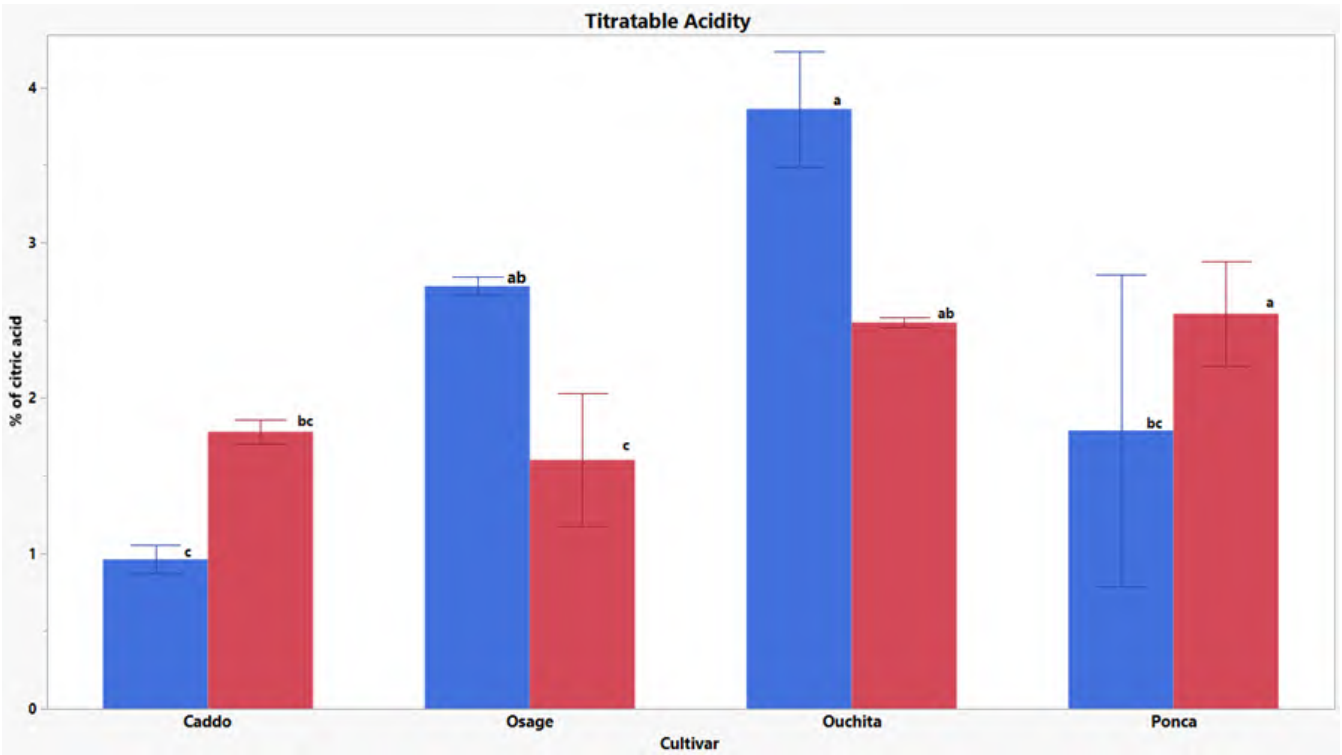


Fig. 3. Titratable acidity expressed as % of citric acid. Blue bars represented the fruit harvested on June 23rd and red bars represent the fruit harvested on June 29th.

Table 1. Berry size and firmness of fruits harvested on June 23rd and red bars represent fruits harvested June 29th.

Cultivar	23rd harvest		30th harvest	
	Berry Size (mm)	Firmness ($g.mm^{-1}$)	Berry Size (mm)	Firmness ($g.mm^{-1}$)
Ouachita	19.4b[y]	128.5b	19.6b	132.8a
Ponca	20.1ab	144.4a	20.4b	110.0b
Caddo	21.3a	128.3b	21.9a	129.9a
Osage	18.0c	130.7ab	20.0b	126.0ab
P Value	*<0.0001*	*0.0253*	*<0.0001*	*0.0028*

[y] Means with different letters for each attribute are significantly different (P ≤ 0.05) using Tukey's honestly significant difference test.

Table 2. Sensory attributes of the four blackberry varieties evaluated using a 9-point hedonic scale. 1= dislike extremely, 9 =like extremely, and 5 = neither like nor dislike

Sensory Evaluation I					
Cultivar	Appearance	Texture	Sweetness	Overall Liking	Flavor
Ouachita	7.4 a[y]	7.2 a	5.3 b	6.8 a	6.1 b
Ponca	7.8 a	7.9 a	7.3 a	7.8 a	7.9 a
Caddo	8.1 a	8.4 a	7.7 a	7.9 a	8.1 a
Osage	7.1 a	8.1 a	7.7 a	7.9 a	8.0 a
P Value	0.5446	0.1860	0.0008	0.3458	0.0015

[y] Means with different letters for each attribute are significantly different (P ≤ 0.05) using Tukey's honestly significant difference test.

Table3. Sensory attributes of the four blackberry varieties evaluated using a 9-point hedonic scale. 1= dislike extremely, 9 =like extremely, and 5 = neither like nor dislike

Sensory Evaluation II					
Cultivar	Appearance	Texture	Sweetness	Overall Liking	Flavor
Ouachita	7.4 a[y]	7.1 a	4.7 b	6.2a	5.6 b
Ponca	7.1 a	7.4 a	6.9 a	7.4a	7.4 a
Caddo	8.2 a	7.2 a	6.3 ab	7.3a	6.6 ab
Osage	7.6 a	7.3 a	7.4 a	7.3a	7.4 a
P Value	0.1935	0.9362	0.0009	0.1497	0.0231

[y] Means with different letters for each attribute are significantly different (P ≤ 0.05) using Tukey's honestly significant difference test.

Strawberries: Late planting - What now?

Mark Hoffmann, NC State University; Amanda McWhirt, University of Arkansas; Jayesh Samtani, Virginia Tech University.

Planting date, pre-plant soil and bed preparation and plant quality are the three important pillars that make the foundations for a successful crop. Planting windows for strawberry grown in annual hill plasticulture can vary by the region and are provided in Table 1.

Growers across the region have experienced a delay in receiving plant material this year due to a multitude of reasons including labor issues in nurseries, shipping and supply chain holdups, or simply not enough availability. In addition, Hurricane Fiona hit eastern Canada during one of the busiest times for nurseries. Rain events in some areas or prolonged drought in others have led to a delay in soil and bed preparation in many states in the southern U.S.

The good news is: There is still time to enhance plant growth, even if you are a few weeks late on planting. Increasing growing degree days (GDD) by using floating row covers in the fall is one of tools a grower has in their toolbox to mitigate the problem of late planting date. ***However, it is important to recognize differences between cultivars before deciding if a row cover is needed.***

Cultivars such as Sweet Charlie or Chandler have lower GDD requirements. Other cultivars, such as **Camarosa, Ruby June or Camino Real** require more GDDs. If you are late in planting the latter cultivars, the application of floating row covers in fall to improve GDDs is an option to consider. Below are details that we encourage a grower to pay attention to, during the planting season.

Table 1. Planting dates for several regions in the South and Southeast.

State	Sub-Region	Recommended Strawberry Planting Date Range	Notes
Arkansas	Northern	September 10 -20	Growers at higher elevations should plant on the earlier side of the recommended range.
	Central	September 20-Oct 1	
	Southern	September 25-October 8	
Alabama		October 1-15	Growers in northern part of the state should plant closer to Oct 1.
Louisiana	Southeast	October - Early November for bareroot plants Late September for early plug plant production	
North Carolina	Mountains	1st week of September	Dates listed are for 'Chandler' and 'Camarosa'. Bareroot plants should be set 3-5 days earlier than plugs.
	Foothills	3rd week of September	
	Upper Piedmont/ Tidewater	4th week of September-1st week of October	
	Lower Piedmont/ Coastal Plains	1st – 2nd week of October	
	Lower Coastal Plain	2nd week of October	
Virginia	Mountains	Early September	
	Upper Piedmont, Northern	Mid-September	
	Southeast, Coastal	Late September to first week in October	

Before planting

Table 2. Screen your plant material

The Dos	Order 5% excess plants; Check plants for diseases before planting; Only plant disease-free plants with established root systems;
The Don't s	Don't plant plants with clear disease symptoms. Don't plant plants with a weak root system.

Even with a late planting, it is still absolutely important to screen your plants when they arrive. If plants appear to be weak, it can be a simple nutrition problem. But it also could be a weak root system or a disease problem. We recommend cutting the crowns of weak appearing plug plants and search for reddish-brown discoloration (Figure 1). Such discoloration could point to diseases such as *Phytophthora* crown rot. We also recommend looking for brown leaves, crisp leaves, blackish lesions and an unusual amount of leaf spots (Figure 1). That could point to a host of different diseases, from Angular Leaf Spot to *Neopestalotiopsis.* The second trait you want to screen is the root ball. A well-established root ball and a good crown are extremely important for a successful use of plug plants (Figure 2). The more and more popular tray-plants should also have well-developed root balls, and possibly two crowns. Bare-root and cut-off plants should have well developed fibrous roots.

Figure 1. Left: *Phytophthora crown rot discoloration in strawberry plants. Photo by F. Louws* ***Right:*** *Leaf spots caused by Neopestalotiopsis disease*

We do not recommend planting any weak material, even if you plan to use row-covers to increase GDDs. Your order should contain about 5% more plants that you intend to use.

Keep your plug plants under a sprinkler for a few days before planting. Make sure that suspicious trays are being stored separately from the other trays and that water can run off separately as well. You can avoid a lot of hardship by selecting your planting material in the first place.

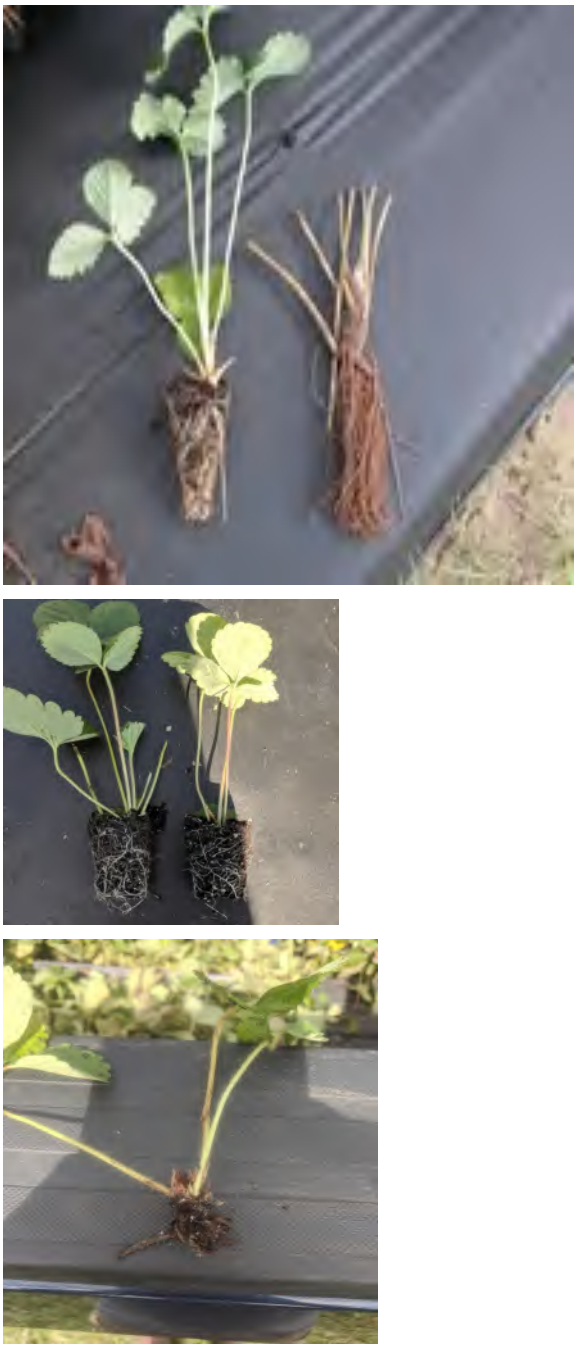


Figure 2: *Quality differences in planting materials.* ***TOP:*** *Well-established plug plants and cut-offs have a full root ball and a crown that is above the substrate (picture by B. Poling).* ***Middle:*** *Poorly developed plug plants show weak root systems and/or a crown that is buried under the substrate surface. The particular picture shows both.* ***Bottom*****:**

Tips that were stuck when they were too old show two-three leaflets, but no root system.

At Planting time:

Table 3. Correct planting is important

The Dos	Plants at the correct depth. Water plants in after transplanting. Screen your plants for disease and nutrition disorders. Control for *Botrytis* gray-mold, Anthracnose, *Phytophthora* crown rot and other foliar diseases.
The Don'ts	Do not walk away after planting!

Plug- and bare-root plants need to be planted at the crown level. Strawberry transplants are very unforgiving if it comes to the wrong planting depth. That means, that the root ball of a plug plant and the roots of a bare-root plant **need to be covered and have good soil contact**, while the **crown needs to be above ground**. If plants are planted too shallow or too deep, plants will most likely underperform or even die. **Train your workers how to plant plants.**

The hole for a plug plant should be a little less than the size of the rootball. Usually, plug plants come in a 50-cell tray with a 2 ¼ to 2 ½ inch root ball. The ideal depth for a planting hole is 2 ¼ - 2 inches deep, so that plug plants can gently be pressed against the soil for good soil-root contact. After successful planting, the rootball should be slightly covered with soil, at low to mid-crown level.

After planting, make sure to monitor your strawberry field and remove any plants that show disease symptoms or weak growth in the first two weeks after planting.

Many apply water, either through the drip line or through sprinklers for the first two to three days. Go through your field and sanitize crispy leaves, discolored leaves and cut runners during the first week. Apply a fungicide with *Phytophthora* activity (e.g. Rodimil Gold) through the drip line in the first two weeks and **make preventative fungicide applications against Anthracnose, Botrytis and Neopestalopsiosis.**

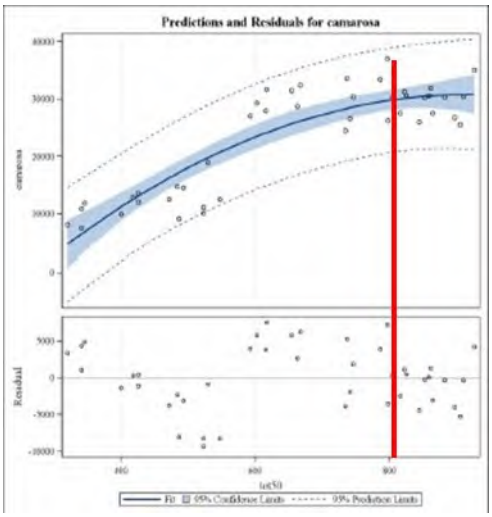
After Planting: Correct use of floating row covers to enhance floral initiation

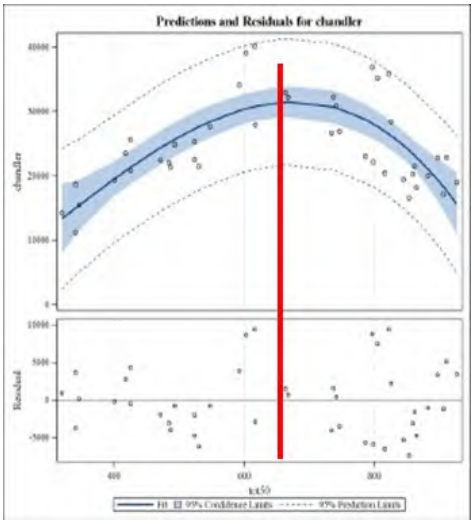
Table 4. Timing and disease control are important if you use row covers to increase GDDs

The Do's	Use row covers October until end of November for 2-3 weeks max.; Control for diseases before applying row covers and again after taking them off. Measure temperatures under row cover and calculate GDDs!
The Don'ts	Don't use row-covers without calculating the GDDs in your area! Don't walk away without disease control after row covers use.

Figure 3 (after Pattison et al. 2013). Research in NC suggests optimal GDDs for 'Chandler' in Fall are around 630 GDDs, while the optimal GDDs for 'Camarosa' are around 800 GDDs. Based on these results 'Chandler' will not need additional row-cover use. However research in Arkansas has found that row-cover application to Chandler can be useful in years where the weather turns cold very early.

GDDs in fall are decisive for floral initiation in traditional short-day cultivars. Research has shown that the planting date is the most important factor to affect the **number of crowns** in spring. The use of floating row covers to optimize GDDs however can have a positive effect on the number of **inflorescences per branch crown**. We say 'optimize', because you also can provide too many GDDs.





This is especially

Table 5. How to calculate GDDs. GDD is a temperature-based measurement of the growth and development of plants during the growing season. The base temperature at which growth occurs varies with different plant types. For strawberries, the base temperature is 50 °F. GDDs are calculated for each day, using the daily maximum and minimum temperatures.

Explanation	Formula
T_{max} = daily maximum Temperature; T_{min} = daily minimum Temperature;	$GDD = \frac{Tmax + Tmin}{2} - 50\ °F$
Examples	
T_{max} = 60 °F; T_{min} = 39 °F	$GDD = \frac{60\ °F + 39\ °F}{2} - 50\ °F = -0.5 = 0\ GDDs$
T_{max} = 75 °F; T_{min} = 40 °F	$GDD = \frac{75\ °F + 40\ °F}{2} - 50\ °F = 7.5 = 7.5\ GDDs$

true for Chandler or Sweet Charlie, which need less GDDs for an optimal harvest.

The use of floating row covers in fall can help make up for some of the GDD lost due to a late planting date, however research in Arkansas consistently shows that row covers applied to late plantings cannot completely make up for the lost time. Additionally, fall row cover use makes the most sense if cooler temperatures are expected. In some exceptional years where the weather stays warm well into fall, enough GDDs will be provided during fall without the use of covers. We recommend to ALWAYS calculate GDDs (Table 5) based on the predicted weather before using floating row covers. Use light weight (0.5-0.75 oz) row covers, for maximum of 2-3 weeks **between October and end of November!**

Additional work in Arkansas is underway to verify the GDD requirement for additional cultivars. The rule of thumb used in Arkansas has been to apply row covers a few weeks after planting if the daily high temperatures are predicted to remain below 65F.

More information on row cover use and GDD calculations can be found here:

https://strawberries.ces.ncsu.edu/2012/09/discussion-with-dr-jeremy-pattison-about-3-years-of-planting-date-and-row-cover-research-92712/

https://ashs.confex.com/ashs/2013/webprogramarchives/Paper15918.html

New Option for Broad Mite Management in Blackberry

Aaron Cato , Extension Specialist – Horticulture IPM, University of Arkansas

Broad mite continues to be a sporadic issue in Blackberry across the Southeast. In bad years infestations can be found across the region, but every year we observe serious infestations in Arkansas. This pest can severely limit plant growth, result in high levels of yield loss and growers in the entire region should be scouting each year. Information about broad mite biology, management and the challenges it presents to blackberry growers can be found in a previous small fruit news article at this link: https://smallfruits.org/2021/04/managing-broad-mite-in-southeastern-caneberry-plantings/?cat=16. Broad mite management is often not simple due to the small number of miticides that are effective. Agri-Mek and Magister are currently the only miticides that offer good-excellent suppression of broad mite infestations, and Magister can be hard to find at times. Additionally, these miticides both have a 7-day preharvest interval which often complicates their use in primocane fruiting or late floricane fruiting varieties. This means that growers often have to choose between harvesting or spraying to knock back broad mite populations.

In 2020 the Southern Region Small Fruit Consortium funded a research grant to determine if any effective miticides with shorter preharvest intervals existed, with the idea that these data could support potential IR-4 registration. Shared below are preliminary results from this trial, that mainly focused on the potential use of Portal. This miticide recently received an ex-

panded label containing caneberries and had previously shown promise for broad mite management in peppers, but most importantly, Portal only has a 1-day preharvest interval.

Portal Efficacy Trial Design

The efficacy of Portal was assessed with two separate spray trials compared to known standards in commercial blackberries in Arkansas. These trials were performed in a grower field where broad mite injury was easy to find and preliminary sampling indicated broad mite numbers to be well above threshold (1-5 per leaf). Trials were utilized a randomized complete block design with 4 replications of each treatment in 5 plant plots with 3 plant buffers between each plot. Cane damage ratings were taken at each sampling date, with 10 random canes within the 5-plant plot examined and rated from 1-5 as shown in figure 1. Leaf samples consisted of 10 leaflets, from 10 unique leaves, pulled from the first node with unfurled leaves (generally the 3rd node from the terminal) and were taken back to the lab where the number of adults, immatures, and eggs were counted per leaf. Trial 1 assessed 5 miticides (results from Portal and Agri-Mek only are shared here) and the untreated check (UTC), and a second application was made 21 days after the first (21 DAA). Trial 2 compared Portal with two known standards, Magister and Agri-Mek, as well as the UTC.

Figure 1. 1-5 Rating scale for broad mite damage. A rating of 1 has no shortened internodes or leaf cupping. A 2 rating indicates leaf bronzing, reduced internode length and the beginning of leaf cupping or upturned leaves. A rating of "3" exhibits excessive leaf cupping and a rating of 4 indicates that leaves are beginning to become necrotic. A rating of 5 indicates tip-dieback and excessive necrosis of new leaves. Photos by Ryan Keiffer and Aaron Cato.

Results from Trial 1

Results from the first trial indicated that Portal was able to suppress broad mite populations as good as Agri-Mek over a 7-day period compared to the UTC (Figure 2). Broad mite populations rebounded much more quickly in plots containing Portal around 10 days after first application and were well above threshold 14 DAA (Figure 2). When considering damage ratings, Portal and Agri-Mek were similar 14 DAA, but at 21 DAA excessive damage was observed in Portal (Figure 3). After the second application (21 DAA), broad mite numbers and damage ratings in Portal

`plots crashed once again, but did not look as good as Agri-Mek. This likely indicates that Portal could be a short-term solution for broad mite and potentially should be sprayed on tighter intervals if issues persist.

Results from Trial 2

Results from the second trial indicated that all 3 miticides (Portal, Magister, and Agri-Mek) were able to knock back excessive broad mite populations (Figure 4). Magister and Portal exhibited less reduced residual control compared to Agri-Mek, with populations bouncing back to 3-4x threshold by 13 DAA. Samples could not be assessed for 21 DAA as this trial was accidentally over-sprayed by the grower. Damage ratings in this trial indicated an excessive 3.5 rating at 0 DAA when initial applications were made, and all three miticides were able to reduce ratings under 3 by only 7 DAA. These results indicate that Agri-Mek was most effective with the best residual control, and both Portal and Magister would likely warrant a second application within 14 DAA if broad mite persisted.

How Should Portal be Utilized?

Our results indicate that Portal is an excellent option to utilize during harvest. Agri-Mek continues to provide excellent control with great residual, but a 7-day preharvest interval hampers its usefulness. Portal is a good option for growers that are either looking to finish out floricane harvest or need to protect developing fruit while harvesting primocane fruiting varieties. Results from both trials indicate that Portal will knock back damaging broad mite populations and limit the amount of plant injury that is observed, while offering a 1-day preharvest interval. We would likely expect higher efficacy in real-world applications, as less reservoirs for reinfestation would exist compared to our small plot trials. However, any grower that uses Portal should continue to scout for damage and mites. A second portal application of Portal should only be considered 14 days (label restriction) after the first if harvest is ongoing, and either Agri-Mek or Magister should be prioritized for a second application to help reduce the likelihood of resistance.

If you have any questions about our trials or when an application of a miticide may be necessary for broad mite, please feel free to give me a call anytime at **479-249-7352**.

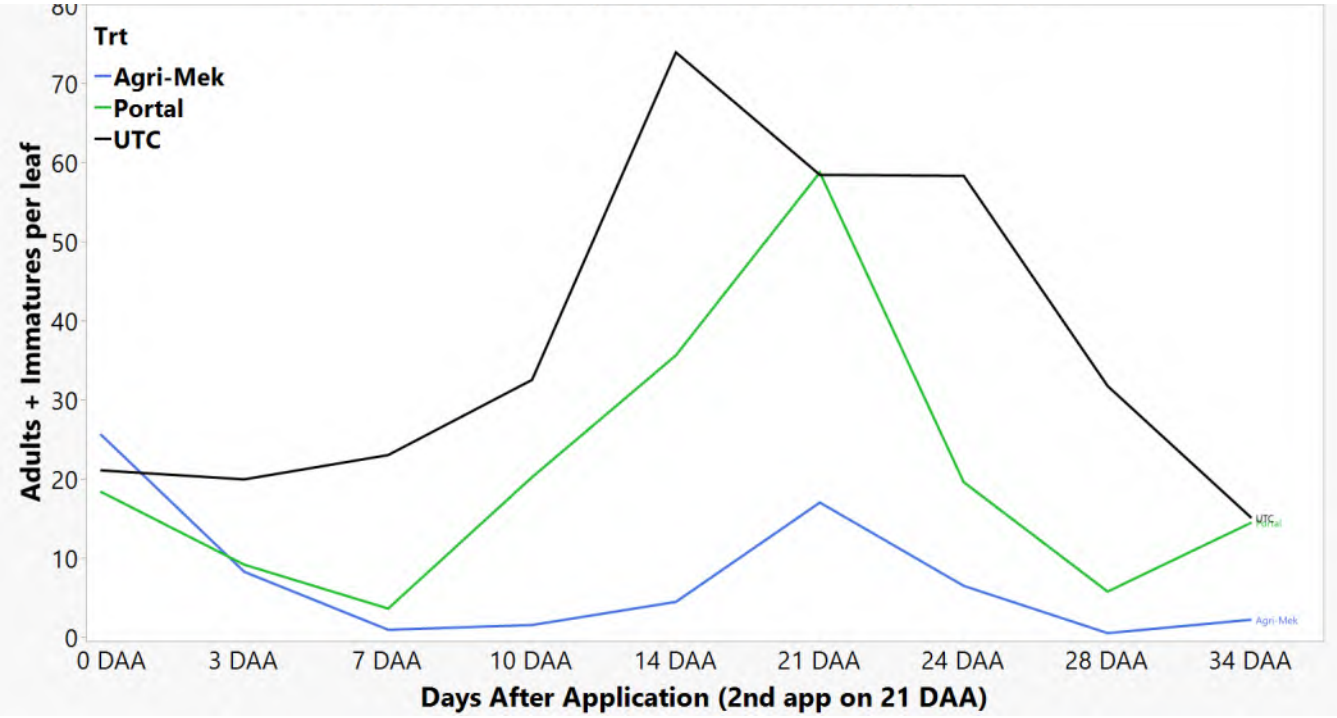


Figure 2. Average number of broad mites observed per leaf after 2 applications of Portal and Agri-Mek (application 1: 0 DAA and application 2: 21 DAA) compared to an untreated check (UTC) from a trial in Arkansas in 2022.

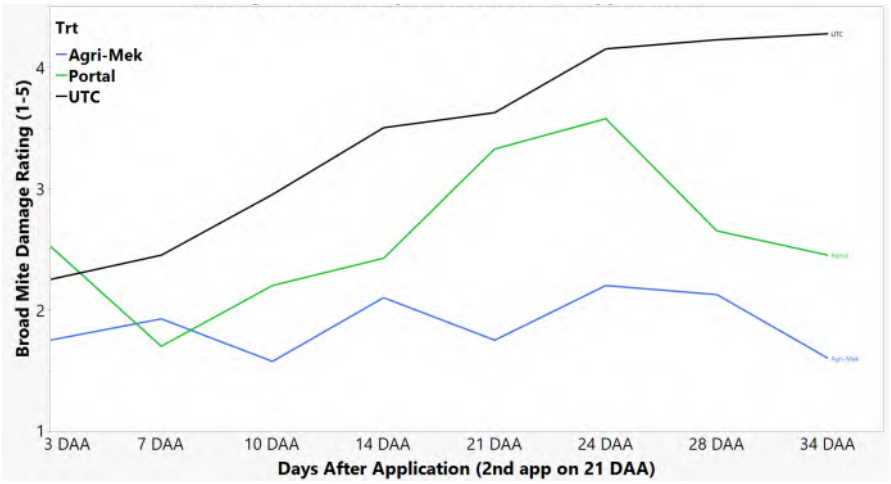


Figure 3. Average broad mite damage rating observed after 2 applications of Portal and Agri-Mek compared to an untreated check (UTC) from a trial in Arkansas in 2022. Damage rating was completed using the 1-5 scale shown in Figure 1.

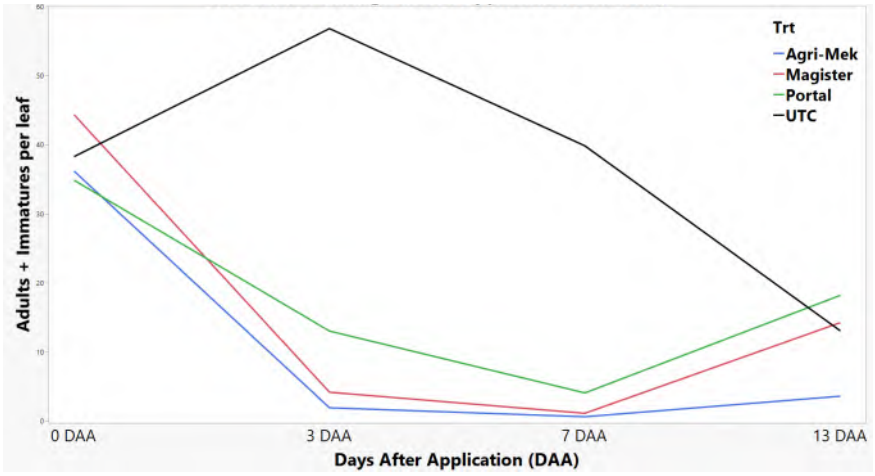


Figure 4. Average number of Broad Mites observed per leaf in the second efficacy trial after 1 application of 3 different miticides compared to an untreated check (UTC) from a trial in Arkansas in 2022.

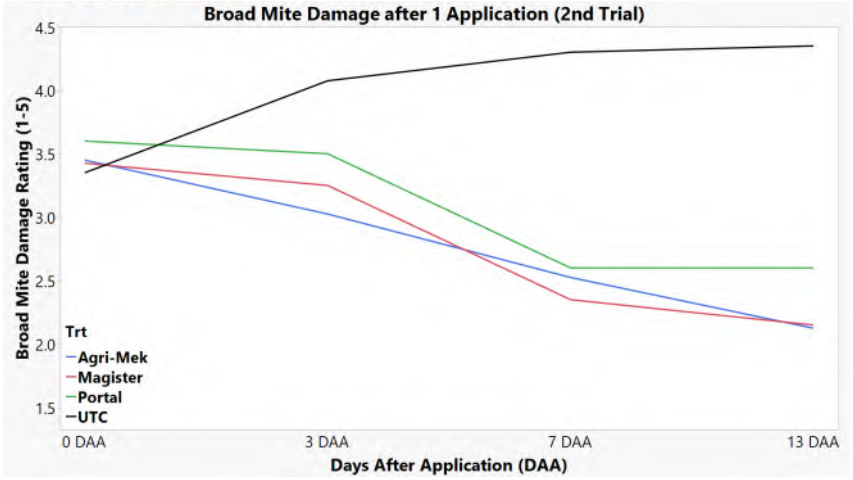


Figure 5. Average broad mite damage rating observed in the second efficacy trial after 1 application of 3 different miticides compared to an untreated check (UTC) from a trial in Arkansas in 2022. Damage rating was completed using the 1-5 scale shown in Figure 1.

What we know, and what we should know, about blueberry production in soilless substrates

Gerardo H. Nunez

Blueberry bushes are notorious for their strict soil requirements. Optimum growth is frequently observed in well-drained acidic soils (pH below 5.5) with high organic matter content (> 1%) and low salt concentrations (< 2.0 dS/m). These soil characteristics are relatively uncommon in the southeastern United States. Therefore, the blueberry industry has relied on soil amendments to create ideal conditions for blueberry roots. Containers filled with soilless substrates are the latest tool growers have to achieve this purpose.

The soilless substrates used to grow blueberry bushes consist of organic fibers (that provide water holding capacity) and mineral aggregates or organic materials with large particles (that provide adequate porosity and drainage). Coconut coir is a commonly used organic fiber, while perlite or pine bark can be added for porosity. Our research identified several ratios of coconut coir:pine bark:perlite that can be used successfully to grow southern highbush blueberries (https://doi.org/10.1016/j.scienta.2022.111149).

Growing in containers has strengths and weaknesses. Containers can isolate plant roots from the native soil, helping prevent soil-borne diseases, high pH stress, and nutrient imbalances. On the other hand, containers constrain the volume of substrate available for root exploration. This renders plants vulnerable to drastic changes in water availability, salt concentrations, and temperature. The ideal container size is one that balances these factors. In our research, we compared 10.7 gal and 13.3 gal containers and found no differences in plant growth and yield. Some farms in Florida and overseas use containers as small at 6.6 gal. Smaller containers might be more economical to fill with substrate, and purchasing prefilled containers can cost less than creating custom mixes on the farm.

With regards to plant nutrition, soilless substrates have two main differences compared to soil: 1) soilless substrates do not contain essential plant nutrients, and 2) soilless substrates have very limited nutrient holding capacity. Therefore, all essential plant nutrients must be provided in the fertigation solution. Additionally, nutrient-to-nutrient ratios in the substrate can be managed very effectively. This has created a need for the development of complete nutrient management recipes for blueberry, (including both macronutrients and micronutrients). Unfortunately, there is very little academic research on this matter to date.

Another area that warrants more research is the farm economics of substrate-based blueberry production. Growing blueberries in soilless substrates can be very costly due to the added expenses of containers and substrates. In our research, we had very high plant density. This allowed us to reach considerable yields in the first two years after planting. While early revenue is certainly welcomed by any blueberry farm, there is a need for enterprise budget and profitability analysis to understand under which conditions this production system can be economically viable.

While the knowledge base is rapidly expanding, there are still several open questions about substrate-based blueberry production. More and longer term experiments will be necessary to develop science-based practices that improve the productivity and sustainability of this new production system.

10th North American Strawberry Symposium & North American Strawberry Growers Association 2023 Conference

March 7-10, 2023, San Luis Obispo, California

We cordially invite you to the 10th North American Strawberry Symposium (NASS), a meeting of strawberry growers, researchers, and other industry members from around the globe, to be held in conjunction with the annual NASGA conference, **March 7-10, 2023 in San Luis Obispo, CA**, where nearly 90% of U.S. strawberries are grown.

The Symposium will include two and a half days of workshops, reception, research presentations, marketing presentations, poster sessions, and an award luncheon, and will be followed by a post-conference tour on March 10, which will encompass strawberry production in the region as well as the research, training and testing facilities at the CalPoly Strawberry Center.

Subject areas include Global and North American Overviews, Breeding, Genetics, Molecular Biology, Disease & Pest Management, Propagation & Nursery Management, Cultural Practices, Indoor Production, Precision Agriculture, Robotics, Automation, Plant Nutrition and Water Management, Plant Physiology, Economics of Production Practices, Post-Harvest Quality Management, and Food Safety.

We encourage the submission of journal articles of the

presented work to be published in a special issue in International J. Fruit Science. To help us plan the program, ***please submit presentation titles as soon as possible and before November 1, 2022***, indicating whether your presentation will be ***oral or a poster***, to Kim.Lewers@usda.gov

Workshop topics under consideration include Disease Management, Nursery Developments, Entomology, Strawberry Breeding Tools and Tips, Production Management/Plant Physiology, Getting Started with Automation/ Precision Agriculture, Indoor Production, Methyl Bromide Alternatives, Novel Weed Management Approaches.

Look for a mail-in registration form and more program details (abstract deadlines, keynote speakers, etc.) and opportunities for industry, organization, and agency sponsorship on the NASGA website: http://www.nasga.org in July 2022. Online registration will become available in September.

NARBA 2023 Annual Conference Visits Florida's Gulf Coast

By Darcy Kochis, Executive Director, North American Raspberry and Blackberry Association

The North American Raspberry & Blackberry Association (NARBA) will be gathering in person for their annual meeting to be held **January 22-24, 2023 in Tampa, Florida**. After two years of virtual conferences due to Covid-19, the group will move the conference to the Sunshine State for the first time. The event will be held at the Hotel Alba Tampa. Visit the hotel website for more information on the hotel's great amenities, including free wi-fi, outdoor pool, wellness center, and two in-house dining options as well as many walkable Tampa attractions and dining. Visit https://www.raspberryblackberry.com/2023-narba-conference/ for more information.

Conference sessions will feature top experts and experienced growers. Topics include caneberry breeding and varieties, pest and disease management, production research, new technology and industry updates, new grower resources, and marketing. Over 50 speakers from around the world are included in the multi-track format. Time for Q&A and networking will be part of all sessions.

Attendees will have the opportunity to register for the conference tour which will include field and nursery visits for an up-close look at the emerging raspberry and blackberry industry in Florida and a visit to the University of Florida Gulf Coast Research Center to learn about advances in berry research. The tour will include dinner, networking with speakers and views of the beauty of the Florida Gulf Coast.

Registration for the conference, tour and the hotel block will open in August of 2022 and a detailed listing of speakers and courses will be posted in September 2022 on https://www.raspberryblackberry.com/2023-narba-conference/ Early registration is recommended to ensure attendees have first choice for desired room types and sessions.

The North American Raspberry & Blackberry Association is a membership association of growers large and small, researchers, suppliers, and others in the caneberry industry.

For further information and updates about the 2023 NARBA annual conference please contact Darcy Kochis at info@raspberryblackberry.com.

For more information please visit: https://www.raspberryblackberry.com/2023-narba-conference/

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