SOUTHEASTERN

Blackberry Nutrient Monitoring and Management

Southeastern Blackberry Nutrient Monitoring and Management

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Introduction

Nutrients play important roles in blackberry plant growth and fruit development. Annual fertilizer inputs are generally required to maintain a healthy plant nutrient status and optimize fruit production. When concentrations of key nutrients in blackberry plants or the soil are limited, growth and yield can be reduced. Applying excessive rates of key nutrients such as nitrogen (N), however, can negatively impact fruit production.

Due to the two-year life-cycle of blackberry canes, nutrient management is more complicated than with other perennial fruit crops. For example, research has shown that most of the N applied in-season is used by the plant to support primocane growth (Malik et al. 1991; Mohadjer et al. 2001; Naraguma et al. 1999). In contrast, the majority of nutrients in floricane growth originate from nutrients stored in the canes, crowns and roots of the plant that were taken up in previous seasons. Because stored nutrients are reallocated to fruiting laterals and leaf development when growth commences in the spring and summer, it is important to monitor blackberry nutrient status and appropriately fertilize blackberries annually. This allows primocanes the nutrients they need to develop into healthy floricanes the following year. If floricane-fruiting blackberries are poorly fertilized during the present season, the next year's crop is more likely to reflect insufficient nutrients than the current season's floricane crop.

This publication outlines general blackberry fertilizer rate recommendations, best nutrient management practices and soil and plant nutrient monitoring methods for southeastern blackberry production based on research conducted in Arkansas and surrounding southeastern states. Fine-tuning recommended general nutrient application rates should be done at the farm level using leaf tissue nutrient sampling, soil sampling and observations of plant growth and fruit production. Recommended methods for leaf tissue nutrient sampling and updated blackberry leaf tissue nutrient concentrations are provided based on work conducted across the Southeast from 2022 to 2023. Growers are encouraged to contact their local cooperative extension agent for assistance with local recommendations concerning leaf and soil nutrient sampling.

Fertilizer Application Methods

How fertilizer is applied can directly impact nutrient availability and ultimately plant nutrient status. Fertilizer application method also affects the volume of fertilizer applied because of the differences in surface area covered by each method. Generally, the two most popular fertilizer application methods for blackberry production are:

- **Fertigation:** Liquid or water-soluble fertilizer injected into the drip irrigation system (Fig. 1). Fertigation is an efficient way to apply nutrients because they are applied with water directly at the rooting zone. Nitrogen-based fertilizers are often applied weekly during the growing season using this method. In a 2024 survey, just 22% of southeastern blackberry growers said that they use fertigation for annual applications of N and K (McWhirt et al. 2024). However, fertigation can be easily implemented and is an efficient means of feeding nutrients to the crop. For more information about fertigation and fertilizer rate calculations, check out the UAEX factsheet *Basics of Drip Irrigation and Fertigation for Specialty Crops* (https://www.uaex.uada.edu/publications/PDF/FSA6160.pdf) and the UAEX YouTube video *Calculating Blackberry Fertility Rates* (https://youtu.be/DArPa8eUC68?si=u-VP-ScfBUIpdNJRS).

- **Broadcast:** Granular or pelletized fertilizer is evenly spread across an entire field (Fig. 1). While broadcast fertilizer applications have their place, application of nutrients to the soil surface and both near and away from the rooting zone results in slower

Figure 1. Dosamatic injector (left) used for fertigation. As water moves through the irrigation line (black hose), the Dosamatic draws up a fertilizer solution (white bucket) to be added to the irrigation water that will go through the drip line. Tractor with fertilizer broadcaster (right) spreads granular fertilizer over a wide area of the field.

uptake and reduced fertilizer efficiency. In blackberry production, lime, phosphorus (P) and potassium (K) are well-suited for broadcast. Other nutrients can be broadcast but it may not always be appropriate to do so.

Other, less popular methods of fertilizer application can still be appropriate in certain situations:

- **Foliar:** Spraying fertilizer solution onto plants to be absorbed through the leaves. This method is not recommended for many commonly applied nutrients, but can be efficient for micronutrient deficiencies. Several micronutrients are immobile in the soil and in the plant (B, Cu, Fe). While deficiencies for these nutrients are rare in blackberries, foliar applications can be an efficient method of application when they occur.

- **Banding:** Band applications place granular fertilizers near the row (≈12 inches either side of row). In perennial crops, like blackberries, this can be beneficial for replenishing certain immobile nutrients in larger quantities, such as P. Banding fertilizer is most efficient in bare ground production.

Fertilizer Rate Recommendations for Established Blackberry Plantings

Soil pH

While the optimal soil pH for blackberry production is 6.0-6.5, blackberries can grow well in soils with pH between 5.6-7.0. Most U.S. southeastern soils are moderately to strongly acidic (pH < 6.0) and must be amended with lime for optimal blackberry production. Soils with a pH that is too high (basic) or too low (acidic) will limit the plants' ability to take up nutrients regardless of the rate of fertilizer applied. For example, as soils become more acidic, macronutrients (N, P, K, Ca, Mg, and S) become less available to the plant, whereas as soils become more alkaline (pH > 7.0) most micronutrients (Fe, Mn, B, Cu, and Zn) become less available to plants. Soil pH should be evaluated through the use of soil testing prior to planting and then monitored annually or bi-annually during production.

Nitrogen

Blackberries require annual applications of N to maintain adequate plant growth and fruit production. However, research in Arkansas has demonstrated that blackberries do not exhibit a large response to N fertilizer applications (Lay-Walters et al. 2026). Excess N applications can also decrease fruit quality after harvest and result in excessive growth that requires additional labor to manage (Lay-Walters et al. 2026). For these reasons, nitrogen applications should be made annually but rates should not be excessive.

Timing and Method

Nitrogen is a mobile nutrient in soil, and N fertilizers can be lost from the soil through leaching. For this reason annual N applications that are well-timed to crop N uptake are required to optimize N fertility in blackberries. Nitrogen fertilizer application should start once primocanes emerge in the spring and should stop in late summer. Applying extra N late after harvest (such as September or October for much of the southeastern United States) can cause a flush of new growth that will be more susceptible to cold injury.

- **Fertigation:** Total annual N applications could be split evenly into roughly 15 weekly applications from spring to late summer. If your floricanes are N deficient due to inadequate fertilization in the previous year, applying slightly higher rates (≈10%) of N during those first few weeks at primocane emergence may help supply floricanes with additional N. However, this is a very short window of time when the primocanes are very small (< 6 inches).

- **Broadcast fertilization:** Nitrogen fertilizer can be split equally into two to three broadcast applications, generally timed to coincide with the crop stages of (1) primocane emergence, (2) small green fruit and (3) immediately after harvest.

Rates

Previous recommendations have suggested applying 50-80 lb N/ac to floricane-fruiting blackberry (Davis et al. 2024; Fernandez et al. 2023; Hart et al. 2006) and an additional 20-30 lb N/ac for primocane-fruiting blackberry (Strik 2017). Arkansas research indicates that rates as low as 30-60 lb N/ac/year can support optimal blackberry production in moderately fertile soils (Lay-Walters et al. 2026). Higher rates of N (>90 lb N/ac) did not result in higher yields for the blackberry cultivar "Ouachita" in these trials but instead resulted in excess plant growth that required additional pruning labor and higher incidence of decay in fruits post-harvest (Lay-Walters et al. 2026). Growers should avoid applying high N rates of during harvest, as negative impacts on fruit quality, including higher incidence of red drupelet reversion, have been observed (Edgely et al 2019). Some growers stop or greatly reduce N appli-

Figure 2. Blackberry growth/development stages when it is appropriate to sample primocane leaves. These include when primocanes are between 6-12 inches, when there are small, green fruit on the floricane, at peak floricane harvest and when floricanes are post-harvest. The timing these stages occur vary by region and cultivar, so be sure to make a note of what stage you collect leaf tissue samples.

Primocanes at 6-12" | **Small, green fruit on the floricane** | **Peak-floricane harvest** | **Floricane Post-harvest**

cations during harvest in an effort to reduce possible negative effects of N on fruit quality.

Research conducted in the Pacific Northwest found floricane-fruiting blackberries remove 11-18 lb N/ac during harvest each year and 28-45 lb N/ac during cane removal at pruning. Using this information, growers are encouraged to consider an application rate of 40-65 lb N/ac as a minimum rate of N to be added each year to replace annual N losses from harvest and pruning. Similarly, research in Arkansas found that in double-cropped primocane-fruiting blackberries, a total of approximately 14-20 lb N/ac are removed in fruit via harvest and approximately 49-50 lb N/ac are removed via cane removal during winter-pruning each year (Lay-Walters 2025). Based on these results, primocane-fruiting blackberries should be fertilized with at least 63-70 lb N/ac/year. Additional research is needed to fine-tune N fertilizer rates for primocane fruiting blackberry in the Southeast.

Based on new research in Arkansas, southeastern blackberry growers are recommended to use in-season leaf tissue nutrient sampling (Lay-Walters et al. 2025) and soil sampling (Lay-Walters et al. 2026) to fine-tune their N fertility program for their specific location, fertilizer application method and soils (see *How to Leaf Sample* section for details).

N Fertilizer Source

Generally, blackberries prefer nitrate (NO_3) based N fertilizers over ammonium (NH_4) based N fertilizers. Synthetic (conventional) fertilizers such as potassium-nitrate (KNO_3)(13-0-45) or calcium-nitrate [$Ca(NO_3)_2$] (15-0-0-18) have been used successfully in conventional blackberry production. These fertilizers provide nutrients that are immediately available for plants to take up once dissolved, either through fertigation or when irrigated after broadcast applications. Organic N fertilizer sources, such as compost or fish emulsions, break down over time for more gradual N release and plant uptake. They also have the added benefit of contributing organic matter to the soil. However, depending on the source, organic fertilizers aren't always consistent in nutrient content. Patterns of nutrient release from these fertilizer sources may not align with patterns of nutrient uptake by the plant.

Phosphorus & Potassium

Previous research in the PNW on blackberry cultivars popular in the region found that 4-11 lb P/ac and 32-75 lb K/ac are annually removed through harvest and pruning (Strik and Bryla 2015). Research is still needed to determine if these results are similar for blackberry in the Southeast.

Annual P applications are generally not required for blackberries if the soil was properly amended prior to planting. If leaf tissue analysis indicates a deficiency (Table 1 & 2), 30-60 lb P_2O_5/ac should be broadcast or band applied in late winter. Due to P being essentially immobile in soils, band application of P can be a more efficient means to increase plant uptake of P when a deficiency is detected. Additionally, if a P deficiency is detected in plant tissue, the grower should verify that soil pH is in the desired range (6.0-6.5). If soil pH is too low, it can be difficult for plants to take up P.

Factors such as irrigation and soil moisture can impact blackberry uptake of K. Because of this, leaf tissue sampling is often recommended over soil sampling to determine K needs (Davis et al. 2024).

Potassium can be applied via broadcast or fertigation. Because K is easier for the plant to take up with adequate amounts of water, fertigation can be a very efficient means to apply K. Broadcast application is still a viable method, so long as plants are irrigated sufficiently. In some soils, potassium is considered to be almost immobile, so banding might be preferred over broadcasting. If fertigation is used, alternating weekly applications of KNO_3 and $Ca(NO_3)2$ will supply sufficient K and calcium (Ca) to the crop. If leaf tissue analysis indicates a K deficiency (Table 1 & 2), a rate of 30-60 lb K_2O/ac should be applied. Soils high in K may not require annual applications. Due to the high K content of fruit, however, many growers annually apply 30-60 lb K_2O/ac. Be aware that high K rates, especially in sandy soil, can burn young roots and interfere with the uptake of Ca and magnesium (Mg).

Table 1. Soil test sufficiency recommendations for Southeast Regional Caneberry Production Guide (Fernandez et al. 2023).

	Soil Test Level	
Nutrient	**lb/ac**	**ppm**
Phosphorus (P)	40–60	20–30
Potassium (K)[i]	200–400	100–200
Calcium (Ca)[ii]	1000–2000	500–1000
Magnesium (Mg)	100–250	50–125
Sulfur (S)	20–40	10–20
Iron (Fe)	100–200	50–100
Manganese (Mn)	50–200	25–100
Zinc (Zn)	1.0–3.0	0.5–1.5
Copper (Cu)	1.0–3.0	0.5–1.5
Boron (B)	1.0–2.0	0.5–1.0

[i] K recommendations from Oregon State are higher (300 to 600 lb K/ac). Since K is relatively immobile in soil, higher rates might be needed. Apply 12 inches away from base of new plants to prevent salt injury.

[ii] Optimum Ca levels depend on soil type. Maintain optimum soil pH (6.0 to 6.5) with liming supplies that have sufficient Ca and Mg.

Calcium, Magnesium, & Sulfur

Soil pH, Ca and magnesium interact in various ways, depending on which forms of the nutrients are applied. Applying dolomitic lime to increase soil pH (see the *Southeastern Caneberry Guide* for more) will also supply blackberries with both Ca and Mg. Additional Ca and Mg applications are not recommended unless soil or leaf tissue analysis indicates a deficiency (Table 1 & 2). Calcium-nitrate will provide the plant with water-soluble forms of Ca and N. Epsom salt ($MgSO_4$) can also be applied for deficiencies in Mg and sulfur (S). Annual application of S is not recommended for blackberries, but if soil or leaf tissue analysis indicates a deficiency (Table 1 & 2), 30–40 lb S/ac is recommended to be applied. Be sure to check the guaranteed fertilizer analysis (fertilizer grade) as many fertilizers and soil amendments, such as gypsum, already contain S.

Boron

Although only needed in small quantities, boron (B) is an important nutrient for blackberry growth and development of flowers and fruit. Annual B application is not recommended unless soil or leaf tissue analysis indicates a deficiency (Table 1 & 2). If B deficiency is observed in leaf and soil samples, application of 1-2 lb B/ac is recommended at flowering or early fruit set. If B deficiency is only observed in the leaf (Table 2) but within recommended ranges for soil (Table 1), 0.9 lb B/ac is recommended. In both conventional and organic production, Solubor and Borax are good options for soil or foliar applied B. Foliar applications of B fertilizers, can be very effective to address B deficiency., Growers should use caution, however, with both soil and foliar

Table 2. Blackberry leaf tissue nutrient sufficiency ranges for southeastern blackberries at four growth stages for most recently mature primocane leaves (MRML). Adapted from survey results of blackberry in the southeastern U.S. from 2022-2024.

Element	Primocanes At 6-12”	Small, Green Fruit	Floricane Peak Harvest	Floricane Post-Harvest
N (%)	3.30 - 4.00	2.90 - 3.75	2.15 - 3.00	1.95 - 2.95
P (%)	0.25 - 0.40	0.20 - 0.40	0.15 - 0.40	0.15 - 0.40
K (%)	1.30 - 1.75	1.30 - 1.75	1.15 - 1.50	1.00-1.50
Ca (%)	0.30 - 1.00	0.35 - 1.00	0.40 - 1.50	0.45-1.50
Mg (%)	0.30 - 0.60	0.30 - 0.60	0.30 - 0.60	0.30 - 0.60
S (%)	0.10-0.20	0.10-0.20	0.10-0.20	0.10-0.20
Fe (ppm)	45-100	45-100	35 -100	35-100
Mn (ppm)	50-300	50-300	50-300	50-300
Zn (ppm)	20-50	20-50	20-50	20-50
Cu (ppm)	5-15	5-15	5-15	5-15
B (ppm)	10-50	10-50	10-50	20-60

[i] Ranges developed based on the data collected during Lay-Walters et al. 2025 research and represent the 25th and 75th percentile based on the median leaf tissue nutrient concentration of each nutrient.

applications, as excessive B rates can injure blackberry plants.

Additional Micronutrients

Annual applications of micronutrients, such as iron (Fe), zinc (Zn) and copper (Cu), are not recommended for blackberry. Often, if soil pH is within a suitable range (5.6-7.0), these micronutrients should be sufficient and available in most U.S. soils. Deficiencies in macronutrients (N, P, K, etc.) can often limit uptake of micronutrients that then show up as deficient in leaf tissue nutrient tests. After correcting the macronutrient deficiency, often the micronutrient deficiency will also be corrected. However, micronutrient applications should be considered if tissue analysis continues to show a need after macronutrient application. Use caution when considering fertilizer applications to address micronutrients, as the range between deficiency and toxicity is very narrow for micronutrients and visible symptoms may be misleading.

Iron deficiency has been observed in blackberries grown in soils with a pH over 8.0, which is more common in western U.S. soils. Blackberries in the southeastern U.S. have been observed to have an average leaf tissue Fe concentration lower than many other regions (Lay-Walters et al. 2025). Currently, this lower leaf tissue Fe concentration does not appear to negatively impact growth or yield. Southern soils are often high in manganese (Mn), often resulting in high leaf tissue concentrations.

Pre-Plant Fertilizer Recommendations for New Blackberry Plantings

The best time to adjust soil pH and make significant amendments to your field is before planting, when amendments can be tilled in and incorporated throughout the soil profile. Prior to establishing a new blackberry planting, soil samples should be collected from the field at a depth of 6-8 inches (10+ soil cores per sample or per acre) and analyzed for nutrient content and soil pH. The minimum soil test values for blackberry presented in Table 1 are also applicable during pre-planting.

The optimal soil pH for blackberries is 6.0-6.5. Most southeastern soils are moderately to strongly acidic (pH < 6.0) and must be amended with lime for optimal blackberry production. Tracking soil pH through soil sampling during and after planting is beneficial to understanding limitations in nutrient uptake and growth. When amending with lime, calculate the rate with a target soil pH of 6.5. To learn more about soil tests and lime, check out the UAEX factsheets Understanding the Numbers on Your Soil Test Report (https://www.uaex.uada.edu/publications/pdf/FSA-2118.pdf) and Not all Liming Materials are Created Equal (https://www.uaex.uada.edu/publications/pdf/FSA-2201.pdf).

It is common to amend soils with additional P and K prior to planting. Pre-plant N application is not recommended, however, if growers plan to fertigate in the first year. Use soil test results to determine rates of P and K to apply pre-plant. In soils with low soil test P, in general an application of 60-180 lb P_2O_5/ac is recommended. As with pre-plant lime, P should be incorporated into the soil prior to planting, due to low mobility of P in the soil (Strik 2017). If pre-plant soil samples are low in K (<150 ppm K), apply 20-30 lb K_2O/ac before planting and again, at the same rate, after planting (Davis et al. 2024).

If soil test S is less than 10 ppm, apply 30 lb S/ac and incorporate before planting. If soil test S is above 10 ppm and pH is between 5.6-7.0, no S is required. Broadcast applied amendments to the field or to a strip in which the crop will be planted, disk or rototill the area thoroughly to mix the amendments into the upper few inches of soil and then deep plow the field to put the amended topsoil at the bottom of the furrow. If large amounts of amendments are needed, apply one-half to two-thirds of the total, disk and plow as described above then apply the remaining amendments to the soil surface and disk or rototill it in.

Blackberries in their first year should be fertilized with a rate of 25-45 lb N/ac to support new growth. Nitrogen rates can be split-applied into weekly applications through fertigation or one to two broadcast applications. Nitrogen fertilizer applications should start two weeks after planting for plug plants, or once new growth starts on bareroot plants. All other nutrients applied prior to planting should be sufficient for the first year of growth.

Once the crop has been planted, the role of regular soil testing is to monitor soil pH. It has been shown that soil tests are not always a reliable indicator of plant response to micronutrient and secondary macronutrient content, often due in part to the accumulation of applied fertilizer nutrients in the upper few inches of the soil above the rooting zone of the crop. Considering that blackberries root to a depth of 18-24 inches, if nutrient stratification in the soil profile is suspected, collecting separate soils samples at two depths (0-3 inches and 3-6 inches, or 0-8 inches and 8-16 inches) can help to clarify the issue. Nevertheless, leaf tissue analysis along with soil pH, soil sampling records, and observations of plant growth should be the key factors used in formulating a nutrient application program.

Leaf Tissue Nutrient Sampling for Monitoring Crop Nutrient Status

To monitor crop nutrient status, regular leaf tissue nutrient sampling can help detect a deficiency prior to the onset of visual symptoms (Davis et al. 2024; Fernandez et al. 2023; Hart et al. 2006; Strik 2017). Blackberry leaf tissue nutrient sampling is an important tool for monitoring the nutrient status of plants. The results of these samples give insight to the effectiveness of the farms' nutrient management strategies and whether adjustments are necessary. Over-application of nutrients can increase fertilizer costs and labor costs for pruning, and may decrease post-harvest fruit quality.

Blackberry leaf tissue nutrient sufficiency ranges have been updated for the Southeast to allow growers to monitor crop nutrient status at four key crop stages (primocanes at 6 inches, small green fruit, peak floricane harvest, and floricane post-harvest) throughout the season (Lay-Walters et al. 2025). Previous recommendations were to sample only at post-harvest. The updated recommendations and guidelines, however, allow growers to adjust their fertility programs earlier in the season, while plants are still actively taking up nutrients, as opposed to solely after harvest. Soil sampling adds context to leaf tissue nutrient sample results. These two pieces of information should be used together, particularly because of the impact soil pH has on nutrient uptake.

How to Leaf Sample

Leaf tissue nutrient samples must be collected from the correct type of leaf and at the correct growth stage in order to accurately compare results to established ranges. A poorly collected sample will provide a poor interpretation.

Leaf type

Leaf tissue nutrient samples should be collected from the most recently mature leaves (MRML) of the primocane, which is generally the third or fourth fully expanded leaf back from the growing point (Fig. 3). Sampling these leaves gives the most accurate results for plant nutrient content. Primocanes generally have higher concentration of nutrients than do floricanes, with the exceptions of Ca, Cu, and Zn (Lay-Walters et al. 2025; Strik and Bryla 2015). Sampling floricane leaves is not recommended, as their results rarely reflect the efficacy of current or recent fertilizer applications.

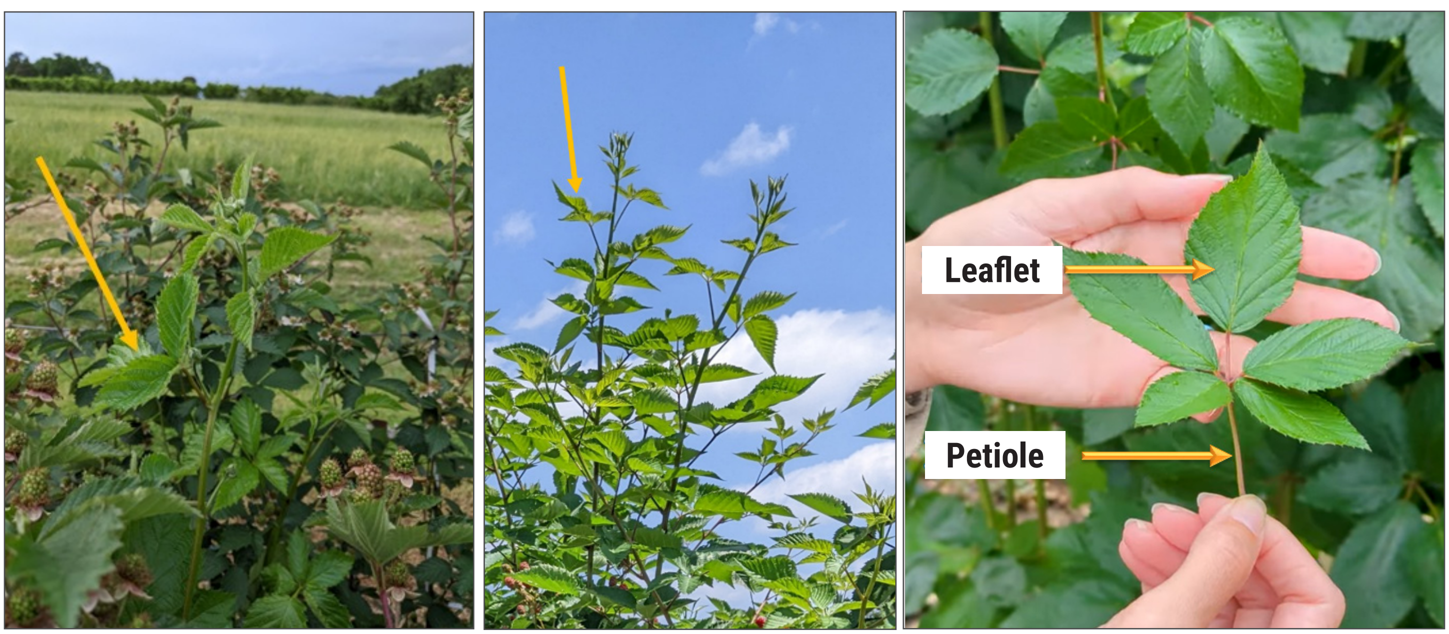

Figure 3. Close up of blackberry primocane at green fruit stage (left), the yellow arrow points at the 3rd or 4th leaf for leaf tissue nutrient sampling. Blackberry primocane near the peak harvest stage (center), the yellow arrow points at the third or fourth leaf for leaf tissue nutrient sampling. MRML primocane leaf (right) with leaflet and petiole still attached, the yellow arrows point at the leaflet (sample) and petiole (remove).

Timing of Sampling

Leaf tissue nutrient content varies dramatically throughout the season depending on the crop growth stage, which is sometimes referred to as phenological or physiological stage. Recording the crop stage at the time of sampling is important to compare your results with the corresponding crop nutrient sufficiency range established for that plant growth stage. Nutrient sufficiency ranges for primocane leaf tissue have been established for four crop stages (Fig. 2):

1. Primocanes between 6-12 inches tall (early spring)
2. Small, green fruit on the floricane (late spring-early summer)
3. Floricanes at peak harvest (summer)
4. Floricanes at post-harvest (late summer)

As a rule, the leaves collected for nutrient sampling should always be collected from primocanes., These updated sufficiency ranges, however, are currently applicable to both primocane- and floricane-fruiting types of blackberries for MRML leaves collected on the primocanes.

To collect a leaf tissue nutrient sample at any stage, follow these steps:

- Collect MRML leaves on primocanes (Fig. 3). These are typically the third or fourth fully expanded leaf back from the growing point. Remove the petiole from the leaflets and save the leaflets for analysis. The updated sufficiency ranges for the Southeast were developed based on sampling leaflets without the petiole, which may differ from some other regional recommendations.
    - A primocane leaf is generally comprised of five compound leaflets, but this may differ in primocane-fruiting cultivars. Be sure you are able to confidently differentiate primocane and floricane leaves.
    - Samples should not be washed or cleaned. However, leaves without soil, residue from foliar applications or other contaminants should be collected. Unclean leaves should be avoided.
    - Select healthy leaves that are representative of the crop.
- Collect at least 25–30 leaves from different plants that uniformly represent the entire field for each sample. Collect up to 50 leaves for larger fields or split the field into two samples if appropriate.
    - Samples for the same field can be pooled across different cultivars, so long as these cultivars are in the same growth stage and are managed the same. Although one may sample cultivars separately to fine-tune nutrient needs for a specific cultivar, the current developed sufficiency ranges are considered suitable for all cultivars.
- Store leaves in paper bags. Do not use plastic bags for sampling
    - If possible, dry samples after collection to prevent molding or spoilage prior to submission for analysis.
- Record location and date of sampling and crop stage.
- Store samples in a cool dry place until they can be sent for lab analysis.
- Avoid collection of leaf samples in the first few days immediately after fertilizer application, as this may skew results.
    - Assuming a consistent weekly fertilization schedule, this can be avoided by sampling the day before fertilization.
    - This includes not sampling after foliar applications of fertilizer and pesticides unless there has been rainfall.
- For a demonstration of how to collect samples, UAEX YouTube channel has a video titled Blackberry Plant Tissue Nutrient Sampling (https://youtu.be/GE7h35dTXEs?si=3goudv1hZSGy-Eo_).

Factors such as soil type, topography, soil drainage, age of planting, and different irrigation sources should be considered when choosing how many samples to collect. We recommend splitting up the farm/fields into separate samples to account for these factors. Previous recommendations have suggested sampling separately by blackberry cultivar. However, new research from the Southeast finds that this is generally not necessary. Cultivars or fruiting-types in the same field and at the same crop stage can be pooled as long as sampling accounts for the other factors mentioned earlier (Lay-Walters et al. 2025). Growers should start sampling once primocanes are between 6-12 inches in order to identify possible nutrient deficiencies early in the season, allowing time to make changes to fertility programs as soon as possible.

Interpreting Results of Leaf Tissue Nutrient Samples

This section discusses factors to consider when interpreting your leaf tissue nutrient analysis results, and provides example interpretations of common results. Growers should follow regional fertilizer rate recommendations, but then use leaf tissue sampling and their own observations to tailor those rates for their specific location and conditions. After receiving a leaf tissue nutrient analysis report, compare results from the report to the updated southeastern blackberry nutrient sufficiency ranges in Table 2. Be sure to consult the correct crop growth stage when comparing the sufficiency ranges to the report's results. When possible, consult a recent soil test report while reviewing leaf tissue analysis results. Nutrients found to be below the sufficiency range may require a higher application rate. Nutrients found to be in excess of the sufficiency range may require a lower application rate of that nutrient or no application at all. There can be exceptions to these scenarios, however, so it is important to understand the factors that can impact leaf tissue nutrient results when making an interpretation.

Following a heavy rainfall, for example, soil nutrients will often be highly leached or washed out, whereas during dry periods without irrigation, the uptake of water-soluble nutrients such as NO_3, Ca, and K may be lower. Additionally, leaf tissue sampling soon after foliar nutrient applications or fertigation may result in inaccurate nutrient measurement. Understanding how different factors influence crop nutrient status can help to interpret leaf and soil sample results, determine how much fertilizer to apply next, and assess the overall efficiency of the current fertility management program.

Once a decision is made to amend a component of the fertility program based on leaf tissue nutrient results, keep in mind that the crop will be slower to take up broadcast-applied amendments, while nutrients applied via fertigation will move more quickly into the plant's tissues. Growers are encouraged to re-sample at the subsequent growth stages to confirm if adjustments to their fertility program are effective. Seek assistance from the cooperative extension service when making decisions about how to amend a fertility program in-season.

Common Questions About Leaf Tissue Nutrient Reports

How does soil type impact fertilizer application and interpreting leaf nutrient sample results?

- Soils with a high sand content are more prone to nutrient loss via leaching than soils with a high clay content. In soils that do not retain nutrients well, such as sandy soils, applying smaller fertilizer rates on a more frequent basis will increase fertilizer efficiency compared to large, infrequent applications.
- Different soil types vary in drainage, pH, soil organic matter content, and concentrations of some nutrients. Knowing these inherent characteristics of the site can help when interpreting leaf tissue nutrient results.

Why is my leaf tissue N concentration low following weekly N applications when my soil pH is adequate?

- Low leaf nutrient concentrations in plants with vigorous growth may be caused by over-fertilization, resulting in diluted nutrient concentration from excessive growth (Strik 2017). Reduce N fertilizer rate and re-sample at the next stage.
- Plants with low leaf nutrient concentrations and poor growth but sufficient soil nutrients could be a sign of limitations due to other nutrient deficiencies or factors outside of nutrient management, such as poor irrigation management or soil compaction.

What does it mean when a leaf tissue nutrient sample indicates a deficiency in one or two macronutrients (N, P, K, Ca, and Mg) and several micronutrients like Mn, Fe, and Zn, etc.?

- A deficiency in one macronutrient such as N, P or K can have cascading impacts on the uptake of many other nutrients.
- Prioritize correcting macronutrient deficiencies. This will often subsequently resolve micronutrient deficiencies.

Should I be concerned about leaf tissue Mn concentrations higher than the sufficiency range?

- High Mn concentration is common for many crops in the southeastern United States because the soil and water sources are high in Mn compared to other regions. Low or acidic pH can also exacerbate high Mn in the soil and plant tissues. Keeping the soil pH in the optimal range will help temper Mn uptake.

- Mn toxicity, or high concentrations of Mn that damage the plant, is not common in blackberry. In acidic soils (pH < 5.6), however, Mn toxicity can occur, so monitor soil pH through annual soil sampling and check for visual symptoms like yellowing of the leaf between the veins.

Why is my leaf tissue B so high?

- Was a foliar B application made prior to sampling? If so, this high result is probably not a sign of B toxicity. Instead, your sample is capturing the B fertilizer on the surface of the leaf instead of the actual nutrient contents in the leaves.
- Foliar applications of nutrients and certain pesticides can impact leaf tissue nutrient sample results without accurately reflecting the nutrient status of the plants. We do not recommend sampling shortly after foliar applications.

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UADA & UAEX Resources

Videos

- Blackberry Plant Tissue Nutrient Sampling: https://youtu.be/GE7h35dTXEs?si=3goudv1hZSGy-Eo_
- Calculating Blackberry Fertility Rates: https://youtu.be/DArPa8eUC68?si=uVP-ScfBUIpdNJRS
- Primer on Primocanes: A Breakthrough in Blackberries: https://youtu.be/qH5uRXYR6EY?si=sI3D1my-7Ef17kD4g

Factsheets

- Basics of Drip Irrigation and Fertigation for Specialty Crops: https://www.uaex.uada.edu/publications/PDF/FSA6160.pdf
- Not all Liming Materials are Created Equal: https://www.uaex.uada.edu/publications/pdf/FSA-2201.pdf
- Understanding the Numbers on Your Soil Test Report: https://www.uaex.uada.edu/publications/pdf/FSA-2118.pdf

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