Blueberries-Southern Highbush in Pinebark Beds (*Code* #134)

Because finely ground pine bark has properties different from soil, we do not use the routine soil test for determining the fertilizer requirements of blueberries grown in pine bark beds. Instead, the testing procedure for "Greenhouse and Nursery Soils" (pH, P, K, Ca, Mg, nitrate, ammonium, and soluble salts) is used, primarily as a troubleshooting test to determine if soluble salts and pH may be outside the desirable range. Suggested EC levels (soluble salts) for pine bark substrate are 0.50 to 0.75 mMhos/cm. The pH should be in the desirable range of 4 to 5. In addition, the following table gives values for nutrient concentrations considered insufficient, sufficient, and excessive for woody ornamentals, and which may be used as a partial guide for the production of blueberries grown in pine bark beds. The nutrient ranges, while highly useful for controlled environments such as the greenhouse, may not be as reliable in the field because nutrient levels can sometimes change quickly due to heavy leaching rains. Do not rely heavily on the nutrient ranges in the table because nutrient levels can change quickly with heavy leaching rains. An "insufficient" level does not mean the plants are nutrient deficient.

Recommendations

Range of nutrient concentration in saturation extraction method for soil-less media for optimal production of woody ornamentals during the growing season. Method used by UGA lab.

Element	Parts per million (ppm)		
	Insufficient	Sufficient	Excessive
Nitrogen (nitrate)	<39	40-139	>140
Phosphorus	<3	4-13	>14
Potassium	<49	50-179	>180
Calcium	<69	70-219	>220
Magnesium	<29	30-99	>100

Recommended pH of the saturated extract: pH = 4.0 to 5.0.
Recommended EC of the saturated extract: 0.50 to 0.75.

pH management

Pine bark should have a natural pH between 4.0 and 5.0, ideal for blueberries. High pH irrigation water can raise the pH too much, which may require action by the grower. If the pH increases above 5.0, use ammonium sulfate as a nitrogen source. Acidification of the irrigation water is another option. Many Georgia greenhouse growers and longleaf pine nursery growers normally use sulfuric acid for acidifying the irrigation water for their crops. Elemental sulfur can also be used to lower the pH, but apply a modest amount (300 pounds per treated acre) and wait several months to determine the extent of the pH change before applying more, if needed. At the 300 pound per acre rate, sulfur can be applied over the top on plants in the field. However, do not apply when the leaves are wet. Iron sulfate can also be used to lower the pH of the pine bark and supply iron. On plants already set in the field, use a maximum of one-half pound per cubic yard of pine bark substrate or one-half pound per 54 square feet. This is equivalent to 400 pounds per treated acre if the pine bark is six inches deep. If the pH of the pine bark is below 4.0 use urea as a nitrogen source. It is less acid forming than ammonium sulfate. Liming with dolomitic limestone can be conducted if necessary, but in our experience it has not been needed since most of the deep well irrigation water in the South Georgia blueberry belt is alkaline (pH above 7).

EC management

If EC is consistently below the desirable range, this indicates that plant nutrients may be limiting to the growth of the blueberries. Fertilizer application according to the recommended levels below will raise EC into the desirable range.

Fertilizer management

First year of planting
Young blueberry plants are easily burned by excess fertilizer salts. For this reason, extreme caution must be exercised if you are using a regular dry granular fertilizer on young blueberry plants, especially rooted cuttings. **Slow release or controlled release fertilizers are recommended for this phase of production. Follow manufacturers directions. Use the "low" or "medium" rate for salt sensitive plants.**

Rooted cuttings with controlled release and slow release fertilizer
If rooted cuttings or plug plants are set, typically about a one teaspoon to one tablespoon of fertilizer per plant is applied at each application with two to four applications per year depending on if controlled release or slow release fertilizer is used. This is based on manufacturers' recommendations for a one gallon container. Some growers are using several applications of controlled release fertilizer per year with regular fertilizer applied monthly. Scatter the fertilizer evenly over a circle about 12 inches in diameter with the plant in the center. Increase amount of fertilizer as plants grow.

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Regular fertilizer in year one

If you plant rooted cuttings or plug plants and decide to use regular fertilizer, apply about one-half teaspoon of premium grade (contains micronutrients) 10-10-10 applied evenly in a circle 12 inches in diameter starting at bud break and continuing every two to three weeks during the early part of the summer. This is equivalent to 30 pounds of nitrogen per acre if broadcast. As the rooted cuttings grow to about a foot in height, if one gallon size plants are set, the rate can be increased to a teaspoon per application and the diameter of the circle increased to 18 inches. Apply every two to three weeks. This is equivalent to 27 pounds of nitrogen per acre if broadcast.

Year one gallon size plants with controlled release and slow release fertilizer

If gallon size plants are set, use the manufacturer's recommendations for production of plants in a three to five gallon container. A typical program might be 1.5 ounces of 13-6-6 slow release fertilizer applied four times per year or 2-2.5 ounces of controlled release "8-9 month" 18-6-12 applied once. Additional fertilizer from a regular, slow release or shorter term controlled release material may be needed to finish the season, since "8-9 month" controlled release fertilizer is based on an average 70 degree F temperature and normally only lasts about five months in Georgia. Apply evenly in a circle about 24 inches in diameter with the plant in the center.

Fertilizing two year old bushes in pine bark beds

Based on recent research from Florida, if you are using regular fertilizer, second year plants should receive about two teaspoons (10.5 grams) of premium grade 10-10-10 or 12-4-8 applied to a circle 24 inches in diameter. This is equivalent to 30 pounds of nitrogen at each application per acre if broadcast. Apply every two weeks during the period growth is desired.

If you are using slow release or controlled release fertilizer spread the fertilizer over an area about three feet in diameter with the plant in the center. The area of the circle in this case would be 7 square feet or 3.5 cubic feet (26 gallons) if the pine bark is six inches deep. **Follow manufacturers directions.** A typical program may be 4 ounces of a slow release material (such as 13-6-6) applied three times per year or 8 ounces of a 8-9 month controlled release material (such as 18-6-12) applied once a year. In late summer an additional application of regular fertilizer may be needed.

Fertilizing bushes three years and older

In most high density southern highbush plantings, bushes three years and older are considered mature and have filled their allotted space. Normally a severe rooftop hedging program is practiced, where the bushes are cut back to about three feet immediately after the harvest is finished (about June 1 in South Georgia). This creates a higher demand for fertilization than plants growing in soil where moderate winter pruning is often the only pruning conducted. Also, since pine bark does not hold phosphate well, there is a need to apply phosphorus throughout the growing season.

Research on fertilizing mature bushes in pine bark is very limited, but there is a large body of grower experience. One grower observation is the significant release of nitrogen from old pine bark beds. After the pine bark has been fertilized and aged for a number of years, plants may not require as much nitrogen as expected late in the season. Leaf nutrient levels and growth should be monitored.

Many growers in Georgia and Florida are using a premium grade (contains micronutrient and secondary nutrients) 10-10-10, 12-4-8, or 18-6-12. Micronutrients (boron, iron, manganese, zinc, etc.) and secondary nutrients (sulfur, magnesium, etc.) may be needed but some micronutrients such as boron and manganese may reach toxic levels in some situations. Leaf nutrient levels should be monitored and fertilizer blends adjusted as needed.

Typically about 100 to 220 pounds of actual nitrogen is applied per year, divided into six to eight applications. A typical program with **regular** fertilizer would be 150-200 pounds per acre of 10-10-10 or 120-135 pounds per acre of 18-6-12 applied in mid-February, mid-March and early April in South Georgia. Avoid application of nitrogen during harvest if the plants look healthy and have adequate nitrogen in the leaves based on leaf analysis. Make sure that plants have adequate potassium in the leaves at harvest. This is an important element for fruit quality. However, excessive application of potassium will induce magnesium deficiency. Starting at hedging June 1, another 150-200 pounds of 10-10-10 or 120-135 pounds per acre of 18-6-12 is applied every three to four weeks until early September in South Georgia.

Soils vary in their natural ability to supply the plant available forms of nitrogen (N). The N fertilizer recommendations given here for Southern Highbush are based on soils with 3 to 5% organic matter (OM). Soils with higher OM generally supply more N; therefore, less N fertilizer is needed on high OM soils. Likewise, be aware of conditions that may increase the need for additional N. On new plantings to which pine bark has been added (especially pine bark with white wood), additional N fertilizer may be needed to overcome N tie-up by bacteria. Sufficient nitrogen should be applied to grow good lateral fruit wood 5 to 8 inches in length. However, do not add too much nitrogen because it may lead to growth of highly succulent shoots that are susceptible to Botryosphaeria stem blight. In general, N should not be applied after early September in South Georgia or mid-August in North Georgia. Nitrogen fertilizer is used more efficiently if added through drip irrigation systems; therefore, recommended N rates may be reduced by about 20%. Because of these many complex factors, we recommend plant tissue analysis and grower observations as the most reliable guide for adjusting the rate of N fertilizer to apply. For more information on plant analysis, go to http://aesl.ces.uga.edu/publications/plant/.