Calendar for High Density Southern Highbush Blueberry Production In Pine Bark Beds

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Production of southern highbush blueberries in high density, pine bark beds is becoming a common method of culture in South Georgia. The system can produce impressive yields, but demands attention to detail. Disease and weed control are extremely important in this system. This publication addresses production requirements on a month-by-month basis.

Aged pine bark generally holds water well, and wet conditions are ideal for *Phytophthora* and *Pythium* fungi. The use of Ridomil Gold may be of value in a new planting. Once plants are established, maintenance applications with Ridomil Gold may be required, but established, healthy plants are not generally as susceptible to disease. When possible, maintain adequate bed moisture without keeping the beds too wet.

December - January

Bark Sampling: Collect bark samples from at least five areas and blend together into one sample. Sample problem areas separately. Take these to your county extension office and send off as a "greenhouse" sample. Adjust pH with sulfur or iron sulfate as needed.

Insects: Scout for thrips. If present in significant numbers, spray with diazinon. See Georgia Blueberry IPM guide for details. Cover bee hives with plastic sheet if nearby.

Winter pruning:
*Young bushes usually require only basal pruning of low limbs.
*Third year and older bushes may require removal or thinning of "brush wood"(weak, thin wood with lots of flower buds) in lower part of bush. Normally the tops are cut back in June on mature bushes, so little or no "brush wood" is present in this area.
*Bushes four years and older may need some basal cane renewal pruning in addition to brush wood removal or thinning.

Dormex:

Dormex can be used to promote spring leaf development and promote earlier ripening. However, it advances bloom and increases the danger of freeze damage if conditions are too severe to run overhead irrigation for freeze protection. Use on a trial basis to determine if you like the results. Apply in early January using 1.5 % Dormex. plus 0.5% non-ionic surfactant. Dormex can kill flowers at stage 3 (early bud cracking open stage), so don't apply if you have much bud swell. Cultivars such as 'Emerald' that have good leaf development should not need Dormex.

February

Main bloom period: Use a minimum of one to two strong hives per acre on mature plantings. If weather is cool and rainy, a minimum of four strong hives or more per acre should be used.

Protect field from deer. Normally a three strand electric fence works well. Deer eat the flower buds as they swell and one deer can destroy a huge amount of fruit in this manner.

Freeze protection: See www.smallfruits.org (weather section-frost and freeze protection) or your local county agent for a printed copy.

Start fertilization: If the pine bark is well aged, total nitrogen needed for the season is 120-200 pounds in a mature high density pine bark bed planting. Some plantings have performed well with less nitrogen than this, especially if the bark is old. However, grower experience in N. Florida indicates that total nitrogen application in the range of 175-200 pounds per acre produces an excellent response. However, recent research indicates that even higher rates may be beneficial. Phosphorus and potassium need is probably about one-half this amount. Include magnesium (1 to 2%) and micronutrients in fertilizer (premium grade fertilizer). Apply every three to four weeks at the rate of about 20-25 pounds of nitrogen per acre in a blend (i.e. 200-250 pounds per acre of 10-10-10 or 166-208 pounds per acre of 12-4-8 or 111-138 pounds per acre of 18-6-12, etc.). Nitrogen in the mix should be mostly in the ammonium or urea form, not nitrate form. Slow release forms such as sulfur-coated urea and urea formaldehyde are also excellent as part of the blend. For instance, 18-6-12 can be blended with 25% of the nitrogen as sulfur-coated urea. If pH is getting high (above 5.0), apply nitrogen as ammonium sulfate. Adjust phosphorus and potassium based on leaf samples. Use highbush information not rabbiteye information to interpret results (see www.smallfruits.org Blueberry Fertilization in Soil to obtain the chart. Fertilizer is more subject to leaching in pine bark than soil, so if you have heavy rains (tropical storm, etc.) you may need to refertilize if recently applied.

Apply preemergence herbicides: Although there are several herbicides labeled for use in highbush blueberries, little testing has been performed on highbush blueberries grown in 100% bark. Table 1 and 2 are lists of pre- and post- emergent herbicides labeled for blueberries. Table 3 is a list of herbicides that can be used on non-bearing blueberries. Non-bearing blueberry plants are defined as

plants that will not be used for food production for a period of one year after herbicide application. With limited information available on herbicide use for highbush blueberries grown in pine bark, it is suggested that growers try herbicides on a limited scale before using them on large acreage. Many of these preemergent herbicides can only be used on established plants (plants that are in the ground for more than 1 or 2 years, so make sure to check the herbicide label before use. Application of preemergence herbicides with a TK (flood nozzle) may be a good method of application, since you could spray a five foot band from one nozzle. Calibrate the back pack sprayer before application. Be sure to wear rubber boots and other protective gear when applying the preemergence herbicides.

Non-bearing plants: Apply before March 15 for Spring weed control. For preemergent weed control options see Table 2 and 3.

Bearing Plants: Apply before March 15 for Spring weed control. For preemergent weed control see Table 2.

Postemergence weed control: There are several herbicides that can be used around and a few grass herbicides over the top of highbush blueberries. Refer to Table 1 for your options. Many growers prefer using glyphosate as it can provide good kill of a broad range of plant material. Spray solutions can range from 1 to 5% (using a 41% active ingredient glyphosate). A 1 or 2% solution will normally control most annual and perennial herbaceous plant material, but higher % glyphosate solutions may be necessary to control difficult perennials (Florida betony, nutsedges, etc.) and woody weeds (greenbrier, brambles, oaks, pines, etc.). Use a 1% solution for easy to control weeds since there is less danger of damaging the blueberry plant if drift does occur.

Certain rules should be followed when applying postemergent herbicides. Apply postemergent herbicides to unstressed weeds. Weeds that are drought stressed do not respond well to herbicides, and herbicides can fail under these conditions. The exception is paraquat, it works well on drought stressed weeds.

Avoid postemergent herbicide applications when wind gusts exceed 10 mph. Spray or drift of certain herbicides (such as glyphosate) should not be allowed to contact green stems or leaves of blueberries. If accidental contact of a spray solution contacts a green stem, cut or break off the stem below point of contamination. Paraquat drift can cause minor damage to green canes that allow later infection by stem blight *(Botryosphaeria dothidea*) to invade the green cane and possibly proceed to the crown of the plants. Stems that are damaged by paraquat should be removed as soon as browning occurs. The newly cleared herbicide Rely may be a better choice than paraquat. See the herbicide section at the end of this bulletin.

Some growers are using the Danville Express roller-type postemergent herbicide applicator with paraquat (1%). This can be used under windy conditions. If you get a spot of paraquat on the green cane it may die some months later from bot canker (*Botryosphaeria dothidea*). However, running over some low han

ging leaves should not be a problem, it will just dry them up. Some growers do not like the Danville

Express applicator since it uses a significant amount of chemical. Sponge-type or wick-type glyphosate applicators can also be used under windy conditions. However, be sure that excessive herbicide solution is not squeezed on the pine bark. This can result in root uptake of herbicide. If possible, do not irrigate for 24-hours after postemergent herbicide application. Air-induction spray nozzles which limit spray drift have also been used successfully in high density plantings with paraquat.

Fungicides: Mummy berry has not been a serious problem on southern highbush because most bloom ahead of the infection period. However, we suggest growers not risk infection. Mummy berry is not tolerated in the market. Indar is the product of choice for mummy berry control. At least two to three applications are generally required for control. Start spraying when green tip occurs on the leaf buds or 1-5% open bloom (stage 6) occurs on the flower buds, whichever comes first. Continue sprays till all blooms have fallen. Always use Captan in combination with the Indar applications, since Indar alone increases rots. Elevate fungicide applied during bloom is good for botrytis (gray mold) control , especially if there is freeze injury to the flowers or very wet weather.

Insects: Scout for thrips. If present in significant numbers, spray immediately before first open bloom with Spintor. See Georgia Blueberry IPM guide for details. Cover bee hives with plastic sheet during spraying if nearby.

March

We still do not have a excellent spray schedule for control of rots. However, one to two applications of Abound or Captan following bloom should be considered.

End of bloom period

Fertilize

Irrigate as needed, probably two or three times a week on beds with good moisture holding capacity (such as well aged pine bark).

April

Fertilize in early April before harvest. If you do not plan to fertilize again until after harvest, apply 25-30 pound of nitrogen per acre (250-300 pounds of 10-10-10, etc.) per acre since it will be six to eight weeks before the next fertilization.

Harvest should begin about April 15-20th in South Georgia on FL86-19 (V1). This cultivar can get soft in hot weather. Keep closely picked and pick in the morning.

Irrigate as needed. Typically about .25 inches per day or .5 inches every two or three days. Several factors are considered in irrigation such as, plant size, water holding capacity of the bark, rainfall, temperature, etc. As you go into harvest, monitor water needs closely. Daily irrigation may be

beneficial to help size the fruit.

Bird control: Crows can be shot. Try to keep them from getting established in the field. Shoot away from the field to keep shot out of berries. The first year or so you may have less problem than in future years.

May

Scout for leaf spots, spray if needed. Generally, we have not observed leaf spot epidemics until late May or early June, roughly coinciding with the end of harvest. However, if leaf spots are observed earlier, this should be addressed. Contact your county agent for identification of early leaf spots to determine whether a spray is necessary.

Heavy harvest underway. Try to pick two or three times a week. Cool as soon as possible, placing fruit in an air-conditioned room if a cold room is not available.

Watch out for fruit rots. We have only seen these a few times, but they can be a problem. A spray of Abound fungicide just prior to harvest or during harvest may help to control leaf spots and rots, and it may even give some post-harvest activity (maintaining shelf life). This needs additional research, but an application of Abound is advised at this time.

Put up traps for blueberry maggot. Spray if needed. Refer to Georgia Blueberry IPM guide.

Fertilize in mid to late May after harvest.

June

Late May or very early June, conduct post-harvest hedging on mature bushes using a gasoline hedger on bushes that are getting too tall. The top of the "roof top" cut should be at 36-40 inches depending on the vigor of the cultivar. The shoulder should be at 24-30 inches. More vigorous cultivars (V1, etc.) can be cut harder than less vigorous ones. Try to leave some leaves below the cut to help the plant regenerate. If insufficient branching or flower bud development is occurring with certain cultivars, lightly hedge or tip the shoots a second time in August. At the end of the season the plants should be back up to five feet at the top with an inverted “V” shape looking down the row. This will allow for easy picking.

After harvest, move to a two or three day irrigation cycle, to let the pine bark dry out slightly between irrigations. This is thought to help control root rot.

Spray for Septoria (frogeye spot on 'Star') and anthracnose (larger brown areas) leaf spots. Alliette

should be a good chemical for Septoria control with additional benefits on *Phytophtora* root rot control. Abound and Cabrio is also registered for use; however, Abound and Cabrio have similar chemistries, so rotate with Alliete for resistance management. Do not exceed label rates or number of applications, etc. Spray every 14 days postharvest until dry fall weather starts if diseases are a problem. If periods of very rainy weather come in, additional applications may be required.

Fertilize

July

Spray fungicide if needed.

Fertilize

Spray for flea beetles and caterpillars (if small) as needed with Malathion or Sevin.

August

Spray fungicide if needed. Scout for leaf rust in August and September. If found, use Cabrio immediately to prevent defoliation.

Fertilize

Spray for flea beetles and caterpillars (if small) as needed with Malathion or Sevin.

September

Fertilize. In South Georgia, the last application should be in early September. October fertilization may increase growth, but increases the risk of cold injury and may not allow enough time for flower buds to develop at the tips of the new shoots.

Spray for flea beetles and caterpillars (if small) as needed with Malathion or Sevin.

October

Reduce irrigation as weather cools.

Start hardening off plants for winter.

Preemergent weed control: If winter weeds are a problem, make an application of preemergence herbicide by late October.

November

Reduce irrigation as weather cools.

Start hardening off plants for winter.

Herbicide Application Information:

With 100% pine bark as a growing media, weed pressure can vary depending on sight location, preparation, and growing conditions. It is likely that heavy weed pressure will be encountered during the second year of establishment. In order to reduce weed pressures on developing blueberry plants, a preemergent herbicide program should be employed the end of the first growing season. A weed control program may be initiated early if heavy weed pressures are expected. Up to three applications of preemergent herbicides and eight postemergent herbicide applications may be necessary to keep the planting relatively weed free. The herbicide schedule should be as follows:

- Fall preemergent herbicide application should be applied in mid to late fall (early October), if winter weeds are a problem.
- Spring preemergent herbicide application should be applied in mid to late winter (late February / early March).
- Summer preemergent herbicide application should be applied in late spring to early summer (late May / early June).

Some herbicides have harvesting restrictions. To avoid chemical residue problems, care should be taken to avoid herbicides with long harvesting restrictions during your Spring herbicide application. It is unlikely that you will ever attain 100% weed control with preemergent herbicides. Inevitably some plants will survive herbicide applications. However, these plants can be controlled by hand pulling or with postemergent herbicide applications. It is important that every attempt be made to control these escaped weeds before

these plants go to seed. Weeds such as pigweed (*Amaranthus* spp.), lambsquarters (*Chenopodium* spp.), and spurge (*Euphorbia* spp.) is capable of producing thousands of seeds that you will fight for years to come.

There are several factors to consider when using herbicides. First, failure to apply herbicides at the correct rate is probably the number one reason for herbicide failure. One can not over emphasize the need to properly calibrate herbicide application equipment. A failed herbicide application is a waste of time and money! Second, most preemeregent herbicides will not control emergent plants, however some like Karmex (diuron) will control some. Always try to apply your preemergent herbicides before weed emergence. If weeds have emerged before your apply a preemergent herbicide, make sure to control these emerged weeds with post emergent herbicides. If you attempt to hoe or pull these weeds you will break the barrier of herbicide protection that you applied with the preemergent herbicides. Finally, if you use a postemergent herbicide, determine if you need to add a surfactant to the spray solution. This information is located on the herbicide label. Failure to mix a surfactant in a herbicide spray solution when it is required could result in a 30 to 50% reduction in weed control. Of course, read and understand your herbicide label. Make sure that you know key information before you applied any pesticide. Information such as personal protective equipment (PPE), reentry interval (REI), preharvest interval (PHI), and carryover information can be attained form the pesticide label. Understand the pesticide label!

Table 1: Postemergence Herbicides for Use in Highbush Blueberries

Trade Name	Active chemical	Formulations	Application rate	Surfactant or crop oil	Use	Notes
Roundup and others (make sure that the label includes blueberries or includes a disclaimer covering you application)	glyphosate	4.0 to 5.4 lbs/ gal	0.25 to 10% solution Usually 1% or 2% on hard to kill	Can be used but refer to label (surfactant)	Post directed	Depends on formulation. Some manufacture restrictions include: do not use 14 days before harvest, do not use 30 days before planting.

Gramoxone and others (make sure that the label includes blueberries or includes a disclaimer covering you application)	paraquat	2.5 or 4.143 lbs/gal	1.6 to 3.2 pints of product per acre. 1% solution in hand sprayer	Recommended (surfactant)	Post directed	Use before leaf emergence. Avoid contact with plants. Green canes damaged may die later from disease.
Poast	sethoxydim	1.5 lbs/gal	2.0 pints of product per acre.	Required (crop oil)	Post directed	Used to control emerged grass, will not control sedges. Good on annual grasses.
Trade Name	**Active chemical**	**Formulations**	**Application rate**	**Surfactant or crop oil**	**Use**	**Notes**

Relay	glufosinate-ammonium	1.0 lbs/gal	3.0-5.0 quarts per acre. Use low rate on weeds less than six inches tall, higher rate on taller weeds, 1-3% in hand sprayer	None required	Post directed	Maybe be tanked mixed with simazine, Solicam, Surflan, or Devrinol. Avoid contact with leaves and green canes if possible. Green canes may turn black where contacted, but usually these canes will not die like those contacted with paraquat. However, try to minimize contact as long term effects are not know. Do not use 14 days before harvest. Max. 14 quarts per year.
Touchdown	sulfonium	6.0 lbs/gal	up to a 5% solution	Recommended (surfactant)	Post directed	Use before leaf emergence. Avoid contact with plants.

Table 2: Suggested Preemergence Herbicides for Use in Highbush Blueberries						
Trade Name	**Active chemical**	**Formulations**	**Application rate**	**Surfactant**	**Use**	**Notes**
Casoron	dichlobenil	4G	100 to 150 lbs of product per acre	N/A	Preemergent control winter annuals	Needs to be applied between November 15 and February 15 . Very volatile in warm temperatures. Does control some weeds postemergent (i.e. Florida Betony) Wait until four weeks after transplant before first application.
Direx and Karmex	diuron	80 DF or 4 lb/gal	1.5 to 2.0 lbs	Recommended if trying to control newly emerged weeds	Mainly for preemergent weed control but can be used to control some newly emerged weed	Use on plants that have been established for 1 year. Works best as a preemergent herbicide, but does have activity on some newly emerged weeds. Avoid applications on exposed roots. Use should be limited to a trial basis in well rotted pine bark.
Trade Name	**Active chemical**	**Formulations**	**Application rate**	**Surfactant**	**Use**	**Notes**

Solicam	norfluazon	78.6 DF	2.5 to 5.0 lbs. per acre	Not recommended	Mainly for preemer -gent weed control	Excellent at controlling a broad spectrum of weeds for long periods, but unforgiving if applied incorrectly. Apply to plants set 6 months or longer on well rotted bark. Avoid application to exposed roots. Can cause recoverable damage to blueberries (bleached plants).
Surflan	oryzalin	4 lbs/gal	2-6 quarts per acre	Not recommended	Works only as a preemergent herbicide	Works very well controlling annual grasses and many small seeded broadleaf weeds. Do not apply more than 12 quarts in one calendar year. Has a very short residual.
Princep	simazine	4 lbs/gal or 90 WP	2 to 4 quarts per acre or 2.2 to 2.6 lbs per acre	Not recommended	Mainly for preemergent weed control	Apply to plants greater than 6 months old. Do not apply when fruit is present. Good for broad spectrum weed control, but short lived.

Table 3: HERBICIDES THAT CAN BE USED ON NON-BEARING BLUEBERRY PLANTS						
Trade Name	**Active chemical**	**Formulations**	**Application rate**	**Surfactant**	**Use**	**Notes**
Dimension	dithiopyr	1.0 lb/gal	2.0 qt per acre	Not recommended	Preemergent and early post emergent weed control	Excellent at controlling annual grasses and small seed broadleaf weeds. Control crabgrass up to 3 tillers. Use on one year old plants
Fusilade	fluazifop	2.0 lb/gal	16 to 24 oz per acre	Required	Postemergent grass control	Use post directed and not over the top as up to 50% injury can occur to blueberries. Excellent at control perennial grasses (i.e. bermudagrass)
Gallery	isoxoben	75% a.i.	0.66-1.33 lbs. per acre	Not recommended	Preemergent weed control	Excellent on small seeded broadleaf weeds. Maximum of four pounds per year.
Prism	clethodim	0.94 lbs/gal	1.0 quart per acre	Required (crop oil)	Broadcast	Used to control emerged grasses. Very good on Bermuda grass.
Reglone	diquat	2.0 lbs/gal	1.5 to 2.0 pints of product per acre	Recommended (surfactant)	Post directed	Use before leaf emergence. Avoid contact with plants.

Regal Ronstar	oxadiazon	2G	100-200 lbs/acre or 4 to 8 water soluble pack per acre	N/A	Preemergent weed control	Works well on many winter annuals (i.e. Bittercress, Oxalis, etc.). Excellent product for smaller operations. Label recommends using on small acreage to confirm safety before large scale use.
Snapshot	trifluralin / isoaben	2.5 G	150 to 200 lbs per acre	N/A	Preemergent weed control	No post emergent activity. Excellent product for smaller operations
XL	benefin / oryzalin	2 G	150 lbs per acre	N/A	Preemergent weed control	No postemergent activity. Excellent product for smaller operations.