

# **2010 Southeast Regional Blueberry Integrated Management Guide**

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Recommendations are based on information from the manufacturer's label and performance data from research and extension field tests.

Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will always conform to the safety and pest control standards indicated by experimental data.

This publication is intended for use only as a guide. Specific rates and applications methods are on the pesticide label, and these are subject to change at any time. Always refer to and read the pesticide label before making any application! The pesticide label supersedes any information contained in this guide, and it is the legal document referenced for application standards.

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## PESTICIDE EMERGENCIES

### Poisonings

**1-800-222-1222**

This number automatically connects you with a local Poison Control Center from anywhere in the United States.

### Pesticide spills or other emergencies

Spills on public roads (In many cases you can call CHEMTREK at 1-800-424-9300 or 911.)

STATE	AGENCY	PHONE NUMBER
<b>Georgia</b>	Georgia State Patrol	Cell: call <b>*GSP</b> <i>or 911</i>
<b>North Carolina</b>	Regional Response Team (RRT)	<b>911</b> or your RRT
<b>South Carolina</b>	South Carolina Highway Patrol  ----- South Carolina DHEC Emergency Response Section	Cell: call <b>*HP</b>  ----- <b>1-888-481-0125</b> (Toll Free)
<b>Tennessee</b>	Tennessee Emergency Management Agency (TEMA) State Emergency Operations Center	<b>1-800-262-3300</b>
<b>Virginia</b>	Virginia Emergency Operations Center	<b>804-674-2400</b>

*Environmental emergencies (contamination of waterways, fish kills, bird kills, etc.)*

STATE	AGENCY	PHONE NUMBER
<b>Georgia</b>	Georgia Department of Natural Resources Response Team	<b>1-800-241-4113</b>
<b>North Carolina</b>	North Carolina Div. of Water Quality	<b>1-800-858-0368</b>
<b>South Carolina</b>	South Carolina DHEC	<b>1-888-481-0125</b> (Toll Free)
<b>Tennessee</b>	Tennessee Wildlife Resources Agency	<b>1-615-781-6643</b>
<b>Virginia</b>	Virginia Emergency Operations Center	<b>804-674-2400</b>

## Pesticide Poisonings

- **Tightening of the chest, mental confusion, blurred vision, rapid pulse, intense thirst, vomiting, convulsions, and unconsciousness are serious symptoms! Dial 911!**
- **Pesticides with 'DANGER' or 'DANGER/POISON' on the product label can cause severe injuries or death very quickly. Take immediate action!**
- *Other symptoms of pesticide poisoning:* headache, fatigue, weakness, restlessness, nervousness, profuse sweating, nausea, diarrhea, or irritation of the skin / eyes / nose / throat. Consult the product Material Data Safety Sheet (MSDS) for symptoms associated with a particular pesticide.

## Pesticide on Skin

- Immediately wash pesticide from skin as quickly and as thoroughly as possible with any available water that does not contain pesticides.
- Remove protective clothing and any contaminated clothing.
- Rewash contaminated skin with soap and water as soon as possible.
- If the victim experiences *any* symptom(s) of poisoning, consult a physician. **Take the pesticide label with you**, but take care not to cause contamination of vehicles or exposure to others if you must take the container with you.

## Pesticide in Eyes

- Rinse eye(s) gently with clean water for *at least* 15 minutes.
- If eye remains irritated or vision is blurry after rinsing, seek medical attention right away! **Take the pesticide label with you.**

## Pesticide in Mouth or Swallowed

- Provide / drink large amounts of water or milk to drink - **DO NOT GIVE LIQUIDS TO A PERSON WHO IS UNCONSCIOUS OR IS CONVULSING!**
- Consult the label **BEFORE** vomiting is induced. The label may advise against inducing vomiting. Do not induce vomiting with emulsifiable concentrate (E, EC) formulations.
- **DO NOT INDUCE VOMITING IF A PERSON IS UNCONSCIOUS OR IS CONVULSING!**
- Seek medical attention. **Take the pesticide label with you.**
- If the pesticide was not swallowed, rinse mouth thoroughly with clean water. If mouth is burned or irritated, consult a physician.

## Pesticide Inhaled

- Move victim to fresh air immediately!
- Warn others in the area of the danger.
- Loosen tight clothing.
- Administer artificial respiration if necessary, but try to determine if the person also may have swallowed any pesticide - avoid any pesticide or vomit that may be around the victim's mouth.
- Seek medical attention. **Take the pesticide label with you.**

## Heat Stress

- Move the victim to a cooler area.
- Remove protective clothing and pour cool water over the person.
- Give cool liquids to drink - **DO NOT GIVE LIQUIDS TO AN UNCONSCIOUS OR A CONVULSING PERSON!**
- Pesticide poisoning may mimic heat illness. Seek medical attention if the person is unconscious or if the person is not fully recovered within 15 minutes of cooling down and drinking liquids.

## Signal Words

- The pesticide signal word will appear on the pesticide label. It provides information about the acute risks of the pesticide to people.
  - **DANGER/POISON:** less than a teaspoon can kill an adult.
  - **DANGER:** pesticide can cause severe eye and/or skin injury.
  - **WARNING:** two tablespoons or less can kill an adult.
  - **CAUTION:** an ounce or more is required to kill an adult.
- Understand that the signal word does not provide information about chronic pesticide exposure risks (e.g., cancer) or allergic effects. Minimize your exposure to all pesticides. The signal word does not indicate environmental toxicity or other environmental effects.

# PESTICIDE LIABILITY and STEWARDSHIP

The applicator, the supervisor, and the business owner may face severe criminal and/or civil penalties if pesticides are misused – knowingly or accidentally. Some applicators have been incarcerated, fined, and even forced into bankruptcy as a result of the deliberate misuse of pesticides

*The pesticide label.* Federal and state laws require pesticide applicators to follow the directions on the pesticide label exactly. Do not exceed maximum label rates, apply a pesticide more frequently than stated on the label, or apply a pesticide to a site that is not indicated on the label. Labels change; review them regularly.

*Restricted Use Pesticides (RUP).* These pesticides are clearly labeled “Restricted Use Pesticide” in a box at the top of the front label. To purchase, apply, or supervise the application of an RUP, an applicator must be certified or licensed through the pesticide regulatory agency in their state. Some states have mandatory licensing for certain pesticide use categories whether or not RUPs are applied.

*Personal Protective Equipment (PPE).* Anyone handling or applying pesticides must wear the PPE indicated on the pesticide label. The Worker Protection Standard requires applicators to wear the label PPE and requires agricultural employers to supply the label PPE and ensure that the PPE is worn correctly by applicator employees. Do not wear PPE items longer than it has been designed to protect you. Clean, maintain and properly store PPE. Do not store PPE with your pesticides.

*EPA Worker Protection Standard (WPS).* Growers who employ one or more non-family members must comply with the WPS (<http://www.epa.gov/agriculture/>). This standard requires agricultural employers to protect applicator employees and agricultural worker employees from pesticides exposure in the workplace by providing specified pesticide safety training, providing specific information about pesticide applications made on the agricultural operation, providing and ensuring that applicators wear label PPE, providing decontamination facilities for potential pesticide and pesticide residue exposures, and providing timely access to medical assistance in the event of a suspected pesticide exposure. These protections apply to both Restricted Use and general use pesticides used in agricultural plant production.

*Pesticide Recordkeeping.* You must keep records of all RUP applications for at least two years under the Federal (USDA) Pesticide Recordkeeping Requirement if your state does not have its own pesticide recordkeeping requirements. Maintaining records of all pesticide applications, not just RUP applications, indefinitely, cannot only help troubleshoot application problems, but also allows you to reference successful applications and can help protect against future liability. Consult your local Extension Service for details.

**Be prepared for emergencies.** Store pesticides securely and clean empty containers. Develop and provide written plans and training to prepare your employees, and family members, for pesticide fires, spills, and other emergencies. Assign responsibilities to be carried out in the event of pesticide emergencies. Keep copies of the pesticide labels and MSDS away from the area where pesticides are stored. Provide copies of product MSDSs to your community first responders. Consult your local Extension office and insurance company for assistance.

**Properly dispose of clean empty pesticide containers and unwanted pesticides** as soon as possible. Containers can often be recycled in a pesticide container recycling program. Unwanted pesticides may pose a risk of human exposure and environmental harm if kept for long periods of time. Consult your local Extension office for assistance.

# SPRAYER CALIBRATION

Sprayer calibration is very important. Sprayers should be calibrated often to guard against using excess pesticides due to nozzle wear, speed increases, etc. Failing to calibrate often costs money, may cause crop damage and is unsafe.

## Broadcast Herbicide Sprayer Calibration

The following procedure will give the gallons (total volume) of material applied per acre on a broadcast basis. **Calibrate with clean water only.** The uniformity of nozzles across the boom should be checked. Collect from each nozzle for a known time period. Each nozzle should be within 10% of the average. Replace nozzles with output above 10% with new nozzles and recheck output.

1. Determine appropriate calibration distance from table. Measure and adjust nozzles to an even spacing. Find spacing in table and read the corresponding calibration distance. Example: For an 18-inch spacing, the distance would be 227 feet.
2. Measure and mark calibration distance in a typical portion of the field to be sprayed.
3. Traveling at the desired operating speed, determine the number of seconds it takes to travel the calibration distance. Travel at full operating speed the full length of the calibration distance. Note RPM and gear setting.
4. With sprayer sitting still and operating at same throttle setting or engine RPM as used in step 3, adjust pressure to desired setting.
5. Collect spray from one nozzle for the number of seconds required to travel the calibration distance.
6. Measure the amount of liquid collected in fluid ounces. **Number of ounces collected is the gallons per acre.** For example, if you collect 18 ounces, the sprayer will apply 18 gallons per acre on a broadcast coverage basis. Adjust applicator speed, pressure, nozzle size, etc. to obtain recommended rate.
7. To determine the amount of pesticide to put into a sprayer or applicator tank, divide the total number of gallons of mixture to be made (tank capacity for a full tank) by the gallons per acre rate from Step 6 and use recommended amount of pesticide for this number of acres.
8. Sprayers should be checked for proper calibration every 4-8 hours of use. Simply repeat steps 5 and 6. If there is a difference of more than 10% of original calibration, check the system.

CALIBRATION DISTANCES TO BE USED BASED ON NOZZLE SPACING	
Nozzle Spacing (Inches)	Calibration Distance (Feet)
40	102
36	113
32	128
28	146
24	170
20	204
18	227
16	255
14	292
12	340
10	408
8	510
To determine distance for spacing, divide the spacing expressed in feet into 340.3, example: for a 13" band, the calibration distance would be $340.3/(13/12) = 314$ .	

## Air Blast Sprayer Calibration

Sprayers need to be calibrated to meet the coverage needs of the orchards to be sprayed and to facilitate precise dosing of each material. A sprayer should be set up to apply a gallon per acre rate at a desired speed and pressure. In-orchard calibration frequently indicates a need for adjustments to achieve the target gallons per acre.

**Speed** of travel of a sprayer is a vital factor in obtaining the number of gallons of spray per acre desired. Change in gallons per acre (GPA) applied is inversely proportional to the change in speed. If speed is doubled, the gallons per acre will be halved. Thus, if nozzles have been installed and pressure set to provide a gallon per acre rate at a certain speed, the sprayer should apply the GPA rate at that speed.

To determine the travel speed, measure a known distance. A distance over 200 feet and a tank at least half full are recommended. Travel the distance determined at your normal spraying speed and record the elapsed time in seconds. Repeat this step and take the average of the two measurements. Use the following equation to determine the travel speed in miles per hour:

$$Travel\ Speed_{(MPH)} = \frac{Distance_{(feet)} \times 0.68}{Time_{(Seconds)}}$$

(0.68 is a constant to convert feet/second to miles/hour)

### Check gallons per minute output:

The gallons per minute output required for a sprayer covering a swath of known width, for a desired gallon per acre rate can be calculated with the following equation:

Spray Swath is the distance between spray tractor paths (example: 12 feet if every aisle is traveled or 24 feet if alternate row middle spraying is conducted)

$$GPM_{(req)} = \frac{GPA \times MPH \times Row\ Spacing_{(ft)}}{495_{(spraying\ one\ side)}}$$

GPA = Gallons per Acre  
MPH = Miles per Hour

**To check actual output:**

1. Fill sprayer with water. Note the level of fill. If a material with considerably different flow characteristics than water is to be sprayed fill the sprayer with this material.
2. Operate the sprayer at the pressure that will be used during application for a measured length of time. A time period of several minutes will increase accuracy over a time period of 1 minute.
3. Measure the gallons of liquid required to refill sprayer to the same level it was prior to the timed spray trial with the sprayer in the same position as when it was filled initially. The actual GPM can be calculated as follows:

$$GPM(actual) = \frac{\text{Gallons to refill sprayer}}{\text{Minutes of spray time}}$$

4. Calculate the GPA being applied by the sprayer.

$$GPA = \frac{GPM_{(actual)} \times 495_{(spraying\ from\ both\ sides)}}{MPH \times Row\ Spacing_{(ft)}}$$

If the actual GPA is slightly different from the required GPA, the actual GPA can be increased or decreased by increasing or decreasing spray pressure on sprayer models that have provisions for adjusting pressure. Only small output changes should be made by adjusting pressure. **Major changes in output should be done by changing nozzles.**

**FRAC group** = Fungicide Resistance Action Committee group. Chemicals with the same number have the same mode of action. ([www.frac.info](http://www.frac.info) )

**IRAC group** = Insecticide Resistance Action Committee group. Chemical with the same number have the same mode of action. ([www.irac-online.org](http://www.irac-online.org) )

# Blueberry Integrated Management Guide (Insect and Disease Control)

## Establishment

**Root rots in bark beds** – various root rots of blueberry can be particularly problematic immediately following transplanting and until plants are well established. Even in well-drained soils, root rots have been observed in bark-amended beds, and root rots are particularly damaging in high-density bark beds, even when using new bark. Though cost is an issue, replanting into old bark (high-density plantings) is not a good practice; disease-causing organisms build up in the bark, making reestablishment very difficult. It is recommended that phosphite-containing materials (Aliette, ProPhyt, AgriFos, etc.) be utilized in non-bearing plants after establishment for bedded and high-density bark plantings. Fully-expanded leaf tissue is required for plant uptake of these materials, as they are foliar-applied. In the initial year or planting, a minimum of four applications (spaced approximately one month apart) would be advisable. In general, phosphite materials are acidic, and they should not be applied with acidifiers or acidic water (pH < 6). Excessive application or application intervals which are less than those dictated by label will result in plant injury. These phosphite materials also suppress Septoria leaf spot and anthracnose, major foliar diseases of young plants. Some of the phosphonate materials are labeled for use as drenches or chemigation, but there is currently limited information as to the success of these methods in southern blueberry production.

In high-density bark beds, use of Ridomil Gold EC will also provide good control of Pythium and Phytophthora root rots; use of Ridomil Gold EC in field plantings is very expensive and difficult, since the product has to be taken up by the roots for activity. Where possible, rotation of Ridomil Gold EC and phosphites is a good resistance-management practice. Do not exceed label recommendations. Fungicides will not correct problems caused by poor drainage.

## Dormant (before flower or leaf buds break)

**Blueberry gall midge** is a tiny fly. Blueberry gall midge larvae are tiny white, carrot-shaped maggots which feed inside flower buds and leaf buds. Blueberry gall midge can be extremely injurious, especially to rabbiteye cultivars. Midges lay their eggs in flower buds on warm winter days when bud scales initially show separation (stage 2). **Gall midge sprays should protect the earliest flower buds which can realistically be expected to survive anticipated spring cold events. Apply diazinon (Diazinon AG 500) as-needed for gall midge as early as flower bud stage 2, as the most mature buds first show slight separation of scales. Repeat sprays during warm spells.** Gall midge sprays typically provide helpful suppression of pre-bloom thrips population.

**Bagworm** – Remove and dispose of bagworm cases, some of which contain eggs, prior to April.

**Blueberry bud mite** – The blueberry bud mite is a small eriophyid mite, so tiny that it cannot be seen without 20x or greater magnification. Blueberry bud mite is an occasionally encountered pest of blueberries in Georgia, which is more common in North Carolina. Bud mite infestations may be more common in certain cultivars. By early spring **infested plants exhibit stunted, succulent, fleshy, closely packed, reddish rosetted buds, which may dry up, often failing to open.** Bloom on infested plants is reduced. Affected berries are small, roughened and may have small reddish pimples or blisters on the fruit surface. Blueberry bud mite numbers increase during late summer and early fall, infesting the next year's flower and leaf buds. **Sanitation by aggressive, timely pruning of infested branches can be helpful. Mechanical shearing (mowing off old fruiting twigs) immediately after harvest greatly reduces bud mite incidence the following year. Never propagate from bushes that may be infested with blueberry bud mite. Two dilute, high-volume applications of endosulfan (Endosulfan 3EC, Thionex 3EC), or horticultural oil applied after harvest, preferably as new growth begins to flush after shearing, and again in August will aid bud mite control.**

## Dormant (continued)

**Imported fire ants** – Ant baits employed from late winter to early spring as a broadcast treatment should eliminate most, but seldom all, fire ant mounds within treated areas. In orchards where fire ants are very abundant, treating a second time, post-harvest in the fall will bolster fire ant control. Most ant baits are slow acting; they require up to eight weeks to control active mounds. Worker ants must carry the baits back to their colonies where they cause gradual colony die-off. Extinguish Professional Fire Ant Bait (0.5% methoprene) and Esteem Ant Bait (0.5% pyriproxyfen) are both effective. Ant baits work best when soil is moist, but not wet. Active ant foraging is essential; apply on warm and sunny days. Do not apply ant baits when conditions are expected to be cold, overcast, rainy or very hot. **Individual mound treatments are most effective when used as-needed for the occasional colony that survives broadcast treatments.** Mound treatments using insecticide baits should be applied in a circle, 3 to 4 feet from the mound. Do not disturb mounds or place bait directly on top of mounds.

**Mummy berry** – Raking mummified berries to the row middles, followed by deep burial of mummies to a depth of at least one inch, will help to reduce the primary inoculum source for this fungal disease. This activity needs to be conducted prior to mid-January in the most southerly blueberry regions. **Use caution; excessive amounts of dirt mounded on top of blueberry roots and stems can result in injury or plant death.**

**Phytophthora root rot** – Root rot is generally a problem of low, poorly drained sites. Provisions for adequate drainage must be made prior to planting! Site selection and/or proper bedding operations are essential cultural practices for control of this disease. It also is very problematic in pine bark beds for southern highbush varieties (see comments above). Treatment with fungicides is not effective for reversing root rot damage on plants with severe symptoms. Preventative treatments in pine bark beds may be warranted, since the beds are often saturated with water through either irrigation or rainfall.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Mummy berry	Rake mummies to row centers and bury 1" deep		*****			Burying mummies helps to prevent primary infections. However, it is difficult to insure that all mummies will be buried, so chemical control is also necessary.
Phytophthora root rot	<b>mefenoxam</b> <i>FRAC group 4</i> (Ridomil Gold 4EC)	3.6 pt	++++	48 hrs	0 days	<b>Established plantings:</b> Apply 1/4 pt/1000 linear feet of row (3.6 pt/A broadcast basis) in a 3-ft band over the row before the plants start growth in the spring. <b>New plantings:</b> Apply 3.6 pt/A (broadcast rate) at or after the time of planting. An 18-in band over the row is recommended. Do not apply more than 0.9 gal/A broadcast during the 12 months before bearing harvestable fruit or illegal residues may result. For both new and established plantings, one additional application may be made to coincide with periods most favorable for root rot development.
Scale	Dormant horticultural oil (various) <b>Pre-bloom use only.</b>	1 to 3%	+++++	4 hrs	0 days	Oil may be applied dormant or delayed dormant. Apply as needed for scale infestations. Reduce to 1% rate just before bloom. Do not apply oil when temperatures are expected to be higher than 65°F or lower than 30°F within 24 hours. Do not use within 14 days of lime-sulfur or captan.

## Dormant (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Imported fire ants	<b>pyriproxyfen</b> <i>IRAC group 7C</i> (Esteem Ant Bait)	1.5 to 2.0 lb  (2-4 tbsp/mound)	++++	12 hrs	24 hrs	Ant baits should be applied as-needed from late winter to spring and, if needed, again in the fall. Apply on sunny days when the soil temperature is at least 60°F, the soil is moist, and ants are actively foraging. Foraging activity can be gauged by placing a food item, such as a potato chip, near the mound for 30 minutes. If ants are feeding on the chip within 30 minutes, conditions are right to apply baits. Baits are slow acting but effective. Allow 4 weeks to work. Do not make other imported fire ant treatments for 7-10 days. Reapplication may be needed if heavy, flooding rains occur within 7 days.
	<b>methoprene</b> <i>IRAC group 7A</i> (Extinguish Professional Fire Ant Bait 0.5%)	1 to 1.5 lb  (3-5 tbsp/ 1000 sq ft)  (3-5 tbsp/mound)	+++	4 hrs	0 days	Extinguish Professional Fire Ant Bait (0.5% methoprene) is legal for use on 'crop land.' <b>Extinguish Plus baits containing methoprene plus hydramethylnon are not labeled for use on crop land.</b>
	<b>diazinon</b> <i>IRAC group 1B</i> (Diazinon AG500)	1 pt/100 gal	++	24 hrs	7 days	Diazinon mound drenches are a good option for isolated mounds which have survived bait treatment(s). Slowly apply 1 gal of diluted mixture over and 6 inches around each mound. Apply gently to avoid disturbing ants. Do not apply for 7- to 10-days after bait applications.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	1 pt	+	12 hrs	1 day	Malathion is a modestly effective foliar rescue treatment. <b>May be applied to plants</b> one day before harvest to discourage ants from foraging on the plants. This is a stopgap treatment to get ants off the plants. Rely on aggressive dormant or post-harvest season imported fire ant controls to suppress these pests in blueberries.
<b>Dormant (continued)</b>						
Gall midge	<b>diazinon</b> <i>IRAC group 1B</i> (Diazinon AG500)	1 pt	++++	24 hrs	7 days	<b>Diazinon is the material of choice for early gall midge sprays until 5-days pre-bloom. Do not apply diazinon within 5 days of bloom, as its</b>

						<b>residues may injure pollinators.</b>
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	<b>spinetoram</b> <i>IRAC group 5</i> (Delegate WG)	3 to 6 oz	+++	4 hrs	3 days	Do not alternate Delegate (IRAC #5) and SpinTor/Entrust (IRAC #5), as they are in the same chemical class and have the same mode of action.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	2 pt	+++	4 hrs	1 day	SpinTor/Entrust is quite toxic to bees until it is thoroughly dry (3 hrs), but thereafter it is relatively non-toxic to bees. Entrust is OMRI certified for organic use.

**Pre-bloom through green tip (leaf buds) and pink bud (flower buds)**

**Mummy berry** – If mummy berry disease becomes established in your planting, fungicides are very important in pre-bloom sprays (for cultivars that show leaf bud break before flower bud break). 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.

Cherry and cranberry fruitworm – Emergence of adult fruitworm moths can be monitored through the use of pheromone traps. Traps should be placed in the field prior to expected emergence of the pest, three to four weeks before anticipated bloom.

**Flower thrips** – Flower thrips can be very damaging to flower buds and blooms, especially in rabbiteye cultivars. Thrips numbers often increase dramatically as corollas open and bloom progresses. **Blueberries are a pollination-sensitive crop; insecticide-related injury to bees can easily impair pollination and ruin fruit set.** Insecticides should not be applied during bloom. Provisional thrips treatment thresholds follow. Begin sampling bloom clusters for thrips at stage 3. Sample two to three times a week from stage 3 up to bloom. Place flower bud clusters in sealed plastic bags and incubate them in a warm room or on a windowsill. Take a minimum of 5 bags of bloom clusters per block each time. Treat if 2 or more thrips per individual bloom are found. Thrips monitoring may also be done using white sticky traps. UFL recommends use of insecticides in rabbiteye cultivars when approximately 60 thrips/trap/week are caught in sticky traps.

**Diazinon is the material of choice for thrips and gall midge up to 5-days pre-bloom. SpinTor is the material of choice for flower thrips from 5- to 3-days before bloom. If SpinTor/Entrust is allowed to dry before bees begin foraging, it is relatively non-toxic to bees. Malathion has a 24-hour pre-harvest interval (PHI). If applied in the afternoon after bee foraging stops, or at night, malathion is relatively non-toxic to bees.**

<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Mummy berry (shoot blight phase)	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	18.5 to 23 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.

**Pre-bloom through green tip (leaf buds) and pink bud (flower buds) (continued)**

Mummy berry (shoot blight)	<b>fenbuconazole</b> <i>FRAC group 3</i>		+++++	12 hrs	30 days	Indar alone will actually increase rots like anthracnose (ripe rot), and application of captan (Indar + captan
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phase) (continued)	(Indar 75WSP, Indar 2F )	2.0 oz 6.0 fl oz				tank mix) is required during bloom applications to alleviate this problem. Do not make more than 4 applications or apply more than 8 oz of Indar 75WSP (0.38 lb active) per acre per year. Indar belongs to the sterol demethylation inhibitor (DMI) class of fungicides or target site of action fungicides. Alternation with fungicides of different classes is recommended. Aerial application is allowed for this application (see label).
	<b>propiconazole</b> <i>FRAC group 3</i> (Orbit 3.6E, Tilt 3.6E, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	+++++	24 hrs	30 days	May be applied by either ground or aerial application (see label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain.
Phomopsis cane and twig blight	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	18.5 to 23 oz	+++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
	<b>fenbuconazole</b> <i>FRAC group 3</i> (Indar 75WSP)	2.0 oz	+++++	12 hrs	30 days	See precautions above under ‘mummy berry’
Thrips and/or gall midge	<b>diazinon</b> <i>IRAC group 1B</i> (Diazinon AG500)	1 pt	++++	24 hrs	7 days	<b>Diazinon is the material of choice for early gall midge sprays until 5-days pre-bloom. Do not apply diazinon within 5 days of bloom, as its residues may injure pollinators.</b>
	<b>spinetoram</b> <i>IRAC group 5</i> (Delegate WG 25%)	3 to 6 oz	+++	4 hrs	3 days	Delegate is an effective choice for gall midge and thrips control. Addition of an emulsifiable crop oil or methylated crop oil plus organosilicone combination, at 0.25 to 0.5% v/v, may improve performance. However, Delegate is a long-residual material which is quite toxic to bees. Do not apply within 5-days of first bloom. Do not alternate Delegate (IRAC #5) and SpinTor/Entrust (IRAC #5), as they are in the same chemical class and mode of action group.

## Pre-bloom through green tip (leaf buds) and pink bud (flower buds) (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Thrips and/or gall midge (continued)	<b>spinosad</b> <i>IRAC group 5</i> (SpinTor 2SC, Entrust 80W)	4 to 6 fl oz 1.25 to 2 oz	+++	4 hrs	3 days	<b>SpinTor/Entrust is a preferred choice for gall midge and thrips control when applied as-needed just before bloom.</b> SpinTor/Entrust is quite toxic to bees until it is thoroughly dry (3 hrs), but thereafter it is relatively non-toxic to bees. Entrust is OMRI certified for organic use.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	2 pt	+	12 hrs	1 day	<b>Malathion may be applied as-needed late in the day or during evening up to 1-day pre-bloom.</b> Malathion is relatively non-toxic to bees when applied after bee foraging has ceased, but it is quite damaging to bees if applied during foraging.
	<b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)	4.5 to 5.3 oz	++	12 hrs	1 day	<b>Use for thrips control. Thrips species may differ in susceptibility to this product. If you are unsure of the thrips species present and its susceptibility, use the higher rates.</b>

## 10-20% bloom until 80-90% bloom

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Botrytis flower blight	<b>cyprodinil + fludioxonil</b> <i>FRAC group 9 + 12</i> (Switch 62.5WG)	11 to 14 oz	+++++	12 hrs	0 days	Make the first application during early bloom. Subsequent applications should be made every 7-10 days during bloom. Do not apply more than 56 oz. of product per acre per year. Make no more than two sequential applications before using another fungicide with a different mode of action.
	<b>fenhexamid</b> <i>FRAC group 17</i> (Elevate 50WDG)	1.5 lb	+++++	12 hrs	0 days	Begin application at 10% bloom. Applications should be made every seven days when conditions favor disease. Do not make more than two consecutive applications without switching to a fungicide with a different mode of action. Do not apply more than 6.0 lb product per acre per year.

## 10-20% bloom until 80-90% bloom (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Botrytis flower blight (continued)	<b>captan + fenhexamid</b>	3.5 to 4.7 lb	+++++	48 hrs	0 days	CaptEvate is a combination product of captan plus Elevate. Do not make more than two consecutive applications before switching to a fungicide with a different mode of action. Do not apply more than 21.0 lb/acre/season.
	<i>FRAC group M4 +17</i> (CaptEvate 68WDG)	18.5 to 23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	3 lb	++	48 hrs	~30 days	Do not apply later than 3 weeks after full bloom.
	<b>ziram</b> <i>FRAC group M3</i> (Ziram 76DF)	5 lb	++	72 hrs	0 days	Do not apply more than 70 lb per acre per crop year.
	<b>captan</b> <i>FRAC group M4</i> (Captan 50WP)	2 qt	++	72 hrs	0 days	Do not apply more than 35 quarts per acre per crop year.
Mummy berry (blossom infection stage)	<b>captan</b> <i>FRAC group M4</i> (Captec 4L)	18.5 to 23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	2.0 oz	+++++	12 hrs	30 days	Indar alone will actually increase rots like anthracnose (ripe rot), and application of captan (Indar + captan tank mix) is required during bloom applications to alleviate this problem. Do not make more than 4 applications or apply more than 8 oz of Indar 75WSP (0.38 lb active) per acre per year. Indar 75WSP belongs to the sterol demethylation inhibitor (DMI) fungicide class. Alternation with fungicides of different classes is recommended.
	(tank mix with captan products during bloom to prevent rots)					

## 10-20% bloom until 80-90% bloom (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Mummy berry (blossom infection stage) (continued)	<b>propiconazole</b> <i>FRAC group 3</i> (Orbit 3.6 E, Tilt 3.6E, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	+++++	24 hrs	30 days	These DMI fungicides may be applied by either ground or aerial application (see label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain.
Ripe rot (anthracnose) and/or Alternaria rot	<b>azoxystrobin</b> <i>FRAC group 11</i> (Abound)	6.0 to 15.5 fl oz	+++++	4 hrs	0 days	Subsequent applications can be made on 7-14 day intervals. Do not apply more than two sequential applications before switching to a fungicide with another mode of action . Do not apply more than 1.44 quarts per acre per season.
	<b>cyprodinil + fludioxonil</b> <i>FRAC group 9 + 12</i> (Switch 62.5WG)	11 to 14 oz	+++++	12 hrs	0 days	Applications can be made on a 7-10 day interval when conditions warrant. Do not apply more than 56 oz of product per acre per year. Make no more than two sequential applications before using another fungicide with a different mode of action.
	<b>pyraclostrobin</b> <i>FRAC group 11</i> (Cabrio EG)	14 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Cabrio per acre per crop year.
	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	18.5 to 23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
	<b>ziram</b> <i>FRAC group M3</i> (Ziram 76DF)	3 lb	++	48 hrs	~30 days	Do not apply later than 3 weeks after full bloom.
	<b>captan</b> <i>FRAC group M4</i> (Captan 50WP, Captec 4L)	5 lb 2 qt	+++	72 hrs	0 days	Captan is a good resistance management tank mix or rotational partner for FRAC #9 and/or #11 fungicides. Do not apply more than 70 lb per acre per crop year. Do not apply more than 35 quarts per crop year.
	<b>fluazinam</b> <i>FRAC group 29</i> (Omega 500)	1.25 pt	+++	3 days	30 days	Do not use more than 7.5 pints per acre per season.

## Petal fall until one month after bloom

**Cranberry fruitworm, cherry fruitworm, plum curculio** – Review field histories and scout fields for fruitworms and plum curculio. In some southeastern production areas (GA), plum curculio has not been a pest of blueberries. Fields with a history of plum curculio infestation should be sprayed at least twice on a 7-14 day interval, beginning at petal fall, or when plum curculio or injury first becomes detectable. Check for fruitworms twice a week from full bloom until 4 weeks after petal fall. Examine fruit clusters for tiny pin-sized holes in berries, with frass and premature ripening in more mature fruit. Break berries open to look for fruitworm larvae and damage. Early varieties are normally infested first. Control will be best when these insects are sprayed early in the infestation period.

**Septoria and anthracnose leaf spots** – Septoria and anthracnose leaf spot pathogens can cause premature defoliation, resulting in poor bud development and subsequent loss of yield. Fungicide timing for leaf spots varies across the Southeastern region. For example, North Carolina blueberries generally require leaf spot control as soon as green leaves have unfolded (10-14 days after bloom), whereas in Georgia, infections do not occur until mid-May or early June, without regard to the stage of leaf development. Materials applied for rot control will also often have leaf spot activity. Consult with your local county agent for recommendations in your area.

**Blueberry stunt** – Bushes infected with this disease become visible when leaves mature in May in N.C.. Stunt is a devastating disease of blueberry in North and South Carolina, and has also been reported from Arkansas. Symptoms include shortened internodes, small, cupped leaves and loss of productivity. Control relies on removal of infected bushes (including roots) and control of the insect vector (the sharpnosed leafhopper) that carries the disease from bush to bush. Stunt is rarely seen on rabbiteye cultivars but is common on highbush and Southern highbush cultivars in southeastern NC.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Ripe (anthracnose) and/or Alternaria rots	<b>azoxystrobin</b> <i>FRAC group 11</i> (Abound, Heritage)	6.0 to 15.5 fl oz	+++++	4 hrs	0 days	Subsequent applications can be made on 7-14 day intervals. Do not apply more than two sequential applications before switching to a fungicide with another mode of action . Do not apply more than 1.44 quarts per acre per season.
	<b>fluazinam</b> <i>FRAC group 29</i> (Omega 500)	1.25 pt	+++	3 days	30 days	Do not use more than 7.5 pints per acre per season. Do not apply within 30 days of harvest.
	<b>cyprodinil + fludioxonil</b> <i>FRAC group 9 + 12</i> (Switch 62.5WG)	11 to 14 oz	+++++	12 hrs	0 days	Applications can be made on 7-10 day intervals when conditions warrant. Do not apply more than 56 oz of product per acre per year. Make no more than two sequential applications before using another fungicide with a different mode of action.

## Petal fall until one month after bloom (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Ripe (anthracnose) and/or Alternaria	<b>pyraclostrobin</b> <i>FRAC group 11</i>	14 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that

rots (continued)	(Cabrio EG) <b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	18.5 to 23 oz	+++++	24 hrs	0 days	have a different mode of action. Do not apply more than four applications of Cabrio per acre per crop year. No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
	<b>ziram</b> <i>FRAC group M3</i> (Ziram 76DF)	3 lb	++	48 hrs	~30 days	Do not apply later than 3 weeks after full bloom.
	<b>captan</b> <i>FRAC group M4</i> (Captan 50WP,	5 lb	+++	72 hrs	0 days	Do not apply more than 70 lb of 50WP per acre per crop year.
Phytophthora root rot	Captec 4L) <b>fosetyl-Al</b> <i>FRAC group 33</i> (Aliette WDG)	2 qt 5 lb	+++	12 hrs	0 days	Do not apply more than 35 quarts of 4L per crop year. Apply Aliette as a foliar spray after leaves have emerged. Subsequent applications can be made on 14-21 day intervals. Do not exceed 4 applications per acre per year. <b>Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.</b>
	<b>potassium phosphite</b> (ProPhyt)	4 pints	++++	4 hrs	0 hrs	Apply as a foliar spray for Phytophthora and Pythium after leaves have emerged. Also effective against Septoria and Anthracose leaf spots. <b>Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.</b>

**Petal fall until one month after bloom (continued)**

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Phytophthora root rot	mono- and di-potassium salts	2.5 quarts	++++	4 hrs	0 hrs	Apply as a foliar spray for Phytophthora and Pythium after leaves have emerged. Also effective against

<p>(continued)</p> <p>Cranberry fruitworm, cherry fruitworm, plum curculio, and sharpnosed leafhopper</p>	<p><b>of phosphorous acid</b> (Agri-Fos)</p> <p><b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)</p> <p><b>spinosad</b> <i>IRAC group 5</i> (SpinTor 2SC, Entrust 80W)</p> <p><b>spinetoram</b> <i>IRAC group 5</i> (Delegate 25WG)</p> <p><b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)</p> <p><b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)</p>	<p>1.3 lb</p> <p>4 to 6 fl oz 1.25 to 2 oz</p> <p>3 to 6 oz</p> <p>4.5 to 5.3 oz</p> <p>2.8 to 3.2 pt</p>	<p>+++++</p> <p>++</p> <p>+++</p> <p>+++</p> <p>+++</p>	<p>24 hrs</p> <p>4 hr</p> <p>4 hrs</p> <p>12 hrs</p> <p>12 hrs</p>	<p>3 days</p> <p>3 days</p> <p>3 days</p> <p>1 day</p> <p>1 day</p>	<p>Septoria and Anthracose leaf spots. <b>Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.</b></p> <p>Spray when 1 bush in 5 has infested fruit clusters. With all fruitworm materials, the most effective treatment timing is egg hatch (petal fall, with a second application perhaps 7 days afterwards). Treatments may be applied after infested fruit clusters are seen, but linking treatment to observed infested fruit may result in treatments being applied too late, particularly for cherry fruitworm</p> <p>Imidan is an excellent broad spectrum insecticide. Not effective for plum curculio or sharpnosed leafhopper. Effective against fruitworms when correctly timed. Entrust is OMRI certified for organic use.</p> <p>Labeled for gall midge, blueberry maggot, fruitworms and thrips. Not effective for plum curculio or sharpnosed leafhoppers.</p> <p>Effective against leafhoppers, fruitworms, Japanese beetles, lygus and flea beetles. Plum curculio not on blueberry label – blueberry rates not demonstrated to be effective for plum curculio</p> <p>Spray fruitworms when 1 bush in 5 has infested fruit clusters. Emulsifiable concentrate (EC) formulations sometimes contribute to fruit finish problems. Tank mixes with EC formulations should be used with caution unless combinations are known to be safe to fruit finish.</p>
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**Petal fall until one month after bloom (continued)**

<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Cranberry fruitworm, cherry fruitworm, plum curculio, and sharpnosed leafhopper (continued)	<b>esfenvalerate</b> <i>IRAC group 3A</i> (Asana XL 0.66EC, Adjourn 0.66EC)	9.6 fl oz	+++	12 hrs	14 days	Spray fruitworms when 1 bush in 5 has infested fruit clusters. Higher pyrethroid rates are needed for reliable control of plum curculio.
	<b>methoxyfenozide</b> <i>(IRAC group 18)</i> Intrepid 2F	16 fl oz	+++	4 hrs	7 days	For lepidopteran insects (moths and butterflies). See Supplemental Label approved by EPA 2/27/08
	<b>fenpropathrin</b> <i>IRAC group 3</i> (Danitol 2.4EC)	13 to 16 fl oz	+++	24 hrs	3 days	Spray fruitworms when 1 bush in 5 has infested fruit clusters. Pyrethroids provide good control of plum curculio, but higher rates are needed to assure highly reliable control of plum curculio.
	<b>zeta-cypermethrin</b> <i>IRAC group 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	++++	12 hrs	24 hrs	Spray fruitworms when 1 bush in 5 has infested fruit clusters. Higher pyrethroid rates are needed to assure highly reliable control of plum curculio.
	<b>carbaryl</b> <i>IRAC group 1A</i> (Sevin 80WSP)	2.5 lb	+++ (for fruitworms only)	12 hrs	7 days	Spray fruitworms when 1 bush in 5 has infested fruit clusters. Sevin is a poor choice for plum curculio.
	<b>tebufenozide</b> <i>IRAC group 18</i> (Confirm 2F)	16 fl oz	+++++ (for fruitworms only)	4 hrs	14 days	Spray fruitworms when 1 bush in 5 has infested fruit clusters. <b>Confirm controls caterpillars, but it does not control other pests.</b> Confirm needs to be ingested to be effective; therefore, timing is critical. Apply Confirm while fruitworms are still small. Confirm conserves natural enemies.

## Cover Sprays (from one month after bloom until Pre-Harvest)

**Leafhoppers** are small, often triangular insects that frequently move sideways in a crab-like fashion when disturbed. Leafhopper feeding is a coarse stippling or clearing of leaf pigments that resembles a “larger” version of mite injury. In blueberries, leafhopper feeding is seldom significant. However, leafhoppers are vectors; they spread blueberry stunt and bacterial scorch of blueberry (*Xylella fastidiosa*). In southern highbush, leaf scorch is very injurious in some locations and cultivars. Insecticidal suppression of leafhoppers has slowed the spread of the *Xylella* pathogen in grapes. Research is currently underway, but, in southern highbush insecticidal suppression of leafhoppers may be warranted in areas where bacterial leaf scorch (*Xylella*) is present.

**Flea beetles** and **leaf beetles** are small metallic blue or green foliage feeders that shot-hole blueberry foliage, often clustering on terminals. Bushes in healthy, well-tended mature rabbiteye orchards can normally lose up to 20% of leaf surface before any injury is sustained. Young orchards, particularly southern highbush and less vigorous rabbiteye cultivars, are easily hurt by flea/leaf beetles. **Do not allow flea and/or leaf beetles to damage terminal growth or otherwise impede the young bushes’ ability to fill their allotted space. Multiple insecticides will provide good control, though repeat applications may be needed when beetles are abundant.**

**Blueberry maggot fly (BBM)** – BBMs are established in some southeastern blueberry orchards. If present, BBMs are serious mid-and late-season fruit pests. BBMs may go undetected at harvest, so one can easily ship infested fruit. Utilize thorough field-by-field monitoring by hanging yellow sticky traps (baited with ammonium carbonate), at least one trap per cultivar. Trap catches indicate when adult blueberry maggots, or related non-injurious species, are present. **Traps should be hung in orchards by mid-May. If your orchard has been damaged by a BBM infestation before, spray as soon as adults are trapped. If your orchard has not been damaged by a BBM infestation before, and adults are trapped, either:** (1) spray immediately, or (2) accept more risk, begin daily examination of fruit for larval infestation, and **spray immediately** if any larval injury is found. Once spraying for BBM begins, it is very important to **spray every 7-14 days until all the fruit has been harvested.**

**Export fruit protected by systems-approach pest management protocols must comply with appropriate guidelines for scouting, spraying and post-harvest inspection of berries for the presence of maggot larvae in berries.**

Alternaria and Ripe rots	<b>azoxystrobin</b> <i>FRAC group 11</i> (Abound)	6.0 to 15.5 fl oz	+++++	4 hrs	0 days	Subsequent applications can be made on 7-14 day intervals. Do not apply more than two sequential applications before switching to a fungicide with another mode of action . Do not apply more than 1.44 quarts per acre per season.
	<b>cyprodinil + fludioxonil</b> <i>FRAC group 9 + 12</i> (Switch 2.5WG)	11 to 14 oz	+++++	12 hrs	0 days	Applications can be made on 7-10 day intervals when conditions warrant. Do not apply more than 56 oz. of product per acre per year. Make no more than two sequential applications before using another fungicide with a different mode of action.
	<b>pyraclostrobin</b> <i>FRAC group 11</i> (Cabrio EG)	14 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Cabrio per acre per crop year.
	<b>pyraclostrobin + boscalid</b>	18.5 to 23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that

	<i>FRAC group 11</i> + 7 (Pristine WG)					have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.
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### Cover Sprays (from one month after bloom until Pre-Harvest)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Flea beetles	<b>carbaryl</b> <i>IRAC group 1A</i> (Sevin 80S)	2.5 lbs	+++	12 hrs	7 days	Sevin is also effective against small to medium-sized caterpillars.
	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lbs	++++	24 hrs	3 days	
	<b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)	4.5 to 5.3 oz	+++	12 hrs	24 hrs	
	<b>esfenvalerate</b> <i>IRAC group 3A</i> (Adjourn 0.66 EC, Asana XL 0.66 EC)	9.6 fl oz	++	12 hrs	14 days	
	<b>fenpropathrin</b> <i>IRAC group 3A</i> (Danitol 2.4EC)	16 fl oz	+++	24 hrs	3 days	
	<b>imidacloprid</b> <i>IRAC group 4A</i> (Admire 2F, Advise 2FL, Alias 2F, Couraze 2F, Imida E-AG 2F, Nuprid 2F, Admire Pro 4.6F,	16 to 32 fl oz 16 to 32 fl oz 16 to 32 fl oz 16 to 32 fl oz 16 to 32 fl oz 16 to 32 fl oz 7 to 14 fl oz	++++ ++++ ++++ ++++ ++++ ++++ ++++	12 hrs 12 hrs 12 hrs 12 hrs 12 hrs 12 hrs 12 hrs	7 days 7 days 7 days 7 days 7 days 7 days 7 days	Imidacloprid is effective on leafhoppers, Japanese beetles, aphids and flea beetles, but imidacloprid is not as broad spectrum as other options. <b>Soil applied imidacloprid products have longer residual and provide more effective flea beetle control.</b> soil applied only soil applied only soil applied only soil applied only soil applied only soil applied only soil applied only

	Nuprid 4.6F Pro,	7 to 14 fl oz	++++	12 hrs	7 days	soil applied only
	Couraze 1.6F,	4 to 8 fl oz	+++	12 hrs	3 days	foliar
	Nuprid 1.6F,	4 to 8 fl oz	+++	12 hrs	3 days	foliar
	Provado 1.6F)	4 to 8 fl oz	+++	12 hrs	3 days	foliar

### Cover Sprays ((from one month after bloom until Pre-Harvest)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Flea beetles (continued)	<b>spinosad</b> <i>IRAC group 5</i> (SpinTor 2SC, Entrust 80%)	4 to 6 fl oz	+++	4 hrs	3 days	Entrust is OMRI certified for organic use.
	<b>spinetoram</b> <i>IRAC group 5</i> (Delegate WG 25%)	1.25 to 2 oz 3 to 6 oz	++++	4 hrs	3 days	
	<b>thiamethoxam</b> <i>IRAC group 4A</i> (Actara 25WDG)	4 oz	+++	12 hrs	3 days	
	<b>zeta-cypermethrin</b> <i>IRAC group 3A</i> (Mustang)	4.3 fl oz	+++	12 hrs	24 hrs	

In GA southern highbush fields, leafhopper/sharpsooter suppression may slow the spread of blueberry leaf scorch (*Xylella*). Leafhopper numbers typically increase between May 1 and June 15. Trap for leafhoppers with yellow sticky traps. When leafhoppers become abundant, or more than 15 glassy winged (leafhoppers) sharpshooters (*Homalodisca vitripennis*)/trap/week are found, it may be worthwhile to implement a leafhopper suppression program consisting of 3 foliar applications applied at 2 week intervals: 4.3 fl oz Mustang 1.5EC, 1.3 lbs Imidan 70W, 4.3 fl oz Mustang 1.5EC. Soil-applied imidacloprid applied as close as possible to the first Mustang application may further suppress leafhopper abundance.

As-needed for leafhopper/sharpsooter suppression	<b>zeta-cypermethrin</b> <i>IRAC group 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	++++	12 hrs	24 hrs	Mustang 1.5EC may provide helpful suppression of leafhoppers. Apply in rotation with Imidan at 2-week intervals.
	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lb	+++	24 hrs	3 days	Imidan may provide helpful suppression of leafhoppers. Apply in rotation with Mustang 1.5EC.

<b>Cover Sprays (continued)</b>						
<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
As-needed for leafhopper/ sharpshooter suppression (continued)	<b>imidacloprid</b> <i>IRAC group 4A</i>					Imidacloprid is effective on leafhoppers, Japanese beetles, aphids and flea beetles, but imidacloprid is not as broad spectrum as other options. <b>Soil applied imidacloprid products have longer residual.</b>
	(Admire 2F,	16 to32 fl oz	+++	12 hrs	7 days	soil applied only
	Advise 2FL,	16 to 32 fl oz	+++	12 hrs	7 days	soil applied only
	Alias 2F,	16 to32 fl oz	+++	12 hrs	7 days	soil applied only
	Couraze 2F,	16 to32 fl oz	+++	12 hrs	7 days	soil applied only
	Imida E-AG 2F,	16 to32 fl oz	+++	12 hrs	7 days	soil applied only
	Nuprid 2F,	16 to 32 fl oz	+++	12 hrs	7 days	soil applied only
	Admire Pro 4.6F, Nuprid 4.6F Pro	7 to 14 fl oz 7 to 14 fl oz	+++ +++	12 hrs 12 hrs	7 days 7 days	soil applied only soil applied only
Blueberry maggot	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lb	+++++	24 hrs	3 days	<b>Imidan is an excellent choice for maggot control.</b> Imidan provides 10-14 days residual control. Do not apply more than 2 times.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	3.2 pt	+++	12 hrs	1 day	Malathion provides 5-7 days residual maggot control in dry weather.
	<b>diazinon</b> <i>IRAC group 1B</i> (Diazinon AG500)	1 pt/100 gal	+++	24 hrs	7 days	<b>Diazinon may induce fruit finish injury. Use with caution!</b> Diazinon provides 7 to 10-days residual control. Allow 14 days between applications.

Cover Sprays (continued)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Blueberry maggot (continued)	<b>spinosad</b> <i>IRAC group 5</i> (GF-120 NF Naturalyte Fruit Fly Bait)	Broadcast: 10 fl oz bait in 15 fl oz water to 20 fl oz bait in 30 fl oz water Spot spray: 1 fl oz bait in 1.5 fl oz water/bush to 3 fl oz bait in 4.5 fl oz water/bush	+++	4 hrs	0 days	<b>GF-120 NF Naturalyte Fruit Fly Bait can be an excellent tool, but it only controls blueberry maggot. Begin bait application as soon as blueberry maggot flies are caught in traps, or 2 to 3 weeks before fruit begins to ripen. Repeat every 7 days; apply more often during rainy periods and as fruit ripens. Large spray droplets (4-6 mm) are best. GF-120 NF Naturalyte Fruit Fly Bait works best when diluted with water at a ratio of 1 part GF-120 NF plus 1.5 parts water.</b> GF-120 NF is a bait that attracts fruit flies from several yards away. <b>Broadcast Treatments:</b> Apply GF-120 NF as a directed spray applied to one side of each row, targeting the interior canopy to protect the bait from sunlight and rain. Apply from 10 fl oz GF-120 NF in 15 fl oz water/acre to 20 fl oz GF-120 NF in 30 fl oz water/acre. <b>(OMRI certified for organic use).</b> <b>Spot Sprays:</b> Individual bushes may be treated if fruit fly trap captures indicate low pest abundance. Concentrate spray in areas of fields where flies are more common. Spot spray individual bushes using from 1 fl oz GF-120 NF in 1.5 fl oz water to 3 fl oz GF-120 NF in 4.5 fl oz water. Aerial application of GF-120 is not recommended.
Japanese beetle	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lb	++++	24 hrs	3 days	Imidan provides excellent control of Japanese beetles and is a very good broad spectrum insecticide.
	<b>carbaryl</b>  <i>IA</i> (Sevin 80S, Sevin 80WSP)	2.5 lb	+++	12 hrs	7 days	Japanese beetles may require multiple applications. Do not apply more than 12.5 lb of Sevin 80 S or Sevin 80 WSP per acre per crop. Repeat applications as necessary up to a total of 5 times but not more often than once every 7 days.

<b>Cover Sprays (continued)</b>						
<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Japanese beetle (continued)	<b>esfenvalerate</b> <i>IRAC group 3A</i> (Asana XL 0.66EC, Adjourn 0.66EC)	9.6 fl oz	++	12 hrs	14 days	Asana/Adjourn provides good control of Japanese beetles.
	<b>zeta-cypermethrin</b> <i>IRAC group 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	+++	12 hrs	24 hrs	Mustang provides good control of Japanese beetles.
	<b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)	4.5-5.3 oz	+++	12 hrs	1 day	Assail provides good control of Japanese beetles.
	<b>imidacloprid</b> <i>IRAC group 4A</i>  (Couraze 1.6F, Nuprid 1.6F, Provado 1.6F)	6-8 fl oz	+++	12 hrs	3 days foliar-applied	Imidacloprid products are effective against Japanese beetles, aphids, leafhoppers and flea beetles, but imidacloprid is not as broad spectrum as other options.  foliar foliar foliar
	<b>thiamethoxam</b> <i>IRAC group 4A</i> (Actara 25WDG)	4 oz	+++	12 hrs	3 days	Actara provides good control of Japanese beetles.
	<b>azadirachtin</b> <i>IRAC group UN</i> (Neemix 4.5% EC, Aza-Direct)	4 to 16 fl oz  1 to 2 pt	++	12 hrs  4 hrs	0 day  0 day	Azadirachtin complements materials such as carbaryl, esfenvalerate or phosmet. It may perform poorly when used alone against heavy Japanese beetle populations. Azadirachtin products may be used up to or on the day of harvest. <b>Fruit finish problems may occur with pre-harvest or harvest application of EC formulations.</b>

## Pre-Harvest through Harvest

**Blueberry maggot fly (BBM)** –If present, BBMs are serious mid-and late-season fruit pests. BBMs may go undetected at harvest, so one can easily ship infested fruit. Utilize thorough field-by-field monitoring by hanging yellow, sticky traps (baited with ammonium carbonate or bicarbonate), at least one trap per cultivar. Trap catches indicate when adults are present. **Traps should be hung in orchards by mid-May. If your orchard has been damaged by a BBM infestation before, spray as soon as adults are trapped. If your orchard has not been damaged by a BBM infestation before, and adults are trapped, either:** (1) spray immediately, or (2) accept more risk, begin daily examination of fruit for larval infestation, and **spray immediately** if any larval injury is found. Once spraying for BBM begins, it is very important to **spray every 7-14 days until all the fruit has been harvested.**

Export fruit protected by systems-approach pest management protocols must comply with appropriate guidelines for scouting, spraying and post-harvest inspection of berries, including a protocol for cooking (boiling) samples of harvested fruit to test for the presence of maggot larvae in berries. Check with your export certifier before beginning a BBM treatment program.

**Fruit rots** – Fungicides alone do not provide adequate control; proper harvesting and handling is essential. Pre- and post-harvest rots can be greatly reduced by timely, complete harvest of all ripe fruit on the bush, followed by rapid post-harvest cooling. For hand-harvested highbush and southern highbush cultivars, harvest all ripe berries on the bush every 7 days or less. Rabbiteye cultivars should be clean-harvested every 10-14 days. Post-harvest cooling is critical and is best accomplished through the use of partial-vacuum or forced-air systems that use fans to pull cold air through stacks of palletized fruit.

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Alternaria rot and Ripe rots	<b>azoxystrobin</b> <i>FRAC group 11</i> (Abound)	6.0 to 15.5 fl oz	+++++	4 hrs	0 days	Subsequent applications can be made on 7-14 day intervals. Do not apply more than two sequential applications before switching to a fungicide with another mode of action . Do not apply more than 1.44 quarts per acre per season.
	<b>cyprodinil + fludioxonil</b> <i>FRAC group 9 + 12</i> (Switch 2.5WG)	11 to 14 oz	+++++	12 hrs	0 days	Applications can be made on 7-10 day intervals when conditions warrant. Do not apply more than 56 oz. of product per acre per year. Make no more than two sequential applications before using another fungicide with a different mode of action.
	<b>pyraclostrobin</b> <i>FRAC group 11</i> (Cabrio EG)	14 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Cabrio per acre per crop year.
	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	18.5 to 23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.

## Pre-Harvest through Harvest (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Blueberry maggot	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lb	+++++	24 hrs	3 days	<b>Imidan is an excellent choice for maggot control.</b> Imidan provides 10-14 days residual control. Do not apply more than 2 times.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC, Malathion ULV)	1.5 pt 10 fl oz	+++	12 hrs	1 day 0 day	Malathion provides 5-7 days residual control.  Used undiluted in specially designed aircraft or ground equipment capable of ultra low volumes.
	<b>diazinon</b> <i>IRAC group 1B</i> (Diazinon AG500)	1 pt/100 gal	+++	24 hrs	7 days	<b>Diazinon may induce fruit finish injury. Use with caution!</b> Diazinon provides 7 to 10-days residual control. Allow 14 days between applications.
	<b>spinosad</b> <i>IRAC group 5</i> (GF-120 NF Naturalyte Fruit Fly Bait)	Broadcast: 10 fl oz bait in 15 fl oz water to 20 fl oz bait in 30 fl oz water Spot spray: 1 fl oz bait in 1.5 fl oz water/bush to 3 fl oz bait in 4.5 fl oz water/bush	+++	4 hrs	0 days	<b>GF-120 NF Naturalyte Fruit Fly Bait can be an excellent tool, but it only controls blueberry maggot. Begin bait application as soon as blueberry maggot flies are caught in traps, or 2 to 3 weeks before fruit begins to ripen. Repeat every 7 days; apply more often during rainy periods and as fruit ripens.</b> Large spray droplets (4-6 mm) are best. <b>GF-120 NF Naturalyte Fruit Fly Bait works best when diluted with water at a ratio of 1 part GF-120 NF plus 1.5 parts water.</b> GF-120 NF is a bait that attracts fruit flies from several yards away. <b>Broadcast Treatments:</b> Apply GF-120 NF as a directed spray applied to one side of each row, targeting the interior canopy to protect the bait from sunlight and rain. Apply from 10 fl oz GF-120 NF in 15 fl oz water/acre to 20 fl oz GF-120 NF in 30 fl oz water/acre. (OMRI certified for organic use) <b>Spot Sprays:</b> Individual bushes may be treated if fruit fly trap captures indicate low pest abundance. Concentrate spray in areas of orchards where flies are more common. Spot spray individual bushes using from 1 fl oz GF-120 NF in 1.5 fl oz water to 3 fl oz GF-120 NF in 4.5 fl oz water. Aerial application of GF-120 is not recommended.

## Pre-Harvest through Harvest (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Japanese beetle	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lb	++++	24 hrs	3 days	Imidan provides excellent control of Japanese beetles.
	<b>carbaryl</b> <i>IRAC group 1A</i> (Sevin 80S, Sevin 80WSP)	2.5 lb	+++	12 hrs	7 days	Japanese beetles may require multiple applications. Do not apply more than 12.5 lb of Sevin 80S or Sevin 80 WSP per acre per crop. Repeat applications as necessary up to a total of 5 times, but not more often than once every 7 days.
	<b>zeta-cypermethrin</b> <i>IRAC group 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	+++	12 hrs	24 hrs	
	<b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)	4.5 to 5.3 oz	++	12 hrs	24 hrs	
	<b>imidacloprid</b> <i>IRAC group 4A</i> (Couraze 1.6F, Nuprid 1.6F, Provado 1.6F)	4 to 8 fl oz 4 to 8 fl oz 4 to 8 fl oz	+++	12 hrs	3 days	Imidacloprid products are effective against Japanese beetles, aphids, leafhoppers and flea beetles, but imidacloprid is not as broad spectrum as other options. foliar foliar foliar
	<b>thiamethoxam</b> <i>IRAC group 4A</i> (Actara 25WDG)	4 oz	+++	12 hrs	3 days	
	<b>azadirachtin</b> <i>IRAC group UN</i> (Neemix 4.5% EC, Aza-Direct)	4 to 16 fl oz 1 to 2 pt	++	12 hrs 4 hrs	0 day 0 day	Azadirachtin complements materials such as carbaryl, esfenvalerate or phosmet, but it may perform poorly when used alone against heavy Japanese beetle populations. Azadirachtin products may be used up to or on the day of harvest. <b>Fruit finish problems may occur with pre-harvest or harvest application of EC formulations.</b> OMRI certified for organic use.

## Post-harvest

**Blueberry bud mite** - This is an occasional pest in Georgia, but is more common on certain cultivars in North Carolina. This tiny eriophyid mite, best visible with a dissecting microscope, mites infest flower buds in late summer and fall, feeding inside the buds over the winter. In spring infestations are diagnosed only after damage has occurred and reddening/rosetting of emerging flower buds become evident. Cultivar susceptibility and field history are the best means of determining whether treatment is warranted. Use high volume (300 gal/A), high pressure (200 psi) applications of a post-harvest insecticide/miticide and horticultural oils. Pruning and removing or destroying old blueberry canes will reduce bud mite populations. Summer topping or hedging immediately after harvest greatly reduces bud mite by removing old, infested fruiting twigs, and has become the method of choice for controlling bud mite in North Carolina. **Never propagate from bud mite-infested blocks.**

**Blueberry stem borer** -- *Oberea myops*, is a longhorn beetle borer that also attacks rhododendron and azalea. This pest can be minimized by pruning out and removing the infested portion of canes, often brown and wilted, as soon as larvae are detected in the summer. Cut the stems well below their brown, hollowed section, where the stem is still green and not hollow. Promptly destroy each wilted cane containing a larva. This ensures that the larva does not migrate into the crown of the plant.

**Sharpnosed leafhopper** –The sharpnosed leafhopper is the vector (carrier) of blueberry stunt, a disease caused by a phytoplasma that results in severe stunting and loss of productivity in affected bushes. Stunt can be quite severe in North and South Carolina and has been reported from Arkansas. The disease is common on highbush and southern highbush cultivars, but rare on rabbiteye cultivars. Growers should be aware of the symptoms of stunt and be ready to spot-spray and remove infected bushes, followed by vector (leafhopper) control using insecticide sprays timed to coincide with population peaks of the leafhopper. In North Carolina, critical leafhopper control times are May, July and late September.

**Imported fire ants** can be very important pests in orchards, vineyards or fields. Ant baits employed after harvest into fall as a broadcast treatment should eliminate most, but seldom all, fire ant mounds within treated areas. In fields where fire ants are very abundant, use of a dormant, or early spring broadcast application in addition to the post-harvest application, will provide better fire ant control. Ant baits are slow acting; they require up to eight weeks to control active mounds. Worker ants must be attracted to and carry the baits back to their colonies. Most ant baits interfere with reproduction, causing a gradual die-off of colonies. Extinguish Professional Fire Ant Bait (0.5% methoprene) is labeled for use on all 'crop land' sites. It is effective, but somewhat slower acting than Esteem Ant Bait (0.5% pyriproxyfen). Ant baits work best when soil is moist, but not wet. Active ant foraging is essential. Ideally, temperatures should be warm and sunny. Do not apply ant baits when conditions are expected to be cold, overcast, rainy or very hot. **Individual mound treatments are most effective when used as-needed for the occasional colony that survives broadcast treatments.** Mound treatments using insecticide baits should be applied in a circle, 3 to 4 feet from the mound. Do not disturb mounds or place bait directly on top of mounds.

Post-harvest (continued)						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Blueberry bud mite	<b>endosulfan</b> <i>IRAC group 2A</i> (Endosulfan 3EC, Thionex 3EC)	2 qt/300 gal	++++	24 hrs	post-harvest only	Blueberry bud mite infestations are very site-specific, and may be spread via propagation. <b>Aggressive pruning, as in hedging right after harvest, is step one in addressing a blueberry bud mite infestation.</b> A post-harvest application of endosulfan, or the somewhat less consistent horticultural oil, followed by a second application of endosulfan or oil in August, is recommended. Consult with an entomologist to ensure proper timing of these applications. Do not apply more than 4 qt endosulfan 3EC per acre per year ( <b>for post-harvest use only</b> ).
	<b>Verdant horticultural oil</b> (JMS Stylet Oil)	3 to 6 qt/100 gal	++	4 hrs	0 days	Prior to flower bud formation, bud mites are exposed and susceptible to oil applications
	<b>Verdant horticultural oil</b> (Stoller® Golden Pest Spray Oil)	1 to 2 gal (low volume) application or 2 gal/100 gal (dilute spray)	++	4 hrs	0 days	
Yellownecked caterpillar, leaf tiers, spanworms, azalea caterpillar	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	1.5 pt	+++	12 hrs	1 day	Apply to caterpillars while they are < 1/4 inch long, they become more difficult to control as they mature.
	<b>Bacillus thuringiensis</b> <i>IRAC group 11</i> [BT] (Dipel DF)	0.5 to 1.0 lb	++	4 hrs	0 days	<i>Bacillus thuringiensis</i> is an effective microbial insecticide. Apply to small, early-stage caterpillars. OMRI certified for organic use.
	<b>tebufenozide</b> <i>IRAC group 18</i> (Confirm 2F)	4 to 8 fl oz	++++	4 hrs	14 days	Confirm is very effective if applied to small, early-stage caterpillars. Confirm does not control non-caterpillar pests of blueberry.
	<b>esfenvalerate</b> <i>IRAC group 3A</i> (Asana 0.66 EC) (Adjourn 0.66 EC)	4.8 to 16 oz 4.8 to 9.6 fl oz	++++	12 hrs	14 days	Esfenvalerate should be used as a salvage treatment for medium to large caterpillars. It is very effective, but if used often, it encourages scale and mite buildup.

<b>Post-harvest (continued)</b>						
<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Yellownecked caterpillar, leaf tiers, spanworms, azalea caterpillar (continued)	<b>zeta-cypermethrin</b> <i>IRAC group 3A</i> (Mustang 1.5EC, Mustang Max 0.8EC)	4.3 fl oz 4.0 fl oz	+++++	12 hrs	24 hrs	Mustang provides excellent control of foliage-feeding caterpillars
Imported fire ants	<b>pyriproxyfen</b> <i>IRAC group 7C</i> (Esteem Ant Bait)	1.5 to 2.0 lb  (2-4 tbsp/mound)	++++	12 hrs	24 hrs	Ant baits should be applied as-needed during the spring and, if needed, again in the fall. Apply on sunny days when the soil temperature is at least 60°F and the soil is moist. Baits are slow acting but effective. Allow 4 weeks to work. Do not make other imported fire ant treatments for 7-10 days. May need to reapply if heavy, flooding rains occur within 7 days.
	<b>methoprene</b> <i>IRAC group 7A</i> (Extinguish Professional Fire Ant Bait 0.5%)	1 to 1.5 lb  (3 to 5 tbsp/1000 sq ft)  (3 to 5 tbsp/mound)	+++	4 hrs	0 days	Extinguish Professional Fire Ant Bait (0.5% methoprene) is legal for use on 'crop land.' <b>Extinguish baits containing methoprene plus hydramethylnon are not labeled for use on crop land.</b>
	<b>diazinon</b> <i>IRAC group 1B</i> (Diazinon AG500)	1 pt/100 gal	++++	24 hrs	7 days	Mound drench. Slowly apply 1 gal of diluted mixture over and 6 inches around each mound. Apply gently to avoid disturbing ants. Do not apply for 7- to 10-days after bait applications.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	1 pt	++	12 hrs	1 day	Malathion is a modestly effective foliar rescue treatment. <b>May be applied to plants</b> one day before harvest to discourage ants from foraging on the plants. This is a stopgap treatment to get ants off the plants. Rely on aggressive dormant or post-harvest season imported fire ant controls to suppress these pests in blueberries.

## Post-harvest (continued)

<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Flea beetles and leaf beetles	<b>carbaryl</b> <i>IRAC group 1A</i> (Sevin 80S)	2.5 lb	+++	12 hrs	7 days	Sevin is effective against small to medium-sized caterpillars.
	<b>phosmet</b> <i>IRAC group 1B</i> (Imidan 70W)	1.3 lbs	++++	24 hrs	3 days	Imidan is a broad-spectrum insecticide.
	<b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)	4.5 oz	+++	12 hrs	24 hrs	Assail controls leafhoppers, Japanese beetles and flea beetles.
	<b>imidacloprid</b> <i>IRAC group 4A</i> (Admire 2F, Advise 2FL, Alias 2F, Couraze 2F, Imida E-AG 2F, Nuprid 2F, Admire Pro 4.6F, Nuprid 4.6F Pro,	16 to 32 fl oz	++++	12 hrs	7 days	Imidacloprid products are effective on leafhoppers, Japanese beetles, aphids and flea beetles, but imidacloprid is not as broad spectrum as other options. <b>Soil applied products have longer residual.</b> soil applied only
		16 to 32 fl oz	++++	12 hrs	7 days	soil applied only
		16 to 32 fl oz	++++	12 hrs	7 days	soil applied only
		16 to 32 fl oz	++++	12 hrs	7 days	soil applied only
		16 to 32 fl oz	++++	12 hrs	7 days	soil applied only
16 to 32 fl oz		++++	12 hrs	7 days	soil applied only	
7 to 14 fl oz		++++	12 hrs	7 days	soil applied only	
7 to 14 fl oz	++++	12 hrs	7 days	soil applied only		
Couraze 1.6F, Nuprid 1.6F, Provado 1.6F)	4 to 8 fl oz	+++	12 hrs	3 days	foliar	
	4 to 8 fl oz	+++	12 hrs	3 days	foliar	
	4 to 8 fl oz	+++	12 hrs	3 days	foliar	
<b>thiamethoxam</b> <i>IRAC group 4A</i> (Actara 25WDG)	4 oz	+++	12 hrs		3 days	

<b>Post-harvest (continued)</b>						
<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Sharpnosed leafhopper	<b>acetamiprid</b> <i>IRAC group 4A</i> (Assail 30SG)	4.5 oz	++++	12 hrs	24 hrs	
	<b>imidacloprid</b> <i>IRAC group 4A</i>					Imidacloprid is effective on leafhoppers, Japanese beetles, aphids and flea beetles, but imidacloprid is not as broad spectrum as other options. <b>Soil applied products have longer residual.</b>
	(Admire 2F,	16 to 32 fl oz	+++	12 hrs	7 days	
	Advise 2FL,	16 to 32 fl oz	+++	12 hrs	7 days	
	Alias 2F,	16 to 32 fl oz	+++	12 hrs	7 days	
	Couraze 2F,	16 to 32 fl oz	+++	12 hrs	7 days	
	Imida E-AG 2F,	16 to 32 fl oz	+++	12 hrs	7 days	
Nuprid 2F,	16 to 32 fl oz	+++	12 hrs	7 days		
Admire Pro 4.6F,	7 to 14 fl oz	+++	12 hrs	7 days		
Nuprid 4.6F Pro,	7 to 14 fl oz	+++	12 hrs	7 days		
	Couraze 1.6F,	4 to 8 fl oz	++	12 hrs	3 days	foliar
	Nuprid 1.6F,	4 to 8 fl oz	++	12 hrs	3 days	foliar
	Provado 1.6F)	4 to 8 fl oz	++	12 hrs	3 days	foliar
	<b>thiamethoxam</b> <i>IRAC group 4A</i> (Actara 25WDG)	4 oz	++	12 hrs	3 days	
	<b>esfenvalerate</b> <i>IRAC group 3A</i> (Adjourn 0.66 EC, Asana XL 0.66 EC)	4.8 to 9.6 fl oz	+++	12 hrs	14 days	Some users may be allergic to Adjourn or Asana; discontinue use if skin or eyes become inflamed.
	<b>malathion</b> <i>IRAC group 1B</i> (Malathion 57EC)	1.5 pt	++	12 hrs	1 day	

## Late season and after harvest foliage management

During fruit maturation and/or immediately following harvest, fungicide applications may be warranted for control of leaf spots and suppression of dieback diseases and root rots. Start applications as soon as leaf spots are first observed.

**Dieback diseases of southern highbush varieties** – Most southern highbush varieties are hedged immediately after harvest. Hedging cuts can serve as an entry point for many stem pathogens. At the end of each day of hedging, application of broad-spectrum fungicides may be beneficial.

**Blueberry rust** – Rust is predominantly a problem in the extreme southern blueberry production areas such as south Georgia. However, rust does occur in South Carolina and other locations. On susceptible varieties, rust can prematurely defoliate plants by late August. **Bravo WeatherStik is labeled for control of both rust and Septoria leaf spots; this chlorothalonil product makes an excellent rotation partner for the strobilurin-containing products, Cabrio and Pristine. However, Bravo WeatherStik can only be used after harvest, as fruit damage occurs with chlorothalonil usage.**

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Septoria and Anthracnose leaf spots and Phytophthora root rot	<b>fosetyl-al</b> <i>FRAC group 33</i> (Aliette WDG)	5 lb	++++	12 hrs	12 hrs	Apply Aliette as a foliar spray for Phytophthora and Pythium root rots and Septoria leaf spot. Subsequent applications can be made on 14-21 day intervals. Two or three fungicide applications following harvest are generally sufficient to prevent major outbreaks of Septoria leaf spot. Assuming that hedging is conducted immediately following harvest, this is a good time to consider an application. Do not exceed 4 applications per acre per year. <b>Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.</b>
	<b>potassium phosphite</b> (Prophyt)	4 pints	++++	4 hrs	0 hrs	Apply as a foliar spray for Phytophthora and Pythium. Also effective against Septoria and Anthracnose leaf spots. <b>Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.</b>

## Late season and after harvest foliage management (continued)

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Septoria and Anthracnose leaf spots and Phytophthora root rot (continued)	<b>mono- and dipotassium salts of phosphorous acid</b> (Agri-Fos)	2.5 quarts	++++	4 hrs	0 hrs	Apply as a foliar spray for Phytophthora and Pythium. Also effective against Septoria and Anthracnose leaf spots. <b>Do not tank mix with copper and foliar fertilizers, and do not apply in acidic water or add acidifying agents, as foliage/fruit damage could be a result. When tank-mixing this product with others, test the mix on a small area to make sure that phytotoxicity does not occur.</b>
Septoria and anthracnose leaf spots only	<b>azoxystrobin</b> <i>FRAC group 11</i> (Abound)	6.2-15.4 fl oz	++++	4 hrs	0 days	Subsequent applications can be made on 14 day intervals. Apply immediately following harvest. Two or three fungicide applications following harvest are generally sufficient to prevent major outbreaks of Septoria leaf spot. When hedging is conducted immediately following harvest, this is a good time to consider an application. Do not exceed 1.44 quarts per acre per season, and do not apply more than two sequential applications of Abound before switching to a fungicide with another mode of action.
Septoria leaf spot only	<b>cyprodinil + fludioxonil</b> <i>FRAC group 9 + 12</i> (Switch 62.5WG)	11-14 oz	+++	12 hrs	0 days	Applications can be made on 7-10 day intervals when conditions warrant. Do not apply more than 56 oz of product per acre per year. Make no more than two sequential applications before using another fungicide with a different mode of action.
Septoria and rust leaf spots only	<b>chlorothalonil</b> <i>FRAC group M5</i> (Bravo Weather Stik)	3-4 pt	++++	12 hrs (with restrictions) 6.5 days (w/o)	42 days	Apply only as a postharvest fungicide for Septoria and rust. Do not combine with other pesticides, surfactants or fertilizers.
	<b>fenbuconazole</b> <i>FRAC group 3</i> (Indar 75 WSP)	2.0 oz	+++++	12 hrs	30 days	Do not make more than 4 applications or apply more than 8 oz. of Indar 75 WSP (0.38 lb. active) per acre per year. Indar 75 WSP belongs to the sterol demethylation inhibitor (DMI) class of fungicides or target site of action fungicides. Alternation with fungicides of different classes is recommended.

## Late season and after harvest foliage management (continued)

<b>Pest/Problem</b>	<b>Management Options</b>	<b>Amount of Formulation per Acre</b>	<b>Effectiveness (+) or Importance (*)</b>	<b>REI</b>	<b>PHI</b>	<b>Comments</b>
Septoria and rust leaf spots only (continued)	<b>propiconazole</b> <i>FRAC group 3</i> (Orbit 3.6 E, Tilt 3.6E, Bumper 41.8 EC, PropiMax EC)	6.0 fl oz	+++++	24 hrs	30 days	Some DMI fungicides, may be applied by either ground or aerial application (see label). Do not apply more than 30 fl oz per acre per season. More effective when allowed to dry ahead of a rain.
Septoria, anthracnose and rust leaf spots	<b>pyraclostrobin</b> <i>FRAC group 11</i> (Cabrio EG)	14 oz	++++	24 hrs	0 days	No more than 2 sequential applications of Cabrio should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Cabrio per acre per crop year.
	<b>pyraclostrobin + boscalid</b> <i>FRAC group 11 + 7</i> (Pristine WG)	18.5-23 oz	+++++	24 hrs	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than four applications of Pristine per acre per crop year.

## Efficacy of selected fungicides against diseases of blueberry

Fungicide [FRAC #]	Phytophthora root rot	Mummy Berry	Botrytis (gray mold)	Alternaria rot	Phomopsis twig blight	Ripe rot (Anthracnose)	Septoria leaf spot	Anthracnose leaf spot	Rust
azoxystrobin ( <b>Abound</b> ) [11]	NA <sup>a</sup>	++	NA	+++++	++	+++++	++++	++++	???
captan ( <b>Captan, Captec</b> ) [M4]	NA	+	++	++	++	+++	++	+++	NA
chlorothalonil ( <b>Bravo</b> ) [M5]	NA	NA	NA	NA	NA	NA	++++	???	+++
	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>	<b>Do not use prior to harvest</b>
cyprodinil + fludioxonil ( <b>Switch</b> ) [9+12]	NA	++	+++++	+++++	+++	+++++	+++	++++	???
fenbuconazole ( <b>Indar</b> )* [3]	NA	+++++	NA	NA	++++	NA	++++	NA	+++
<b>*During mummy berry applications, tank mix with captan products to prevent rots</b>									
fenhexamid ( <b>Elevate</b> ) [17]	NA	++	+++++	NA	NA	NA	NA	NA	NA
fenhexamid + captan ( <b>CaptEvate</b> ) [17+M4]	NA	++	+++++	++	++	+++	++	???	NA
fosetyl-Al ( <b>Aliette WDG</b> ) [33]	+++	NA	NA	NA	+	+	++++	++++	NA
mefenoxam ( <b>Ridomil Gold</b> ) [4]	+++	NA	NA	NA	NA	NA	NA	NA	NA
mono and di-potassium salts of phosphorous acid ( <b>AgriFos</b> )	+++	NA	NA	NA	NA	NA	++++	++++	NA
mono and di-potassium salts of phosphorous acid ( <b>K-phite</b> )	+++	NA	NA	NA	NA	NA	++++	++++	NA
potassium phosphite ( <b>ProPhyt</b> )	+++	NA	NA	NA	NA	NA	++++	++++	NA
propiconazole ( <b>Orbit, Tilt, Bumper, PropiMax</b> ) [3]	NA	+++++	NA	NA	NA	NA	++++	NA	+++
pyraclostrobin ( <b>Cabrio</b> ) [11]	NA	NA	NA	++++	+++	++++	++++	+++++	+++++
pyraclostrobin + boscalid ( <b>Pristine</b> ) [11+7]	NA	++++	+++++	+++++	+++	+++++	+++++	+++++	+++++
Ziram ( <b>Ziram</b> ) [M3]	NA	+	++	+	+++	+++	???	++	???

<sup>a</sup>NA = no significant activity, ??? = unknown activity; + = very limited activity, ++ = limited activity, +++ = moderate activity, ++++ = good activity, +++++ = excellent activity.

**Efficacy of selected insecticides against blueberry insects** (++++ = excellent, +++ = good, ++ = fair, + = poor, - = no control, ? = control unknown) See [IPM Management Guide](#) section for rates and particulars. These ratings are benchmarks, actual performance will vary.

Common Name (IRAC #)	Trade Name(s)	Fire Ants	Armored scale	Soft scale	Blue-berry gall midge	Flower thrips	Glassy-winged sharp-shooter	Sharp-nosed leaf-hopper	Fruit worms	Plum curculio	Blue-berry maggot	Japanese beetle Green June beetle	Blue-berry bud mite	Crown boring beetles	Foliage feeding caterpillars
<i>acetamiprid</i> (4A)	Assail 30SG	-	-	++++	-	++	+++	+++	++	+	++	+++	-	++	+
<i>azadirachtin</i> (UN)	Neemix 4.5% EC Aza-Direct	-	-	-	-	-	-	-	-	-	-	+	-	-	+
<i>azinphos-methyl</i> (1B)	Dipel DF	-	-	-	-	-	-	-	-	-	-	-	-	-	++
<i>carbaryl</i> (1A)	Sevin 80S Sevin 80WSP	-	-	-	-	-	+	+	+	+	+	+++	-	-	++
<i>diazinon</i> (1B)	Diazinon AG500	+	+++	++	+++	+++	-	-	-	-	+	+	-	+++	+++
<i>endosulfan</i> (2A)	Endosulfan 3EC Thionex 3EC	-	-	-	-	++	+	+	++	-	-	++	+++	-	++
<i>esfenvalerate</i> (3A)	Adjourn 0.66EC Asana XL 0.66EC	-	-	-	-	-	++	++	++++	++	+	+++	-	-	++++
<i>fenpropathrin</i> (3A)	Danitol 2.4EC	-	-	-	-	-	++	++	++++	++	+	++++	-	-	++++
<i>horticultural oil</i>	Superior Oil JMS Stylet Oil Stoller® Golden Pest Spray Oil	-	+	+	-	-	-	-	-	-	-	-	++	-	-
<i>imidacloprid</i> (4A)	Admire 2F Admire Pro 4.6F Advise 2FL Alias 2F Couraze 1.6F Couraze 2F Imida E-AG 2F Nuprid 1.6F Nuprid 2F Nuprid 4.6F Pro Provado 1.6F	-	-	++++	-	-	+++	+++	-	-	+	+++	-	+++	-

## Efficacy of selected insecticides against blueberry insects (continued)

<i>Common Name</i> (IRAC #)	Trade Name(s)	Fire Ants	Armored scale	Soft scale	Blue- berry gall midge	Flower thrips	Glassy- winged sharp- shooter	Sharp- nosed leaf- hopper	Fruit worms	Plum curculio	Blue- berry maggot	Japanese beetle Green June beetle	Blue- berry bud mite	Crown boring beetles	Foliage feeding cater- pillars
<i>malathion</i> (1B)	Malathion 57EC	-	-	-	+	+	+	+	++	+	+	+	-	-	+
<i>methoprene</i> (7A)	Extinguish Professional Fire Ant Bait 0.5%	+++	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>methoxy- fenozide</i> (18)	Intrepid 2F	-	-	-	-	-	-	-	++++	-	-	-	-	-	++++
<i>phosmet</i> (1B)	Imidan 70W	-	++	+++	+++	-	+++	+++	++++	++++	++++	++++	-	+++	++++
<i>pyriproxyfen</i> (7D)	Esteem Ant Bait	++++	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>spinetoram</i> (5)	Delegate WG 25%	-	-	-	+	++	-	-	+++	-	?	-	-	-	++++
<i>spinosad</i> (5)	Entrust 80W SpinTor 2SC	-	-	-	+	++	-	-	+	-	?	-	-	-	+
<i>spinosad fruit fly bait</i> (5)	GF-120 NF Naturalyte Fruit Fly Bait	-	-	-	-	-	-	-	-	-	+++	-	-	-	-
<i>tebufenozide</i> (18A)	Confirm 2F	-	-	-	-	-	-	-	++++	-	-	-	-	-	++++
<i>thiamethoxam</i> (4A)	Actara	-	-	++++	-	-	+++	+++	-	++	+	+++	-	-	++
<i>zeta- cypermethrin</i> (3)	Mustang Mustang Max	-	-	-	-	-	+++	+++	++++	+++	++	++++	-	-	++++

<b>Fungicide classes with moderate to high risk of resistance development (generally single sites of action)</b>	
<b>Fungicide class</b>	<b>Trade Name and Chemical Name</b>
Anilopyrimidines	Switch (cyprodinil; one component of a two-part mixture)
Carboximide	Pristine (boscalid; one component of a two-part mixture)
Demethylation Inhibitors (DMIs) or Sterol Inhibitors	Indar (fenbuconazole) Orbit, Tilt, Bumper, PropiMax (propiconazole)
Hydroxyanilides	Elevate (fenhexamid)
Phenylamides	Ridomil Gold (mefanoxam)
Phenylpyrroles	Switch (fludioxanil; one component of a two-part mixture)
Strobilurins or QoI (Quinone outside Inhibitors)	Abound (azoxystrobin) Cabrio (pyraclostrobin) Pristine (pyraclostrobin; one component of a two-part mixture)
<b>Fungicide classes with low risk of resistance development (generally multiple sites of action)</b>	
<b>Fungicide class</b>	<b>Trade Name and Chemical Name</b>
Coppers	Coppers (numerous formulations)
Dithiocarbamates	Ziram (ziram)
Phthalimides	Captan (Captan or Captec)
Phthalonitriles	Bravo (chlorothalonil)
Phosphonates	Aliette (Fosetyl-Al) AgriFos (Mono and di-potassium salts of phosphorous acid) K-phite (Mono and di-potassium salts of phosphorous acid) ProPhyt (Potassium phosphite)

<b>Insecticide classes with high risk of resistance development (generally single sites of action)</b>	
<b>Insecticide class</b>	<b>Trade Name and Chemical Name</b>
Nicotinic acetylcholine receptor agonist (allosteric)	Delegate (spinetoram) SpinTor (spinosad) GF-120 NF Naturalyte Fruit Fly Bait (spinosad fruit fly bait)
Pyrethroid	Adjourn, Asana XL (esfenvalerate) Danitol (fenpropathrin) Mustang, Mustang Max (zeta-cypermethrin)
Neonicotinoid (soil applied)	Admire 2F, Admire Pro 4.6F, Advise 2FL, Alias 2F, Couraze 2F, Imida E-AG 2F, Nuprid 2F, Nuprid 4.6F Pro (imidacloprid)
<b>Insecticide classes with moderate risk of resistance development (generally single sites of action)</b>	
<b>Insecticide class</b>	<b>Trade Name and Chemical Name</b>
Organophosphate	Imidan (phosmet) Diazinon AG 500 (diazinon) Malathion (malathion)
Neonicotinoid (foliar applied)	Couraze 1.6F, Nuprid 1.6F, Provado 1.6F (imidacloprid) Actara (thiamethoxam) Assail (acetamiprid)
<b>Insecticide classes with low risk of resistance development (generally multiple sites of action)</b>	
<b>Insecticide class</b>	<b>Trade Name and Chemical Name</b>
Oil	Superior Oil, JMS Stylet Oil, Stoller Golden Pest Spray Oil (horticultural oil)

## Seasonal ‘at a glance’ fungicidal spray schedule options for blueberry

Developmental Stage	Green tip	Bloom (2-3 applications) <sup>a</sup>	Petal Fall	10-14 Days after Petal Fall	20-24 Days after Petal Fall	Pre-Harvest <sup>d</sup>	After Harvest Foliage Management
<b>Disease Controlled (Fungicides)</b>	<p><b>Mummy Berry (Pristine [11+7] or Indar [3] or Orbit or Tilt or Bumper or PropiMax [3])</b></p> <p><b>Twig blight (Pristine [11+7] or Indar) [3]</b></p>	<p><b>Mummy Berry and Twig blight (Pristine [11+7] or Indar<sup>b</sup> [3] + Captan [M4] or Orbit or Tilt or Bumper or PropiMax [3])</b></p> <p><b>For serious Botrytis problems, add (CaptEvate [17+M4] or Elevate [17] or Pristine [11+7] or Switch [9+12])</b></p> <p><b>If Alternaria and Ripe Rot have been a problem, add (Abound [11] or Cabrio [11] or Pristine [11+7] or Switch [9+12])<sup>c</sup></b></p>	<p><b>Alternaria and Ripe Rots (Abound [11] or Cabrio [11] or Pristine [11+7] or Switch [9+12]) or Captan [M4]</b></p>	<p><b>Alternaria and Ripe Rots (Abound [11] or Cabrio [11] or Pristine [11+7] or Switch [9+12]) or Captan [M4]</b></p>	<p><b>Alternaria and Ripe Rots (Abound [11] or Cabrio [11] or Pristine [11+7] or Switch [9+12]) or Captan [M4]</b></p>	<p><b>Alternaria and Ripe Rots (Abound [11] or Cabrio [11] or Pristine [11+7] or Switch [9+12]) or Captan [M4]</b></p> <p><b>Septoria Leaf Spot (Abound [11] or Aliette [33] or Cabrio [11] or Pristine [11+7] or Switch [9+12])<sup>e</sup></b></p>	<p><b>Septoria Leaf Spot (Abound [11] or Orbit or Tilt or Bumper or PropiMax [3] or AgriFos or Aliette or ProPhyt [33] or Bravo [M5] or Cabrio [11] or Pristine [11+7] or Switch [9+12] or Indar[3])</b></p> <p><b>Anthracnose (AgriFos or Aliette or ProPhyt [33] or Cabrio [11] or Pristine [11+7])</b></p> <p><b>Rust (Bravo [M5] or Orbit or Tilt or Bumper or PropiMax [3] or Cabrio [11] or Pristine [11+7] or Indar[3])<sup>f</sup></b></p>

<sup>a</sup>Bloom times vary, due to varietal differences and the environment. Bloom sprays should provide protection against the primary pathogens of blooms for the entire bloom period. The number of applications required for bloom may vary from 1-3, depending on the season and the variety.

<sup>b</sup>When using Indar during bloom, always tank-mix with Captan. Captan provides additional control of mummy berry, and it has some activity against twig blight, Botrytis and fruit rots. However, it is mainly of value to prevent increased rots with the use of Indar, as well as providing resistance management.

<sup>c</sup>Many of the fungicides which are registered for rot control may also have activity against twig dieback organisms, such as *Phomopsis* species.

<sup>d</sup>In wet years, pre-harvest and post-harvest rots may be a potential problem. Under these conditions, 1-2 applications of a pre-harvest material may be necessary for rot control.

<sup>e</sup>Septoria leaf spot is generally controlled with 2-4 fungicide applications. This disease is more problematic on highbush blueberry varieties, but some rabbiteye varieties may experience premature defoliation from Septoria as well. For leaf spot, Aliette and other phosphites (ProPhyt, AgriFos, etc.) are best utilized after harvest, since they are not as efficacious against the fruit rots, and they serve as a resistance management tool.

<sup>f</sup>Rust is problematic on some blueberry varieties, especially in far southern areas such as south Georgia, and it can result in complete, premature defoliation on susceptible varieties. Scout for rust in mid to late July. Applications of fungicides (2-3) from August to mid-September will generally result in good rust management. Some varieties may require yearly rust control.

# Insecticide Use ‘At a Glance’

## **Dormant**

Apply dormant horticultural oil diluted (to near the point of runoff) to all blocks that have scale or mite infestations or that received more than one application of carbaryl (Sevin/Carbaryl) or any pyrethroid insecticides (Asana/Adjourn, Danitol, Mustang/Mustang/Max)

## **Pre-Bloom**

Stage 2 up to 5-days before 1<sup>st</sup> bloom.

Apply diazinon (Diazinon AG 500) as-needed during warm spells for gall midge (rabbiteyes) and/or flower thrips.

## **5-Days Pre-Bloom to the evening of First Bloom**

Apply spinosad (SpinTor or Entrust) as-needed for gall midge and/or flower thrips. Confine honey bee colonies until it warms up the next morning if this application is needed just as bloom begins. Spray after bee activity ceases in the evening to further mitigate injury to pollinators.

## **Bloom**

DO NOT APPLY INSECTICIDE DURING BLOOM.

## **Petal Fall**

Apply spinosad (SpinTor/Entrust) as-needed for flower thrips. Remove bees before making a petal fall insecticide application. Spray in the evening, after non-honey bee pollinators have ceased activity.

## **Cover Sprays**

Apply phosmet (Imidan), malathion (Malathion) [OPS, IRAC #1B], or tebufenozide (Confirm) [IRAC #18A] as-needed for cherry and cranberry fruitworms during the period just after petal fall.

## **Southern Highbush CVs:**

After full-leaf, apply as-needed soil-applied imidacloprid (Admire 2F, Admire Pro 4.6F, Advise 2FL, Alias 2F, Couraze 2F, Imida E-AG 2F, Nuprid 2F, Nuprid 4.6F Pro) for leafhopper suppression in blocks where there is any evidence of blueberry leaf scorch/yellow stem disease (*Xylella fastidiosa*). Additional foliar applications of high rate of pyrethroid (Mustang/Mustang Max, Asana/Adjourn, Danitol) alternated on a 14-day schedule as long as leafhoppers are abundant with Imidan.

## **Mid- to Late-Cover Sprays**

Apply phosmet (Imidan) as needed for blueberry maggot.

Insecticide applications for leaf-footed bugs and stink bugs are seldom needed. Fruit quality losses reflected in decreased shelf life or eating quality are uncommon. Do not apply insecticide for leaf-footed bugs or stink bugs until initial signs of fruit shriveling are seen.

**Post-Harvest**

Blueberry bud mite, a small eriophyid mite that is seldom seen without greater than 15X magnification, is associated with reddened deformed flower buds and with yield suppression. Spread of bud mite is often associated with propagation from infested blocks; do not take cuttings from under-performing blocks. Two dilute post-harvest applications of endosulfan (Endosulfan 3EC, Thionex 3EC) are recommended for control of blueberry mite while the mites are moving from old buds to colonize newly developed flower buds. Sprays made during this vagrant (mobile) stage are very effective. Scout 3 times per week beginning after harvest if bud mite is suspected. Contact your County Extension office for details.

Apply phosmet (Imidan), tebufenozide (Confirm – for caterpillars only) or a pyrethroid (Asana/Adjourn, Danitol, Mustang/Mustang Max) as-needed for defoliating caterpillars and/or leaf beetles or flea beetles. Application of soil-applied imidacloprid (Admire 2F, Admire Pro 4.6F, Advise 2FL, Alias 2F, Couraze 2F, Imida E-AG 2F, Nuprid 2F, Nuprid 4.6F Pro) should provide control or strong suppression of flea leaf beetles.

## Preemergent Weed Management Chemicals for Non-Bearing Plants Only

Preemergence herbicides for blueberry container production or small in ground operations (non-bearing):  Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
<b>PREEMERGENCE HERBICIDE</b>	benefin / oryzalin (XL 2G)	150 lb	<b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b>	24	No postemergent activity. Excellent product for containers and small in ground operations. Controls a wide array of annual broadleaf and grass weeds.

<p><b>PREEMERGENCE HERBICIDE</b></p>	<p>dithiopyr (Dimension 1SL) (Dimension 40 WP)</p>	<p>2.0 qt/A 20 oz/A</p>	<p><b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b></p>	<p>12</p>	<p>Provides preemergent control of most annual grasses and small seed broadleaf weeds. Also provides early postemergent control of some annual grasses up to 3 tillers.</p>
<p><b>PREEMERGENCE HERBICIDE</b></p>	<p>flumioxazin (Broadstar 0.25 GR)</p>	<p>150 lb/A</p>	<p><b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b></p>	<p>12</p>	<p>Excellent product preemergence weed control. Use 10 to 12 oz rate for extended control (3 plus months). BroadStar is excellent for containers (greater than 4 inches in diameter) and small in ground operations. Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity). To avoid crop injury do not apply to moist or wet foliage. Irrigate plants with overhead irrigation within 1 hour after application with 0.5 to 0.75 inch of water to wash particles off of foliage and to activate the herbicide. See label for further instructions.</p>
<p><b>PREEMERGENCE HERBICIDE</b></p>	<p>isoxaben (Gallery 75 DF)</p>	<p>0.66 to 1.33 lb/A</p>	<p><b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b></p>	<p>12</p>	<p>Provides excellent preemergent weed control of many small seeded broadleaf weeds. Maximum of four pounds per year. Needs to be tanked mixed with a preemergence grass herbicide (i.e. Surflan)</p>
<p><b>PREEMERGENCE HERBICIDE</b></p>	<p>isoxaben + trifluralin + oxyfluorfen  (Showcase 2.5 TG)</p>	<p>100 - 200 lb</p>	<p><b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b></p>	<p>12</p>	<p>Excellent product for containers and small in ground operations. Controls a wide range of annual weeds. <b><u>DO NOT</u></b> apply to newly planted blueberries until the soil has firmly settled and no cracks are present. <b><u>DO NOT</u></b> apply to blueberries when foliage is wet. Apply 2 to 1 inch of irrigation water to Showcase treated area if adequate rainfall is not received within 3 days of application. Repeat applications of 150lbs or higher should not be made sooner than 60 days. <b><u>DO NOT</u></b> apply more than 600 lbs of Showcase per year.</p>

<b>PREEMERGENCE HERBICIDE</b>	oxadiazon (Regalstar 2G)	100 to 200 lb/A	<b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b>	12	Provides good preemergent weed control on a large spectrum of grass and broadleaf weeds. Works well on many winter annuals (i.e. Bittercress, Oxalis, etc.). Excellent product for containers and small in ground operations. Label recommends using on small acreage to confirm safety before large scale use.
<b>PREEMERGENCE HERBICIDE</b>	trifluralin / isoxaben (Snapshot 2.5 TG)	150 to 200 lb	<b><u>USE ON NON-BEARING PLANTS ONLY.</u></b> Newly planted and non-bearing plantings. <b>May also be used in bark bed production systems.</b>	12	No postemergent activity. Excellent product for containers and small in ground operations. Control a wide array of annual broadleaf and grass weeds.

## Weed Management in Non-Bearing and Bearing Plants

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
<b>PREPLANT/ SITE PREPARATION</b>	<b>Glyphosate, MOA 9</b> Roundup and other generic formulations	1 to 2 qt Depending on formulation and weeds being treated.	Apply 30 days prior to planting.	4	Use to kill strips through blueberry fields prior to planting. Generic formulations may require the addition of a surfactant. See label for details on controlling specific perennial weeds.

<b>PREEMERGENCE</b> Annual grasses and small seeded broadleaf weeds	<b>Napropamide, MOA 15</b> Devrinol 50 DF	8 lb	Newly planted (once soil has settled after transplanting) and established plantings.	24	Soil surface should be relatively free of weeds and plant residue. Rainfall or overhead irrigation within 1 to 2 days of application is needed for activation.
<b>PREEMERGENCE</b> Annual grasses and small seeded broadleaf weeds	<b>Oryzalin, MOA 3</b> Surflan 4 AS Oryzalin 4 AS	2 to 4 qt	Newly planted (once soil has settled after transplanting) and established plantings. <b>May also be used in bark bed production system.</b>	24	Oryzalin may be tank mixed with paraquat (see comments on rabbiteye) or Rely for postemergence weed control. Rainfall or irrigation is needed to activate oryzalin. In established plantings tank mix with simazine for broad spectrum residual weed control.
<b>PREEMERGENCE</b> Annual grasses and small seeded broadleaf weeds	<b>Norflurazon, MOA 12</b> Solicam 80 DF	1.25 to 5 lb	Plantings established at least 6 months. <b>May also be used in bark bed production system.</b>	12	Tank mix with paraquat or Rely for control of emerged weeds. Tank mix with simazine or diuron for expanded residual control. <b>Do not apply within 60 days of harvest.</b>

<b>PREEMERGENCE</b> Annual broadleaf weeds	<b>Mesotrione, MOA 27</b> Callisto 4 L	3 to 6 oz	Apply as prebloom post-directed spray in highbush blueberry.	12	Callisto may be applied at a rate up to 6 oz/acre. May be applied as a split application of 3 oz/A followed by 3 oz/A. If two applications are made do not apply less than 14 days apart. Do not apply more than 6 oz/A per year. Do not apply after the onset of bloom stage. A crop oil concentrate at 1% v/v is recommended.
<b>PREEMERGENCE</b> Annual broadleaf weeds and some annual grasses	<b>Flumioxazin, MOA 14</b> Chateau SW 51 WDG	6 to 12 oz	Newly planted and established. See Comments. <b>May also be used in a bark bed production system.</b>	12	Do not apply to blueberries established less than 2 years unless they are protected from spray contact by non-porous wrap, grow tubes or waxed containers. Do not apply after bud break through final harvest. Do not apply more than 12 oz per acre during a 12-month period. Do not make a sequential application within 30 days of the first application. Do not apply more than 6 oz per acre per application to bushes less than 3 years old on soils having a sand plus gravel content greater than 80%. Apply at the base of the bush. Residual weed control will be reduced if emerged vegetation prevents Chateau from reaching the soil surface.
<b>Weed/Timing</b>	<b>Material</b>	<b>Amount of Formulation per Acre</b>	<b>Crop Age Restrictions</b>	<b>REI (hrs)</b>	<b>Comments</b>

<b>PREEMERGENCE</b> Annual weeds and some perennial weeds	<b>Dichlobenil, MOA 6</b> Casoron 4 G  Casoron CS 1.4 L	100 to 150 lb  1.4 to 2.8 gal	4 G formulation may be applied to newly planted (4 wks after transplanting) and established plantings. CS 1.4 L formulation may be applied to plants at least one year after transplanting. <b>May also be used in bark bed production system.</b>	12	Apply between November and February (air temperatures 60° F or less) for best results. Warm temperatures increase volatility. Overhead irrigation may be use for activation when applied in early spring. Excellent at controlling Florida betony ( <i>Stachys floridiana</i> ) and non seed bearing plants (i.e Ferns).
	<b>Hexazinone, MOA 5</b> Velpar 2 SL Velpar 80 WDG	0.5 to 1 gal 1.3 to 2.6 lb	Blueberry plantings established at least 3 years.	48	<b>Apply before blueberry leaf emergence at least 50 days before harvest.</b> Use lower rates on poorly drained soils. Due to variability in soil type limit initial use to a small area. Do not use on sand, loamy sand, or sandy loam soils. Do not use on soils having less than 3% organic matter. Most blueberry soils in Georgia have less than 3% organic matter.
<b>PREEMERGENCE</b> Broadleaf weeds and some annual grass species	<b>Pronamide, MOA 3</b> Kerb 50 WP	2 to 4 lb	Blueberry plantings established at least 1 year.	24	Apply as a directed spray in established blueberries only for early postemergence control of susceptible winter annual weeds, perennial grasses, and chickweed and for preemergence control of these and other weeds. Optimal herbicide activity occurs when applications are made under cool temperature conditions and are followed by rainfall or overhead irrigation. Do not exceed maximum rate listed per year. Apply only in late fall or winter.

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
<b>PREEMERGENCE</b> Broadleaf weeds and some annual grass species	<b>Diuron, MOA 7</b> Karmex 80 DF or various generic formulations	1.5 to 2 lb	Blueberry plantings established 1 year.	12	Diuron is registered for use in AR, GA, MS, NC, and SC only. Apply as a directed spray in the fall and repeat application in the spring if needed. Do not apply to soils having less than 2% organic matter. Do not use on loamy sand or sand soils. Tank mix with glyphosate, paraquat (see comments on rabbiteye), or Rely for postemergence control.
<b>PREEMERGENCE</b> Broadleaf weeds and some annual grass species	<b>Simazine, MOA 5</b> Princep 4 L or Princep Caliber 90 WDG or various generic formulations	2 to 4 qt 2.2 to 4.4 lb	Newly planted (use half rate and apply once soil has settled after transplanting) and established plantings. <b>May also be used in bark bed production system.</b>	12	Tank mix with glyphosate, paraquat (see comments on rabbiteye) , or Rely for postemergence weed control. The addition of oryzalin or norflurazon with simazine will extend residual grass control several weeks. Rate is soil texture dependent. Do not apply when fruit is present. <b>Do not apply to blueberry planted less than 6 months in bark production system.</b>
	<b>Terbacil, MOA 5</b> Sinbar 80 WP	0.5 to 2 lb	Plantings established 1 year or more.	12	Apply as directed spray in early fall or spring before fruit set. Do not contact foliage. Do not use on loamy sand or sandy soils. Do not use on soils having less than 3% organic matter. This herbicide can be very active, but injurious on blueberry plants. It is advised to try this herbicide on small acreage, and determine acceptability on your soils before large scale use.
<b>POSTEMERGENCE</b> Non-selective control	<b>Glufosinate, MOA 10</b> Rely 200 1.67 L	1.8 to 3 qt	Newly planted (shielded) and established blueberry. <b>May also be used in bark bed production system.</b>	12	Do not allow spray solution to contact desirable foliage or green, uncallused bark. Use a minimum spray volume of 20 gal/A. <b>Do not apply within 14 days of harvest</b> or exceed 12 qts. in 1 year. May be tank mixed with preemergence herbicides.
	<b>Glyphosate, MOA 9</b> Roundup and other generic formulations	See label 1 to 2 qt. Depending on formulation and weeds being treated	<b>May also be used in bark bed production system.</b>	4	Leaf, stem, or exposed root contact with spray can kill or injure crop. Rainfall or irrigation after application in bark bed production systems can result in glyphosate root uptake and crop injury. Apply as a directed or shielded spray, or with a wiper applicator. <b>Do not apply within 14 days of harvest.</b> Generic formulations may require additional surfactant

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
<b>POSTEMERGENCE</b> Non-selective control	<b>Paraquat, MOA 22</b> Gramoxone Inteon 2 SL  Firestorm 3 SL Parazone 3 SL	2 to 4 pt  1.3 to 2.7 pt	Newly planted (shielded) and established blueberry plantings. <b>May also be used in bark bed production system.</b>	12	Do not allow herbicide to contact desirable foliage or uncallused bark. Young plants must be shielded. The addition of a nonionic surfactant at 0.25 % v/v (1qt per 100 gal. of spray solution) is necessary for adequate control. Tank mix with preemergence herbicides for residual control. <b>Use of paraquat in rabbiteye blueberry can increase incidence of stem blight if herbicide contacts green stems. Rabbiteye producers should consider other non-selective postemergence options.</b>
<b>POSTEMERGENCE</b> Broadleaf weeds and yellow nutsedge	<b>Bentazon, MOA 6</b> Basagran 4 L	1.5 to 2 pt	Newly planted or non-bearing plantings. <b>May also be used in bark bed production system.</b>	48	Apply as a directed spray in a minimum spray volume of 20 GPA. Add 2 pt of crop oil concentrate per acre for optimum results. Timely, sequential applications will control yellow nutsedge. Refer to label for details regarding nutsedge. Do not apply within 1 year of harvest.
<b>POSTEMERGENCE</b> Broadleaf weeds less than 3" tall	<b>Carfentrazone-ethyl, MOA 14</b> Aim 2 EC	1 to 2 oz	Established fields only; do not use on newly set plants.	12	Apply using application equipment designed to prevent spray deposition on green stems, leaf tissues, flowers or fruit. May be used alone or tank-mixed with other herbicides; see label for mixing instructions. Aim controls morningglory, pigweed, nightshade, velvetleaf, carpetweed, and spreading dayflower. Apply in a minimum spray volume of 20 GPA. Apply in combination with crop oil concentrate at 1% v/v (1 gal/100 gal of spray solution) or a nonionic surfactant at 0.25% v/v (1 qt/100 gal of spray solution).
<b>POSTEMERGENCE</b> Annual and perennial grasses	<b>Clethodim, MOA 1</b> Select 2 EC or Intensity 2 EC Arrow 2 EC Select Max 1 EC Intensity One 1 EC	6 to 8 oz  9 to 16 oz	Newly planted or non-bearing plantings. <b>May also be used in bark bed production system.</b>	24	Low rates are for annual grass weeds. High rates and sequential applications are for perennial grasses (bermudagrass or johnsongrass). Do not apply within 1 year of harvest. The addition of a nonionic surfactant at 0.25 % v/v (1 qt/100 gal of spray solution) is required. Best results occur when applications are made to actively growing grasses. If using Arrow, avoid contact with the blueberry plant as much as possible, leaf twisting has been observed in Georgia.

Weed/Timing	Material	Amount of Formulation per Acre	Crop Age Restrictions	REI (hrs)	Comments
<b>POSTEMERGENCE</b> Annual and perennial grasses (Cont'd)	<b>Fluazifop, MOA 1</b> Fusilade DX 2 EC	12 to 24 oz	Newly planted or non-bearing plantings. <b>May also be used in bark bed production system.</b>	12	Sequential applications will be necessary for perennial grass control. The addition of a nonionic surfactant (0.25% v/v, 1 qt/100 gal of water) or crop oil concentrate (1 gal./100 gal. of water) is necessary. Do not apply within 1 year of harvest. Do not apply over the top or crop injury can occur.
	<b>Sethoxydim, MOA 1</b> Poast 1.5 EC	1 to 2.5 pt	Newly planted and established plantings. <b>May also be used in bark bed production system.</b>	12	Sequential applications will be necessary for perennial grass control. The addition of a nonionic surfactant (1 qt/100 gal of water) or crop oil concentrate (1 gal/100 gal of water) is necessary for optimum results. <b>Do not apply within 30 days of harvest.</b> Total use rate per season cannot exceed 5 pt/A.

## Blueberry Suggested Herbicide Programs

Crop Age	Fall	Winter	Spring	Summer
<b>First Year</b>	Preplant-Glyphosate (apply fall or winter at least 30 days prior to planting)		Oryzalin (Once soil settles after transplanting)	Simazine + Oryzalin. Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications Poast (as needed); Glyphosate (spot treat for perennial weeds)
			Devrinol (Once soil settles after transplanting)	Simazine + Oryzalin . Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds) Poast (as needed)
			Simazine + Oryzalin (once soil settles after transplanting)	Simazine + Oryzalin. Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. or Poast (as needed)
<b>Blueberry Established 1 year or more</b>	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications; Glyphosate (spot treat for perennial weeds). Poast (as needed).		Simazine + oryzalin or norflurazon (solo) Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed, 30 days PHI)	Rotate to different herbicide. Simazine + Oryzalin or norflurazon (solo). Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed).
<b>Blueberry Established 1 year or more</b>			Diuron. Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed, 30 days PHI)	Simazine + Oryzalin or norflurazon (solo). Existing annual weeds can be removed with separate paraquat (rabbiteye see comments, not recommended) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed)

<b>Blueberry Established 1 year or more</b>	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed)		Sinbar (not for light soils)+ Paraquat (rabbiteye: see comments), Glyphosate, or Rely, Poast (as needed 30 days PHI)	Simazine + Oryzalin or norflurazon Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments, not recommended) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed).
<b>Blueberry established 3 years or more</b>	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications Glyphosate (spot treat for perennial weeds). Poast (as needed).	<b>Velpar (follow all label precautions and restrictions-only for high organic matter soils)</b>	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications Glyphosate (spot treat for perennial weeds), Poast (as needed 30 days PHI)	Diuron, norflurazon, or simazine / oryzalin. Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments, not recommended) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed)
<b>Blueberry established 3 years or more</b>	Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed)		Diuron, norflurazon, or simazine / oryzalin. Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments) or glufosinate applications Glyphosate (spot treat for perennial weeds), Poast (as needed 30 days PHI)	Rotate to different herbicide. Simazine + Oryzalin or norflurazon (solo). Existing annual weeds can be removed with separate paraquat (rabbiteye: see comments, not recommended) or glufosinate applications. Glyphosate (spot treat for perennial weeds). Poast (as needed)

**Due to the recent registration of Chateau and Callisto and limited research with these herbicides, they are not included in the table entitled ‘Suggested Herbicide Programs’ However, in Georgia, Chateau has been used with good results established one year or more and is recommended. Follow the label.**

## Weed Response to Herbicides used in Blueberry

Herbicides	Annual Grasses					Annual Broadleaf Weeds														Perennial Weeds						
	Crabgrass	Foxtails	Goosegrass	Panicum, Fall	Ryegrass, Annual	Chickweed	Dock	Galinsoga	Geranium, Carolina	Groundsel, Common	Henbit	Jimsonweed	Lambsquarters	Morningglory, Annual	Nightshades	Pigweed	Radish, Wild	Ragweed	Sida, Prickly	Smartweed	Spotted Spurge	Bermudagrass	Dandelion	Nutsedge, Yellow	Smilax	Virginia Creeper
<b>Preemergence</b>																										
Callisto	F	PN	PN	PN								G	E	FG	E	E		F		GE		N	N	P	N	N
Casoron	G	G	G	G	G	G	G	F	G	G	G	G	G	F	F	G	G	G		G	G	N	G	N	N	N
Chateau	G	G	G	G	G	G		G	G		E	G	E	G	G	E	G	G	E	G	E	N	G	N	N	N
Dacthal	G	G	G	G	P	F	P	N			F	P	G	N	N	F	N	N	N	N	G	N	P	N	N	N
Devrinol	G	G	G	G	G	G		P		G	P	N	F	N	N	G	N	N	P	P	N	N	P	N	N	N
Diuron	G	G	G	F	G	G		G	F		G	G	G	G	G	G	G	G	G	G	N	N	N	N	N	N
Gallery	P	P	P	P	P	G	F	G	G	G	G	G	G	F	G	G	G	G	G	G	G	N	G	N	N	N
Kerb	G	G	G	G	G	G		P			G	P	F	F	F	P	F	F		F			P	P	N	N
Oryzalin	E	E	E	G	G	G	N	N		F	F	N	E	F	P	E	P	P	P	P	F	N	P	N	N	N
Simazine	F	G	G	F	G	G		G	F	F	G	G	E	F	G	G	E	G	F	G	P	N	P	N	N	N
Sinbar	G	G	G	G	G	E	G	G	E	F	F	E	E	G	G	G	E	E	E	G	E	N	F	P	N	N
Solicam	E	E	E	E	G	E		G		F	G	G	F	F	G	P	G	G	E	G	F	P	G	P	N	N
<b>Postemergence</b>																										
Basagran	N	N	N	N	N			G		G		E	F	F	G	F	P	G	G	E		N	N	G	N	N
Clethodim	E	E	E	E	E	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	N	N	N	N
Fusilade	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	N	N	N	N
Glyphosate	E	E	E	E	E	E	G	G	G	E	F	E	E	G	E	E	G	E	G	F	G	F	G	F	G	G
Paraquat	G	G	G	G	G	G		G	F	F	F	G	G	G	G	G	F	G	G	G	G	P	P	P	P	P
Poast	E	E	E	E	G	N	F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	E	N	N	N	N
Rely 200	F	G	G	G	G	G	N	F	F	F	F	G	G	E	G	G	G	G	F	G	G	F	G	F	P	P

E = excellent, G = good, F = fair, P = poor, N = no activity

## Herbicide Resistance Management

Mode of action describes the process whereby a herbicide kills susceptible plants. The table below lists the mode of action, along with the chemical family, of all herbicides registered for use in blueberry in North Carolina. Each herbicide mode of action is assigned a numerical code for ease of use. Wherever possible, at least two modes of action should be used during the growing season (York , 2009 NC Ag Chem Manual p. 432).

<b>Herbicide Mode of Actions</b>			
<b>Brand Name</b>	<b>Active Ingredient(s) with Modes of Action</b>	<b>Chemical Family</b>	<b>Mode(s) of Action</b>
Aim	carfentrazone, MOA 14	triazolinone	14
Chateau	flumioxazin, MOA 14	n-phenylphthalimide	14
Casoron	dichlobenil, MOA 20	Nitrile	20
Dacthal	DCPA, MOA 3	benzoic acid	3
Devrinol	napropamide, MOA 15	acetamide	15
Direx	diuron, MOA 7	urea	7
Firestorm	paraquat, MOA 22	bipyridilium	22
Fusilade DX	fluazifop, MOA 1	aryloxyphenoxy propionate	1
Gramoxone Inteon	paraquat, MOA 22	bipyridilium	22
Karmex	diuron, MOA 7	urea	7
Kerb	pronamide, MOA 3	benzamide	3
Poast	sethoxydim, MOA 1	cyclohexandione	1

Princep	simazine, MOA 5	triazine	5
Rely or Rely 200	glufosinate, MOA 10	phosphinic acid	10
Roundup WeatherMax	glyphosate, MOA 9	glycine	9
Select and Select Max	clethodim, MOA 1	cyclohexandione	1
Sinbar	terbacil, MOA 5	uracil	5
Solicam	norflurazon, MOA 12	pyridazinone	12
Velpar	hexazinone, MOA 5	triazinone	5

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J. Scott Angle, Dean and Director