

2014 Blueberry Disease and Insect Management for Organic Growers in North Carolina

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Timing	Pest	Action	Comments
YEAR-ROUND	ANY	SCOUT	Scouting fields to identify and monitor pests is a critical part of both conventional and organic production. Scout fields regularly and record your observations. If a pest is not present, control measures are likely not needed, and may actually harm beneficial insects.
YEAR-ROUND	Root rot	IMPROVE DRAINAGE	Most instances of phytophthora root rot and other root-related problems are due to poor drainage. Plant in tilled, raised beds to improve drainage and increase aeration in the root zone. Maintain field drains to prevent standing water or saturated soils. Do not plant in heavy clay soils or in low areas that cannot be sufficiently drained.
DORMANT	Scales	PRUNE or SPRAY: Dormant oil	Scale insects are rarely severe enough to warrant control. Scale infested branches can often be removed during pruning. Be sure to check that scale insects are alive, as the hard cases of dead scale insects can remain on plants. Dormant spray oils can be used at 2 - 3 gal per acre, Pre-bloom only, using 200 to 400 gal per acre and at least 200 lbs of pressure. Not all oils are OMRI listed; check labels (REI 4 h, PHI 0d).
	Twig blight, stem blight, stem canker, fruit rots	PRUNE	Prune to remove dead and diseased stems that harbor fungal diseases. Prune to open the canopy, improving air movement through the bush, and remove those shoots with flower buds that are close to the ground.
	Mummy berry	RAKE, CULTIVATE, MULCH	Infected fruit from the previous year overwinter on the ground and are the source of spores that re-infect the bush each spring. On bare soil, rake or use a leaf blower to remove and destroy old mummies. Cultivating or mulching to bury the mummies under at least an inch of soil (or 3-4 inches of mulch) will prevent spore production.
	Exobasidium fruit and leaf spot	CANOPY MANAGEMENT	Exobasidium is a fungus that causes spots on leaves and green unripe spots on fruit at harvest. Infection occurs shortly after leaves emerge in the spring. The disease has been observed to be worse in areas of poor air movement and in fields where the leaf canopy is too dense. Winter pruning to remove crowded canes and improve penetration of air and sunlight may be beneficial.
DELAYED DORMANT	Exobasidium fruit and leaf spot	Lime-sulfur	Lime-sulfur can be applied at 5 gal/acre in 100 gallons of water 1-2 weeks prior to emergence of leaves or flowers.
PRE-BLOOM	Botrytis blight Mummy berry	SPRAY: Serenade MAX Serenade ASO	The QST 713 strain of dried <i>Bacillus subtilis</i> (Serenade MAX, 1-3 lbs/acre, or Serenade ASO, 2-6 qts./acre) is labeled for mummy berry and botrytis flower blight (REI 4 h, PHI 0d). Apply if mummy berry has been observed in previous years, or if cool, wet conditions occur that favor botrytis flower blight.

			Flower blight caused by the fungus <i>Botrytis cinerea</i> should be anticipated when excessive rain occurs during bloom, or following a freeze event that injures blossoms.
	Thrips Gall midge	SPRAY: spinosad MOA 5 (Entrust)	<p>Spinosad (Entrust, MOA 5) can be applied at 1.25 to 2 oz/acre for thrips or gall midge control (REI 4 h, PHI 3 d). Thrips present in densities greater than 2/flower in open blooms may justify treatment. A minimum of 10 flower clusters per acre should be observed and either placed in a closed plastic bag at room temperature or shaken onto a white sheet of paper. Thrips are more important in rabbit eye blueberries. A non-ionic surfactant may improve the performance of Entrust. Do not use Entrust for thrips if you plan on using during harvest for spotted wing drosophila management.</p> <p>CAUTION -- Entrust is quite toxic to bees until dry, (3 hrs) but thereafter it is relatively non-toxic to bees. Do not apply when bees will be present during this period. See label for additional use limitations. Do not apply insecticides during bloom.</p>
BLOOM	Cranberry fruit worm, Cherry fruit worm	SPRAY: Bacillus thuringiensis sub. kurstaki (many formulations)	Bacillus thuringiensis (Bt) is a bacterium that is effective in controlling lepidopteran insect pests (butterfly and moth larvae). Bt must be eaten to be effective, and thus will not control larvae once they are inside the fruit. Fruitworm adults can be monitored with pheromone traps, and fruit should be observed for egg laying or evidence of tunneling. Treatments should be timed to egg hatch (1-3 days after peak moth captures occur or after first eggs are observed on fruit).
	Botrytis blight Mummy berry	SPRAY: Serenade MAX Serenade ASO	The QST 713 strain of dried <i>Bacillus subtilis</i> (Serenade MAX, 1-3 lbs/acre, or Serenade ASO, 2-6 qts.acre) is labeled for mummy berry and botrytis flower blight (REI 4 h, PHI 0d). Apply if mummy berry has been observed in previous years, or if cool, wet conditions favor botrytis flower blight. Flower blight can be severe following a freeze event that injures blossoms.
	Anthracnose fruit rot Alternaria fruit rot	SPRAY: Serenade MAX	The QST 713 strain of dried <i>Bacillus subtilis</i> (Serenade MAX, 1-3 lbs/acre) is labeled for anthracnose and alternaria fruit rots (REI 4 h, PHI 0d).
PETAL FALL	Fruit rots, Leaf spots	SPRAY: Serenade MAX	
	Plum Curculio	SPRAY: kaolin clay MOA unknown (Surround) WP	Use 25 to 50 lb per acre (4 hr REI, 0 d PHI). Surround acts like a barrier and masks fruit from pest recognition. Because of this barrier, fruit should be washed after harvest, and Surround may be most appropriate for processing fruit.
	Cranberry fruit worm, Cherry fruit worm	SPRAY: Bacillus thuringiensis sub.	Bacillus thuringiensis (Bt) is a bacterium that is effective in controlling lepidopteran insect pests (butterfly and moth larvae). Bt must be eaten to be effective, and thus will not control larvae once they are inside the fruit. Fruitworm adults can be monitored with pheromone traps, and fruit should be observed for egg laying or evidence

		<p>kurstaki (many formulations) spinosad MOA 5 Entrust</p>	<p>of tunneling.</p> <p>Entrust is also affective against fruitworms but should not be used if a pre-bloom treatment was applied for thrips nor if it will be used later in the season for spotted wing drosophila management.</p>
SMALL GREEN BERRY STAGE	Fruit rots, Leaf spots	<p>SPRAY: Serenade MAX</p>	<p>The QST 713 strain of dried Bacillus subtilis (Serenade MAX, 1-3 lbs/acre) is labeled for anthracnose and alternaria fruit rots (REI 4 h, PHI 0d).</p>
	Plum Curculio, Cranberry fruit worm, Cherry fruit worm	<p>Same as at Petal Fall spray</p>	<p>Fruitworm adults can be monitored with pheromone traps, and fruit should be observed for egg laying or evidence of tunneling. Treatments should be timed to egg hatch (1-3 days after peak moth captures occur or after first eggs are observed on fruit).</p> <p>No currently available organically acceptable insecticide has been demonstrated effective against plum curculio.</p>
PRE-HARVEST AND DURING HARVEST	Blueberry maggot	<p>SPRAY: spinosad, MOA 5 (GF-120) (Entrust)</p>	<p>Monitor for adult blueberry maggot flies using yellow sticky traps baited with ammonium bicarbonate food lures. Treatments for blueberry maggot are only necessary if flies are captured in monitoring traps. If you are exporting fruit to Canada, check with your distributor to identify how to comply with blueberry maggot quarantine protocols. Adults usually appear the last week of May, but do not begin to lay eggs until 7 to 10 days later.</p> <p>GF-120 at 10 – 20 fl oz (4 hr REI, 0 d PHI) is a bait spray and kills flies after they feed. Use concentrated sprays under dry conditions; more dilute sprays may be effective under humid conditions.</p> <p>Entrust 1.25 – 2 fl oz (4 hr REI, 3 d PHI) may be used as a cover spray but is not as persistent as conventional insecticides.</p>
	Spotted wing drosophila	<p>SPRAY: spinosad, MOA 5 (Entrust)</p> <p>PYGANIC</p>	<p>Spotted wing drosophila (SWD) begin to attack fruit as it changes from green to blue. If SWD are present in your area, preventive management is recommended beginning when fruit ripen.</p> <p>Entrust 1.25 – 2 fl oz (4 hr REI, 3 d PHI) is the most effective organic insecticide currently available for use against SWD, but it is less persistent than conventional alternatives. Therefore, a frequent application interval may be necessary. Note that only 9 oz of Entrust may be used per season, so applications must be carefully timed to harvest. Do not treat fields with Entrust that do not have ripe fruit present, and do not treat fields with Entrust post harvest. Entrust can be rotated with Pyganic to increase application interval and for resistance management.</p> <p>Pyganic (12 hr REI, 0 d PHI) has limited activity against SWD, but it may be useful used in rotation with Entrust, particularly for resistance management and to allow for season long management. Pyganic applications are expected to be effective against SWD for a relatively short period of time (1-2 days), so they should be followed after that period with Entrust.</p>
	Fruit Rots	<p>HARVEST ONLY WHEN FRUIT IS DRY; TIMELY HARVEST FOLLOWED BY</p>	<p>Most postharvest decay occurs at the stem end of harvested fruit. To reduce postharvest decay handle fruit only when dry -- avoid harvesting or handling fruit that is wet with rain or dew. Timely, complete harvest is critical. Pick all ripe fruit every five days or less to avoid soft, overripe berries. Keep containers of harvested fruit in the shade, and transport to a cooler location as soon as possible. Use forced-air cooling to remove field heat and to dry the exposed stem scars, for improved shelf life. Pre-cool trays of harvested fruit to 65 F prior to packing.</p>

		COOLING	Once packaged for sale, hold at 34 F for optimal quality and shelf life.
IMMEDIATELY AFTER HARVEST	Blueberry bud mite	SPRAY: Oil, superior type MOWING	Use 2 gallons per acre (4 hr REI, 0 d PHI). To obtain satisfactory bud mite control, use 200 to 400 gal water per acre with at least 200 psi pressure. <u>Bud mites are greatly reduced by summer mowing (hedging) immediately after harvest.</u>
	Leaf spots	MOWING	Mowing (summer hedging) can be practiced on southern highbush cultivars in southeastern NC and in states further south where the growing season is sufficiently long for shoots to re-grow after mowing. Mowing after harvest removes old, infected leaves and forces a new flush of growth that is much less affected by leaf spots.
TWO WEEKS AFTER HARVEST	Leafhoppers (Stunt vector)	SPRAY: PYGANIC	Pyganic (12 hr REI, 0 d PHI) can be used to control sharpnosed leafhopper, the vector of blueberry stunt disease. Use yellow sticky traps to determine if sharp nosed leafhoppers are present in your fields and remove any infected plants.
	Blueberry Stunt	REMOVAL	Rogueing (removal of infected plants) helps prevent spread of the stunt phytoplasma from one bush to the next. Plants to be rogued should be sprayed with pyganic (SEE ABOVE) before they are disturbed, to prevent leafhoppers from spreading to adjacent healthy bushes.
	Japanese beetles		Japanese beetle feeding seldom requires treatment in North Carolina blueberries.
FOUR WEEKS AFTER HARVEST	Red humped and yellow necked caterpillars	SPRAY: Bacillus thuringiensis sub. kurstaki (Bt, Deliver, many formulations)	Bt formulations can be used at 0.25 to 1.5 lb per acre (See label; 4 hr REI, 0 d PHI). Several species of caterpillars can feed on blueberries from late summer to early fall. These caterpillars can potentially defoliate bushes, but are often not widespread throughout the planting. Spot treatments may often be sufficient.
SIX WEEKS AFTER HARVEST	Leafhoppers	SPRAY: PYGANIC	
LATE SEPTEMBER OR EARLY OCTOBER	Leafhoppers	SPRAY: PYGANIC	This spray is essential for control of the third leafhopper generation, which is present from late September until frost.
FIRE ANTS	Fire ants	GRANULAR BAIT: spinosad (Seduce)	Seduce Insect Bait contains spinosad and can be used as a broadcast (22-40 lb/acre) or spot treatment. Ants must be actively foraging for baits to be effective. Seduce is OMRI listed (4 hr REI, 3 d PHI).

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BEFORE YOU SPRAY:

- 1. Organic fungicides and insecticides are only one means of controlling disease and insect pests, and should be used only when other control methods are not available or practical.**
- 2. Before using any organic fungicide or insecticide, make sure that the pest has been properly identified. Not all products control all pests, and not all insects require control. Consider whether sprays might adversely affect beneficial organisms.**
- 3. Spray injury has been observed on blueberries following addition of some surfactants to spray solutions. Caution is advised -- in general, surfactants, fertilizers and other spray additives should be avoided whenever possible in sprays applied directly to blueberry flowers, fruit or foliage unless specified on the product label.**
- 4. Host plant resistance, organic products, geographic isolation, clean planting stock, sanitation, and cultural practices can all be used successfully to manage pests. For more information access the Blueberry Pest Management site – http://ipmwww.ncsu.edu/small_fruit/blueipm.html or see regional information at www.smallfruits.org**

It is a violation of the law to use any pesticide, even an OMRI-approved organic product, in a manner not permitted by its labeling. To protect yourself, never apply any pesticide in a manner or for a purpose other than as instructed on the label, or in labeling accompanying the pesticide product that you purchase. Don't ignore the instructions for use of protective clothing and devices and for storage and disposal of pesticide wastes, including containers. Recommendations of specific chemicals are based upon the information on the manufacturer's label and in some cases, on performance in a limited number of trials. Because environmental conditions and methods of application by growers may vary widely, performance of the chemical will not always conform to the safety and pest control standards indicated by experimental data. All recommendations for pesticide use were legal at the time of publication, but the status of registration and use patterns are subject to change by actions of state and federal regulatory agencies. Always read and follow the label.

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