

BUSHEL *and* BERRY®

— Growing Blueberries —

This is a document intended to provide Bushel and Berry® growers information and resources to help with general aspects of growing Bushel and Berry®.

MOST IMPORTANT FACTORS TO BLUEBERRY NURSERY NUTRITION & DISEASE MANAGEMENT

1. Blueberries grow best at low pH levels (4.5-5.5) and are sensitive to high electrical conductivity and drying. Make sure media and water are in correct ranges. Never use lime on containerized blueberries.
2. Foliar diseases can be greatly reduced by minimizing leaf wetness (spacing, shearing, watering times) and by using a basic foliar fungicide program during the growing season.

OBSERVED CONDITIONS OF CONTAINER-GROWN BLUEBERRY NURSERY STOCK:

- **Red coloration to leaves:** Typically due to some environmental stress such as transplant shock or cool nights during the growing season. This may be due to Nitrogen deficiency. Phosphorus, Potassium and micronutrient deficiencies are exceptionally rare when compared to Nitrogen. During the growing season, plants respond quickly to fertilizer applications when Nitrogen is limiting. Pest issues, such as root rot and root weevil can also occasionally cause leaves to turn red.
- **Pale leaves with bright green veins (interveinal chlorosis):** Typically due to high pH of media (>6), or high pH and bicarbonate concentration in water. Test both water and media.
- **Evenly spotted or mottled leaves:** Typically phytotoxicity from chemical application.
- **Unevenly spotted and/or clustered leaf spotting:** Fungal or bacterial leaf-spot.
- **Discolored spots on leaves and/or orange pustules on the underside of leaves:** Rust.
- **Marginal leaf burn and/or crispy leaves:** Dry plants and/or salt stress from fertilizers under hot dry conditions. If suspected, take a sample of media to test the electrical conductivity, and then leach salts immediately by irrigating.
- **Distorted new growth and/or discolored damaged buds:** Arthropod damage or frost.
- **Ragged leaf margins:** Arthropod damage or hail.

I. ARTHROPOD PESTS

a. Distorted growth and/or discolored growing tips

Can appear as a micronutrient deficiency. Both the blueberry gall midge (*Dasineura oxycoccana*) and thrips spp. are typically the cause of this problem. Although less common, aphids are sometimes the cause of this as well. All are common in many growing regions. Thrips damage typically occurs in hot conditions and is usually visible as dry and jagged leaf edges and discolored growing tips. Gall midge larvae feed and grow in the bud, essentially dissolving the bud. All can be identified by careful inspection of damaged buds using a hand lens.

Management: Thrips and aphids can typically be managed effectively using curative applications with effective materials if used before populations get too high. Gall midge can be difficult to control within a year once it has become established. This pest is most effectively managed with spring applications of effective materials, targeted at the first generation of adults.

b. Other foliar insect damage

Depending on the location, a number of insects can cause regional issues in plants, including sucking insects such as aphids and scale, and chewing insects such as Japanese beetles, root weevil adults (*Otiorhynchus spp.*) and a number of caterpillars.

2. FOLIAR DISEASES

Several foliar diseases may affect blueberries, particularly during periods of prolonged leaf-wetness, or in humid environments. Cultural methods that reduce leaf wetness are primary to avoiding issues with these diseases, though a broad spectrum fungicide program during the growing season will also aid in greatly reducing the risk from these pathogens.

a. Leaf spots and cane cankers

Most leaf spots and cane diseases of blueberries are caused by fungi such as septoria, anthracnose, alternaria and botrytis. In the Pacific Northwest and the Northeast, bacterial leaf-spots (*Pseudomonas spp.*) and cane blights can also occur, but typically to a lesser-extent. Bacterial spots are generally much more angular and vein-delimited than their fungal counterparts.

Management: Laboratory diagnoses are often not conclusive as to specifically which organism caused these spots, but for all these diseases, prevention and management are similar. Disease is minimized by keeping leaves as dry as possible through cultural techniques such as irrigation management, plant spacing and shearing to open the canopy. Broad-spectrum fungicides are effective when used preventatively when conditions favor disease development. No fungicides will cure an infection after it develops, but may slow its spread. Although less-common and regionally limited in extent for the Northwest and Northeast, it is important to evaluate whether the leaf-spot could be bacterial. For these cases, standard fungicides are ineffective and Copper is the only effective bactericide used in blueberries.

b. Leaf rust

Blueberry leaf rust (*Naohidemyces vaccinii*) is a common disease, generally more prevalent in humid Southern regions, but also present in Northern regions when warm conditions and prolonged wetness periods favor disease development. The lifecycle is complex, with inoculum sometimes persisting on leaves of varieties that do not defoliate or on leaf-litter in close proximity to plants. Hemlock is also a host, and inoculum can enter a system from trees in close proximity to nursery blocks.

Management: Most of rust management is preventative, and on certain varieties it can be particularly difficult to clean up a disease problem once it develops. For sensitive varieties such as Peach Sorbet® and other evergreen

varieties with Southern genetics, take extra caution to minimize wetness periods, particularly during hot stretches when temperatures are in the 80's and above. Use a preventative fungicide program using effective labeled materials (check individual state regulations), such as Pageant® and Banner Maxx®. At the first sign of disease development, ensure that leaves are not staying wet. Spacing plants may help greatly. Extreme cases may lead to defoliation. Cleaning-up leaves that fall after a crop has finished will reduce the inoculum for future years.

c. Stem blight and other regional diseases

In addition to the disease described above, a number of other diseases do occur regionally. For example, stem blight (*Botyosperia*) can be devastating under certain conditions in the Southeast up into the Mid-Atlantic states. In cases where the above descriptions do not satisfactorily match the observed symptoms, check with local extension experts.

3. VIRUS DISEASES

Keeping these liners free of viruses at grow-out nurseries is fairly simple, but will vary by location. Contact of containerized plants flowering should be minimized to prevent contact with nematode vectors. In the Northwest, flowering should be minimized to reduce exposure to the pollen-borne Shock Virus. In all regions, aphids, leafhoppers and thrips should be controlled to minimize exposure to viruses spread by these vectors.

4. ROOT DISEASES

Blueberries are fairly sensitive to phytophthora root rot (species=*cinnamomi*). Liners will arrive healthy, and to prevent problems from this disease developing, minimize possibilities of introducing the pathogen or generating conditions that favor the development of this disease. For best results, use these general guidelines: 1) Only pot with new, well-drained media mixed on a slab. 2) Never re-use pots without sterilizing with steam. 3) Ensure that water does not stand in the area where the plants are grown. Surface water often contains some natural level of phytophthora, so when at all possible it is preferable to water using well water or treated surface water. However, even when the pathogen is present in the water, issues generally do not develop if the growing conditions do not favor disease development (drainage).

Management: A fungicide program is generally not needed, but if conditions favor the development of diseases, or if problems have existed historically, effective fungicides, such as Fosphite® and Ridomil® may be effective in managing the problem.