



CHAPTER 4

Highbush Blueberries

General

Several species of blueberries are indigenous to the United States. These include the lowbush blueberry (*Vaccinium angustifolium*) which is of commercial importance in Maine and Canada; the rabbiteye blueberry (*V. ashei*), which is grown commercially in the southern United States; and the highbush blueberry (*V. corymbosum*), which is the commercial blueberry of importance in the Midwest. The information presented here pertains solely to highbush blueberry production.

The Blueberry Plant

The blueberry plant is a perennial, consisting of a shallow root system and woody canes that originate from the crown of the plant. The root system is very fibrous but is devoid of root hairs. Root hairs function in most plants by increasing the surface area of the root for water and nutrient uptake. This characteristic makes the blueberry plant very sensitive to changing soil water conditions.

A mature cultivated blueberry (at five to seven years) usually has 15 to 18 canes. Growth habit varies among cultivars, with some bushes growing very upright, while others have a more spreading growth habit. Fruit is borne on buds that are formed the previous growing season. The blueberry plant requires an acid soil pH (4.5 to 5.2).

Blueberries will generally tolerate temperatures to -20°F, although there is some cultivar variation. Most require 750 hours of chilling below 45°F. This requirement is usually met by no later than mid-January to early February. After the chilling requirement is met, the plant loses its dormancy, and thus its cold hardiness, with each warm period, making it increasingly more susceptible to cold injury as the season progresses.

Site Selection and Preparation

Select the site where winter temperatures do not go below -20°F. Depending on cultivar, snow cover, and acclimation prior to winter, blueberries have sustained -25°F with minimal plant damage, but flower buds can be damaged. Also the site should be on a high point (elevated) to avoid low spring temperatures. Blueberry flowers bloom later than peach or apple, and some cultivars can tolerate temperatures of 25°F to 28°F for a short duration without damage.

Soils

The best soils for blueberries are well-drained sandy silt loam or silt loam, with a pH of 4.5 to 5.2, organic matter of 4% to 7%, and adequate phosphorus and potassium. In major commercial blueberry areas, blueberries are produced on sandy soils with high water tables. Most Midwest (except some Michigan soils) soils require amendments and irrigation for maximum growth and yield. Tile drainage may be required, but in most Midwestern soils containing 10% or more clay, raised beds are preferred for optimal growth. A raised bed 8- to 10-inches high (original height) and 4-feet wide is required. Over time, the bed will compact to 6 inches, but the addition of hardwood or other suitable mulches maintains a height of 6 to 8 inches.

Most soils will need to be adjusted in pH. Too low a pH can result in manganese or aluminum toxicity, while a high pH results in the unavailability of certain nutrients such as iron. Do not plant blueberries without amending the pH at least one to two years before planting. Test the soil. Soil test kits are available from your local county Extension office. Where top and subsurface soils have a naturally high pH (6.0 to 8.0) and there is a high buffering capacity, soil amendments will be unable to adjust the pH, and blueberries should not be planted. Where soil pH is too low, apply lime to increase the pH. Sulfur can be



used to decrease the pH to the proper level if the pH is not too high (Table 4-1).

Incorporate sulfur, phosphorus, and organic matter into the raised bed (upper 6 to 12 inches) three to six months prior to planting. This allows time for the chemical reaction to occur and reduces potential root damage. Retest the soil three to six months after application to make further adjustments. Apply all nutrients according to the soil test. Phosphorus will not move through the soil and is ineffective after plant establishment. Applying sulfur to only the raised bed may require 500 to 800 pounds per acre of bed to decrease the pH by 0.5. Incorporate sulfur at least three weeks before planting.

Irrigation and Mulch

Because the blueberry plant is very sensitive to fluctuating soil moisture, mulch and irrigation are essential for a healthy planting and consistent yields. Peatmoss at 1/2 cubic foot per plant should be incorporated into the upper 6 inches of soil as the plants are planted. Blueberry plants require at least 1 to 2 inches of water per week. Hardwood bark mulch (oak or pine), rotted sawdust, and chopped corncobs are good mulches. They should be applied to a depth of 2 to 4 inches and replenished whenever necessary. Avoid mulch with a high pH, such as mushroom compost or noncomposted leaves, which may be high in natural toxins.

Though either overhead or trickle irrigation can be used in blueberries, trickle both conserves moisture and supplies the plant with adequate water. The trickle line can be placed under the mulch, so that it is out of the way and, in some cases, semipermanent. Because the small emitter holes in trickle irrigation components clog easily, the water source must be very clean (municipal, well water, or clean spring), or water should be filtered through a sand filter. Overhead irrigation has the advantage of cooling the plants and the berries during times of extremely high temperatures.

Annual applications of nitrogen are necessary. Where potassium is needed, applications of potassium nitrate or other potassium fertilizers can be used. Ammonium sulfate is recommended in upland soils where the pH is above 5.0. Urea is suggested for soils below 5.0. Apply urea during cool, rainy weather or irrigate after application. Ammonium sulfate, urea, or potassium nitrate can be injected through trickle (microirrigation) systems. Use one half the ground application rates when applying nitrogen with irrigation or in banded application.

For newly planted blueberries, broadcast two applications each of 10 pounds of actual nitrogen per acre at bloom and then three weeks later. (See Table 3-1 page 56.) Ten pounds of actual nitrogen per acre at each broadcast application in mid-April, mid-May, and mid-June should be applied in the second to

Present pH of Soil	Desired pH Value for Blueberries					
	4.5			5.0		
	Sand	Loam	Clay	Sand	Loam	Clay
4.5	0.0	0.0	0.0	0.0	0.0	0.0
5.0	0.4	1.2	1.4	0.0	0.0	0.0
5.5	0.8	2.4	2.6	0.4	1.2	1.4
6.0	1.2	3.5	3.7	0.8	2.4	2.6
6.5	1.5	4.6	4.8	1.2	3.5	3.7
7.0	1.9	5.8	6.0	1.5	4.6	4.8
7.5	2.3	6.9	7.1	1.9	5.8	6.0

^a To convert to lb/acre, multiply by 435.

Source: Pennsylvania State University, *Small Fruit Production and Pest Management Guide*. Used with permission.



fourth year. In mature plantings, 50 to 70 pounds of actual nitrogen can be used but maintain leaf nitrogen levels between 1.7% to 2.1% and potassium between 0.35% to 0.40%. Nitrogen applied to cool soils will require a longer time to convert ammonium. However, nitrogen applied at least three weeks before bloom will increase yields.

When injecting nitrogen fertilizer with irrigation, broadcast the mid-April application and apply one half the remaining broadcast amount from mid-May to mid-June with irrigation. (Example: 60 pounds annually = 30 pounds mid-April, broadcast; 30 pounds irrigated mid-May to mid-June). Continue to irrigate with water only after mid-June as needed. In most Midwest areas, a soil may lose 0.25 to 0.30 inches of water per day. Use tensiometers and maintain 20 to 25 centibars in the upper 12 inches of soil.

Integrated Management of Blueberry Diseases

The development and use of an integrated disease-management program is essential to the successful production of blueberries. The objective of an integrated disease-management program is to provide a commercially acceptable level of disease control on a consistent (year-to-year) basis. This is accomplished by developing a program that *integrates* all available control methods into one program. An effective disease-management program for blueberries must emphasize the integrated use of specific cultural practices, knowledge of the pathogen and disease biology, disease-resistant cultivars, and timely applications of approved fungicides or biological control agents, when needed. In order to reduce the use of fungicides to an absolute minimum, the use of disease-resistant cultivars and various cultural practices must be strongly emphasized.

Identifying and Understanding the Major Blueberry Diseases

It is important for growers to be able to recognize the major blueberry diseases. Proper disease identification is critical to making the correct disease-management

decisions. In addition, growers should develop a basic understanding of pathogen biology and disease cycles for the major blueberry diseases. The more you know about the disease, the better equipped you will be to make sound and effective management decisions.

The literature listed here contains color photographs of disease symptoms on blueberries, as well as information on pathogen biology and disease development:

Compendium of Blueberry and Cranberry

Diseases — Published by the American Phytopathological Society, 3340 Pilot Knob Rd., St. Paul, Minnesota 55121. Phone: 612-454-7250, 1-800-328-7560. This is the most comprehensive book on blueberry diseases available. All commercial growers should have a copy.

Highbush Blueberry Production Guide — This is a very comprehensive book covering most phases of blueberry production. It can be purchased from the Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Cooperative Extension, Ithaca, NY 14853. Phone: 607-255-7654.

For a description of symptoms, causal organisms, and control of the most common blueberry diseases in the Midwest, consult the following.

Fruit Diseases

Mummy Berry

(Monolinia vaccinii-corymbosi)

Mummy berry is becoming increasingly important in some parts of the Midwest; its severity varies from year to year. It is caused by a fungus that attacks new growth, foliage, and fruit and can cause extensive loss.

The fungus overwinters in mummified fruit on the ground (Figure 135). The mummies form cup- or globe-shaped structures called apothecia. Apothecia produce spores that infect young tissue and cause rapid wilting. This is called leaf and twig blight, or bud and twig blight. These symptoms are difficult to distinguish from frost injury. These first infections form more spores, which are spread by rain, wind, and bees to blossoms and other young tissue. The fungus infects and invades the developing fruit. The fruit becomes malformed, looking like a pumpkin,

