Determining When To Irrigate Highbush Blueberry

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The amount of water supplied to blueberry plants influences vegetative growth, fruit size and quality. Supplemental irrigation is almost always needed for maximal yields even in years of plentiful rainfall because rain events occur irregularly resulting in periods of drought during the growing season. In addition, the nature of the root system makes the plants sensitive to moisture fluctuations.

The distribution of the blueberry root system is dependent on the age of the plant and climactic and soil conditions. In general, blueberry plants have shallow root systems with the majority of the roots 8 to 12 inches deep in the soil and rarely deeper than 16 inches. Most of the roots, 90%, are located within the dripline of the blueberry canopy.

Root systems of highbush blueberry plants are composed primarily of very thin roots. Roots can be up to 0.04 inch in diameter, however most are 0.02 to 0.03 inches in diameter, about the thinness of a strand of hair. Blueberry roots lack root hairs that are used in other plants for mining the soil for water and nutrients. Instead, blueberry roots have formed a unique association with endomycorrhizal fungi. The fungi inhabit blueberry root cells and facilitate water and nutrient (especially nitrogen and phosphorous) uptake for the blueberry plant, essentially acting as root hairs. In return, the fungi use carbohydrates from the plant for nourishment. Endomycorrhizal fungi survival is jeopardized in production systems using extensive inorganic fertilizers and cultivation. In this situation the roots can be less efficient at water and nutrient uptake.

The following example will help determine the need for supplemental irrigation in various situations. First, determine the available water holding capacity of the root zone. Ascertain the soil texture of the site and use a rooting depth of 16 inches, multiply the rooting depth by the available water holding capacity (from the table below) to determine the available water holding capacity of the root zone. For example, a clay loam soil would have an available water holding capacity of 2.24 inches of water (0.14 inch of water per inch of soil multiplied by 16 inches of soil). The water held in the root zone should not drop below 50% of capacity to avoid moisture stress to the plants. In this example the amount of available water should not drop below 1.12 inches of water held in the root zone.

The next piece of information needed is how much water the plant uses a day or the average peak use rate. In New York, the average peak use rate varies from 0.17 to 0.23 inches per day (see the table below). A blueberry plant in Buffalo in July can be using up to 0.22 inches of water per day. With 1.12 inches of water easily available to use and no other water supplied, the plant will use 1.12 inches of water in about 5 days (1.12 inches of water divided by 0.22 inches of water per day equals 5.09 days). The daily peak values are averages and can be up to 25% higher.

Several methods exist to determine when to irrigate. One is the 'checkbook' or water budget method, which uses the water holding capacity of the soil (described above). To use this method, determine the plant water use and the amount of rainfall daily. Subtract the daily plant water use

and add the daily amount of rainfall to the available water holding capacity of the soil. Irrigate the plants when the available water holding capacity of the soil drops to 50% of capacity. Soil moisture content should be checked periodically to verify water use and availability.

Available water holding capacity based on soil texture. Source: Commercial Vegetable Production Recommendations Pennsylvania 2003.

Texture	Water Holding Capacity (in. of Soil water /in. of soil)
Course sand	***0.02 - 0.06***
Fine sand	***0.04 - 0.09***
Loamy sand	***0.06 - 0.12***
Sandy loam	***0.11 - 0.15***
Fine sandy loam	***0.14 - 0.18***
Loam and silt loam	***0.17 - 0.23***
Clay loam/silty clay loam	***0.14 - 0.21***
Silty clay and clay	***0.13 - 0.18***

Monthly average potential evapotranspiration or peak use rate of water demand for July and August at various locations in New York.

Location	Average Peak Use Rate (inches/day)
Albany	***0.20***
Binghamton	***0.17***
Buffalo	***0.22***
New York	***0.23***
Rochester	***0.21***
Syracuse	***0.21***

Source: Pritts, M.P. and J.F. Hancock, 1992.

Another method is to assume that blueberry plants need about 1 - 2 inches of water per week depending on the growth stage of the plant. Two inches may be supplied from the period of fruit expansion to harvest. Irrigate the plants when rainfall does not meet the plant demand water in a given week. This method is less precise than the water budget method. As with the water budget method, soil moisture content should be checked periodically to verify water use and availability. *(Source:* Fruit Times, 2003, Vol. 22, No. 11)

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