Managing Blueberry Nutrition

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Blueberries have unusual nutrient requirement so fertilization practices are different from those of other fruit crops. Relative to most perennial fruit crops, they have low nutrient needs and are sensitive to excessive nutrient levels in the soil. Since the crop value is relatively high there is a tendency to apply more types or amounts of fertilizers with the hope of improving yield or quality.

Common Nutrient Problems. Soils vary by region and so do nutritional problems. Most Michigan blueberries are grown on naturally acidic sandy soil with a high organic content. The primary nutrient problem is lack of nitrogen (N). Shortages of phosphorus (P), potassium (K) and magnesium (Mg) are less common, and shortages of and most micronutrient shortages are relatively rare. Other nutritional issues may occur on different soils. This is particularly true if heavier or more alkaline soils are used.

Soil pH. Many nutrition problems can be avoided by maintaining a proper soil pH. Optimum soil pH for blueberries is 4.5 to 5.0, but plants usually do fine a little above or below this range. If pH is above 5.5, leaves become chlorotic and plants lose vigor. Very acidic soils (pH < 4.0) can also reduce growth, particularly those with significant amounts of clay.

Sample the soil to monitor pH before planting new bushes, and every few years thereafter. Apply sulfur to reduce soil pH. Do not use aluminum sulfate; it is expensive and may injure bushes. Measure the pH to determine how much of a reduction is needed. As a guide, 300, 600 or 1,000 lb of S per acre are needed to reduce pH by one unit (e.g. 6.0 to 5.0) in a loamy sand, sandy loam, or loam, respectively. Apply sulfur a year before planting, since it takes a season to react in soils. Lime may help if pH is below 4.0, but we have not seen benefits from lime applications if pH is higher.

Soils that have been acidified to accommodate blueberries tend to migrate back to their original pH, so you may need to add sulfur periodically over time. If irrigation water is high in alkalinity or dissolved lime, watering will tend to gradually increase soil pH. Alkalinity levels above 100 ppm are high enough to increase pH.

Nitrogen. Blueberries on most soils require annual N applications for good production. However, excessive rates can also reduce blueberry vigor, yields and hardiness (also waste money and pollute water). Use fertilizers containing ammonium (NH_4^+) nitrogen. Use urea if the soil pH is sufficiently low (below 5.0), and ammonium sulfate if the pH is slightly high (above 5.0). Ammonium sulfate is more acidifying (reduces pH) than urea. Mono-ammonium phosphate (MAP) and di-ammonium-phosphate are suitable N sources if P is also need. Blended fertilizers contain other nutrients may also be suitable if most of the N is in the form of urea or ammonium.

Start with low rates on young plants and increase amounts as the plants age, up to 60-70 lb N/acre on mature plants (Table 1). These rates may need to be adjusted by soil type. More N may be needed on very sandy soil with little organic matter, whereas plants on organic or fine-textures soils may require much less N.

Table 1. Blueberry nitrogen recommendations (lb/acre).

Years in field	N	Urea	Ammonium sulfate
2	15	35	75
4	30	70	150
6	45	100	215
8	65	150	300

Apply N during periods of peak demand by the plants. Our recommendation is to apply half of the annual amount prior to bloom and the second half at petal fall. If your site is very cold and winter injury is common, be particularly careful about the rate and application time. High rates tend to keep blueberries growing too late into the fall so the wood and buds will not have time to acclimate to the cold. Also avoid fertilizing after early July as this may also stimulate late growth and reduce hardiness.

Blueberries usually benefit from mulching with wood chips or bark. Mulch materials with high C:N ratios tie up N as they decompose, so more fertilizer may need to be applied to get enough N to the plants. Fresh sawdust and wood chips can have C:N rations of 500:1, so N rates may need to be doubled where these are applied. The C:N of bark and aged wood chips is usually lower, so N rates may not need to be increased quite as much.

Phosphorus. Many Michigan blueberries contain deficient leaf p levels even though soil test adequate for P. When plants are deficient, leaves develop a darker green, purplish color. We need to test some strategies for correcting P shortages. At this point, a reasonable program for P deficient plantings is annual applications of modest rates (25-50 lb P_2O_5 per acre). Two useful fertilizers are monoammonium phosphate or MAP (11-52-0) and diammonium phosphate or DAP (16-48-0).

Potassium. K applications are usually not needed each year unless the soil is very sandy. Acute deficiencies cause the margins of leaves to scorch and brown as if they are drying out. Rates of 50-75 lb K_2O per acre correct most deficiencies. Use potassium sulfate (0-0-50) or muriate of potash (0-0-60). Muriate is cheaper than potassium sulfate but the chloride in muriate can injure blueberries. Use some caution if you choose muriate. I would suggest applying this material in the fall so winter precipitation can remove chloride from the soil. Do not use muriate on young bushes or apply more than 100 lb K_2O per year.

Soil testing is best used in blueberries to monitor soil pH. Soil test nutrient levels only provide an estimate of nutrient supply and do not accurately describe whether bushes are getting enough nutrients. Sample all blueberry soils before planting, and sample established plantings every 2-4 years. One sample is usually need for every 10 acres. Soils can be sampled anytime. Collect soil with a soil probe or auger from at least 20 locations throughout the sampling unit. Sample from beneath the plants to a depth of 8 inches. Combine the soil in a bucket, mix, and submit a portion for analysis.

Leaf analysis is the best way to monitor the nutrition of blueberries. Sample from young plantings every 1-3 years and from mature plantings every 3-5 years. Sample leaves in late July to early August. Collect at least 50 leaves from different bushes throughout the sampling unit. Select healthy leaves from the middle of this year's shoots. Package leaves in clearly labeled paper bags, and send them to a reputable laboratory. Use Table 2 to interpret your leaf analysis results.

Table 2. Tissue Analysis Interpretation for Blueberries.

Nutrient	Deficient (<)	Normal	Excessive (>)
Macronutrients (%)			
Nitrogen (N)	1.7	1.7 to 2.1	2.3
Phosphorus (P)	0.08	0.1 to 0.4	0.6
Potassium (K)	0.35	0.35 to 0.65	0.8
Calcium (Ca)	0.13	0.2 to 0.6	0.8
Magnesium (Mg)	0.1	0.15 to 0.3	0.4
Micronutrients (ppm)			
Boron (B)	15	20-60	80
Copper (Cu)	?	5 to 20	?
Iron (Fe)	?	60 to 200	?
Manganese (Mn)	?	50 to 350	?
Zinc (Zn)	?	8 to 30	?