Fertilization of Blueberries

Prior to planting

Sample the soil in representative areas of the field and send the sample(s) to a reliable laboratory for analysis of pH, electrical conductivity, and levels of all nutrients except nitrogen(N). Apply granular forms of the important nutrients – phosphorus(P), potassium(K), magnesium(Mg), calcium(Ca), and the micro elements to bring field soil to optimum levels according to the soil analysis indications. Identify different landscapes, soil types, or prior uses and analyze those areas separately.

When applying fertilizers and acid amendments, concentrate on amending the bed area – 2 ft either side of the row. The form of phosphorus or potassium to apply is not critical. An economical granular form of the nutrient(s) can be used. For magnesium and calcium sources, avoid limestone, as it will raise the pH. Calcium sulfate (gypsum) is a source of Ca and SulPoMag – sulfate of potassium magnesium - is a source of K and Mg that will not affect the pH. Minor elements can be incorporated pre-plant also or added through the drip system. Apply sulfur or other acidification materials as needed pre-plant to alter pH as needed (see section on acidification). The nitrogen analysis is not useful for N fertilizer application rates and timing and N rates are determined by crop, cropping and amendment history, and soil type.

Recurring Maintenance Applications

Blueberry vegetative development responds dramatically to N applications if other conditions are optimum. Plants will respond to N applications by developing the plant structure on which future yields depend with vigorous new and larger canes. Early in the establishment of a new planting, N is important to develop a large vegetative structure on which to hang fruit. Later, the N is important to re-grow large branches and new canes to support continuing growth and to keep plants vigorous and productive. After the crop is established, the soil should be analyzed every 3-4 years for all of the major plant nutrients except nitrogen.

The preferred way of applying nitrogen is injected through the irrigation system. Soluble N forms may also be applied on the surface near the plant row and irrigated in with sprinklers or rainfall. Use ammonium forms of N (e.g. ammonium sulfate, urea,) whenever possible. Blueberries prefer the ammonium form of N and ammonium is the predominate N form in the soil at low pH.

Apply N regularly (weekly, biweekly, or monthly) during the period when the plant is growing actively. Depending on specific climate conditions, with the evergreen growing system in mild winter climates, this will be an annual period from 9-12 months. In even the mildest California growing areas, growth slows during December and January and nitrogen fertilization is not needed during this period. For new plantings, apply 150 lb N per acre per year or 15 lb N per acre per month from February to November. After year 3, apply 275 - 300 lb N per acre per year or 30 lb N per acre per month from June to November and 15 lb N per acre per month from December to May. In more northern parts of mild winter areas, delay N application until February. For example: if using ammonium sulfate fertilizer (21% N), for a typical monthly application at the 30 lb N rate apply 30/0.21 = 143 lb ammonium sulfate per acre per month – distributed among 2-4 weekly or biweekly injections.

One means of acidifying irrigation water is with urea sulfuric acid (US 15, Nphuric, or a similar product). Using the urea sulfuric acid will also supply N with each application. The amount applied depends on the initial pH and the bicarbonate content of the water as determined by a laboratory analysis. Typically, water sources for California blueberry production areas require something in the range of 0.20-0.35 gallon of US 15 providing 15% N for every 1000 gallons of irrigation water applied to lower the pH to near 5.0. This material weighs 12.65 lb per gallon so this means for each acre-inch of acidified irrigation water used, 10.3 lb of N will be applied.
Nitrogen needs tend to fall during the cooler periods of the winter months for field grown blueberries even in the evergreen system. Some growers in mild areas will produce fruit during the mild winter months from open field production. These plants should receive monthly N, but at half the normal rate. If plants are grown in tunnels emphasizing winter and spring production however, N application should continue normally during the winter months.

There are reports that N application can adversely affect flowering and fruit production. Negative effects from N application during the fruiting season have not been documented in California. Blueberries in the evergreen production system and producing over a 2-3 month period need continuing N fertilization to remain vigorous and productive and yield and fruit quality does not appear to decline. Normal N application should continue during flowering and fruiting but at lower levels than the rest of the year when vegetative development is encouraged.

If the soil pH has not fallen below 5.0 in the planted field, apply iron chelate as a foliar, soil drench, or drip application to relieve mild chlorosis due to iron deficiency. Iron chelate application in the first months after planting enables the plant to begin vigorous vegetative growth while the sulfur is still reacting to lower the soil pH. Chelated iron products are available in formulations of 2-12% iron. Apply according to label rates. In established plantings, leaf tissue analysis will help guide the management of micronutrients. In the absence of a leaf tissue analysis, use the color of the foliage to guide iron chelate application; if the foliage color is pale green to yellow - particularly the new growth - iron deficiency chlorosis is apparent and the chelate treatment should continue. Once the foliage is uniformly green / dark green, the iron chelate can be discontinued and used only as necessary for indications of iron deficiency.

Foliar Analysis

Foliar analysis can also be useful for checking the overall nutritional status of plants and in diagnosing macro or micronutrient deficiencies. Use representative plants in the field unless there are problem areas in which case leaves from normal and abnormal plants should be analyzed separately for comparison. Leaves should be sampled during the period between June and September when plants are actively growing. Choose mature, fully expanded leaves on shoots from the current season’s growth and collect 45-50 leaves from different branches on random typical plants in the field. Different varieties and different soil types should be sampled and analyzed separately. Leaf samples should be rinsed with tap water and dried with a paper towel then sent to an experienced soil and plant tissue laboratory. Laboratories will often provide packaging and shipping instructions. If the results vary markedly from the table below, the nutrients should be added as described above.

Much of the research base for foliar analysis of blueberries has been done on northern highbush types in northern growing areas or southern highbush types in an environment that includes a dormant period. It is unclear at this point how well the information applies to evergreen growing blueberries but it is the best information currently available. Iron chlorosis in particular needs to be managed carefully in California because of the background of high soil and water pH. Growers need information from tissue levels and soil and water analysis as well as careful monitoring of plant growth to effectively manage potential iron deficiency.

Table 1: Suggested critical nutrient levels in highbush and rabbiteye blueberry leaves

		STANDARD RANGE FOR HIGHBUSH AND (RABBITEYE)		
ELEMENT	DEFICIENCY BELOW	Minimum	Maximum	EXCESS ABOVE
Nitrogen(N)	1.70 %	1.80(1.20)	2.10(1.70)	2.50
Phosphorus(P)	0.10	0.12(0.08)	0.40(0.17)	0.80
Potassium(K)	0.30	0.35(0.28)	0.65(0.60)	0.95
Calcium(Ca)	0.13	0.40(0.24)	0.80(0.70)	1.00
Magnesium(Mg)	0.08	0.12(0.14)	0.25(0.20)	0.45
Sulfur(S)	0.10	0.12(NA)	0.20(NA)	NA
Manganese(Mn)	23 ppm	50(25)	350(100)	450
Iron(Fe)	60	60(25)	200(70)	400
Zinc(Zn)	8	8(10)	30(25)	80
Copper(Cu)	5	5(2)	20(10)	100
Boron(B)	20	30(12)	70(35)	200

NA = not available

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