

# Talking with Blueberry Plants

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When a crop is not growing, the normal reaction by most growers is a desire to take action. A very common desire is to apply a fertilizer to “make the plants” grow. For 99% of the situations, application of fertilizer is not correct. Our goal is to provide a structure that will assist in determining the problem and possibly the cause of the problem. Using the material here will not make you an expert or guarantee that the answer to your problem will be found. We hope to point you in a logical direction that will assist in resolving your situation.

Communication by plants suffers from the same complications as communication between people. Not only can the same message or plant symptoms be interpreted differently, the symptoms can have many causes. For example, in humans, a headache is a symptom when we have the flu, are hit on the head, or drink too much alcohol. The causes are quite different, but expressed in the same manner, a headache. So you don’t erroneously connect a symptom and cause or extrapolate a problem to the entire field from a single observation, look carefully at the entire field and have many pieces of evidence that point to a problem.

The first step toward understanding communication from plants is to arrange your observations into 4 categories or questions. (1) When did the problem appear? (2) Where on the plant are the symptoms? (3) How are the symptoms expressed? (4) What else should be considered? We provide the basic steps in evaluating problems blueberry plants are communicating to you by examining each of these questions beginning with:

## When did the damage or problem appear?

***The problem is first noticed as growth begins in the spring.*** Blueberry plants exhibiting symptoms at this stage have a problem often caused by conditions that occurred during the last growing season or immediately before bud break. Blueberries have sufficient nutrient and energy reserves to break bud or for initial growth. By showing damage, poor growth, or other symptoms at this time, the plant is telling you a traumatic event was experienced.

To assist assessing the cause, ask yourself questions about conditions in the last several months. Examples of questions to ask are: What was the growth or condition last fall? Did the leaves drop early and what color were they? If the leaves were dark green when they dropped, the plant did not follow a normal pattern of senescence. A dark green leaf that dropped early could indicate moisture stress. A dark green leaf that dropped late or at a normal time could indicate high tissue N. Late season high tissue N concentration is sometimes associated with insufficient hardening and injury during the winter. Bright yellow to light orange leaves rather than the normal reddish color may indicate low nutrient concentration in the leaves – this may be totally normal. However, low nutrient concentration can be caused by root damage; in this situation leaves often drop early. Other questions to ask are: What was weather before bud break – was winter cold damage possible? What was the weather shortly after bud break – were shoots injured by frost?

For new plantings, a “clay pot” that restricts root growth might have been created during planting. Blueberries planted so root growth outside the planting hole is difficult limits water and nutrient availability. In addition, the planting hole can fill with water, drowning the plant. How and when was the field planted? Late planting or another factor may have damaged the plants last year.

***Action--***For any situation, follow standard law enforcement procedure by collecting the usual suspects and begin to eliminate them. Ask experts in plant nutrition, entomology, plant pathology, or crop production for their top five problems with blueberries and determine if your situation might be caused by any of them. Ask neighbors if they have a similar problem. If the problem is in more than one field and experienced by more

than one grower, weather related problems are a prime suspect. Cut several stems and look for discoloration, an indication of a vascular disease or winter cold damage. Inspect roots for insect, mechanical, or pathogen damage. Can plants be easily pulled or lifted from ground? If so, check roots for growth. Examine new shoots and flowers for black discoloration that is an indication of a virus. If flowers or new shoots are black, check virus status of plants. Examine roots from several plants.

***The problem was first noticed early in the season.*** If the problem appears after normal initial growth, the cause is less likely a problem last year and more likely a problem occurring this season. A term used for this situation is “crashing” since symptoms appear rapidly. Rapid onset of symptoms can be caused by a deficiency of a nutrient mobile in the soil such as nitrogen, sulfur, chloride, or boron. Other possible causes are sudden increase in soil salinity from irrigation water, a fertilizer, or foliar absorption of herbicide that drifted onto the crop.

Using the supply of a mobile nutrient is similar to operating an engine until all the fuel is gone. The engine stops. Even when the tank only has a few ounces of fuel, the engine will operate normally. Nutrients that are mobile in the soil usually move with the transpiration flow. When the supply is gone, no additional nutrient moves to the plant. The situation is different for a non-mobile soil nutrient such as potassium or phosphorus. If the supply of phosphorus or potassium is low early in the season, the plant may not show symptoms, just grow slowly. As the season progresses, symptoms may appear. These nutrients are supplied at a slow rate. A comparison is squeezing toothpaste from a tube. When most of the toothpaste is removed, with effort, some toothpaste still can be squeezed from the tube. The supply of toothpaste is not sufficient for the demand. The same statement is true for non-mobile soil nutrients that are available in low amounts.

Sometimes, cool wet springs cause blueberries to grow slowly or for the plants to show a slight purple color. Nothing you can add other than heat will cure this problem. The tops of the plants are responding to the sunlight and the roots are not able to respond adequately because they are in an environment that is too cool and wet to supply the plant tops as needed. The plants usually “grow out” of this situation.

A sudden browning or burning of leaf margins can be caused by a combination of too much fertilizer and too little water. Prime fertilizer suspects are potassium chloride (muriate of potash) and most nitrogen materials. The development of a pale green color in a young planting midway through the season is many times result of unacceptably high soil pH at planting. Soil pH is difficult to correct after planting. The symptoms may be from iron deficiency.

***The problem was first noticed during the middle of the season.*** Growers should expect good normal vegetative growth by mid-season. Poor shoot growth below fruit clusters and/or very little whip growth may be caused by root problems, over cropping, or low plant reserves.

***The problem was first noticed late in the season.*** When damage or symptoms appear late in the growing season, the cause usually is a stress from the current growing season. Three primary “suspects” causing plant damage to appear late in the season are insufficient irrigation, root weevils, and root rot. All these problems require investigation of the root system.

### **Where on the plant are the symptoms?**

Walk around or view plants from several aspects. Symptoms only on one “side” of a plant can be caused by stress to roots under the affected branches. Blueberries do not move nutrients or water from roots on one side of the plant to tops on the opposite side. If irrigation water is supplied through drip lines on both sides of the plant, a plugged emitter on one side will cause drought injury to one side of the plant.

**Stems--** Damage is on stems such as bark peeling, cankers, short internodes, or sap oozing. Injury or damage to the stem of blueberry plants can be caused by contact herbicide drift, mechanical damage such as hoe injury on stems close to ground, mechanical harvester injury, and canker causing diseases. Inadequate or poor vegetative or whip growth may be caused by factors such as lack of water, a low amount of an immobile soil nutrient such as potassium, restriction of the roots from compaction, or over cropping.

**Roots--** If roots are fine, branched and growing to the drip line of the plant, they are normal. The first step in examining roots is to attempt to pull a plant from the ground using moderate force. If the plant is removed with about the same amount of effort as lifting a five-gallon pail of water, carefully examine the roots and planting hole. If the bush can't be easily pulled from the ground, search for roots under the drip line by carefully excavating soil. Sometimes, excavation of a "healthy" plant for comparison of root volume and appearance is useful. You can also compare the color of large roots. After scraping, normal roots should exhibit a cream color. If roots are brown, have plants examined for phytophthora root rot. Other "evidence" to consider is signs of chewing on roots from insects or voles. A hand lens is useful for examining roots for insect damage or frass deposition. Determine if the root area is wet enough to squeeze water from soil, or so dry the soil is almost dusty. Probe soil with a screwdriver to check for compacted areas.

**Fruit --** A high fruit load can stress the plant for nutrients. Consider if the fruit set or load is normal, low and what the yield was last year. Also evaluate fruit size to determine if it is normal, large, or small.

**Leaves --** Leaf appearance can be helpful in diagnosing blueberry plant problems. Small leaves usually indicate a root stress. Rough and strap-shaped leaves result from 2,4-D damage.

Primarily nutrient related examples are used in this section. Two types of tissue sampling are used to diagnose problems. The standard tissue sampling of leaves in August is designed as a gauge of your nutrient or fertilizer program. Standard tissue sampling can be very helpful when viewed for several years in conjunction with fertilizer application and yield information. This tissue sampling is based on standard concentrations for a specific plant part and time of sampling. Unfortunately, many problems occur before August. Analyses of tissue samples can assist in the diagnosis of problems if areas of good or normal growth and development are compared to poor areas.

Low concentration of nutrients in leaves can be a deficiency of oxygen for the roots rather than an inadequate supply of nutrients in the soil. When soil is saturated for a few as 3 days during the growing season, symptoms may appear. The effect usually lasts several days, even after the soil is no longer saturated. Tissue analyses of the leaves can indicate low N, P, K and elevated Fe and Mn.

### **Are leaves normal shape and size?**

**Yes, but they show these symptoms.** Leaves with discolored, scorched, or brown margins probably are telling you they have too much salt from irrigation water or fertilizer, or a combination of normal rates of fertilizer followed by inadequate water supply. The primary fertilizers causing this problem are nitrogen and potassium chloride.

If the leaf tissue veins are green and the remainder of the leaf is yellow or pale green, two suspects come to the top of the list, iron and magnesium. Inter-veinal chlorosis that appears on older growth (base of vigorously growing shoots) is possibly a magnesium deficiency. Insufficient iron will cause chlorosis on new growth (on young leaves near shoot tips). Blueberries are accustomed to an iron rich environment and are not efficient in removing iron from soil. The soil pH in which blueberries are grown complicates iron nutrition.

High soil pH, above 6, causes iron deficiency in blueberries. Low soil pH, below 4, increases availability of manganese, which limits the availability of nutrients such as iron. When soil pH is low, unneeded and repeated

potassium fertilizer application compound nutrient problems. Triazine herbicides can also cause inter-veinal chlorosis. When the entire leaf is discolored, a nutrient mobile in the plant, usually nitrogen, is a likely cause.

***Leaves not normal size.*** Leaves that are not normal shape and size such as small or disfigured leaves can be caused by a boron deficiency or lack of water.

#### **Are all leaves affected?**

***Yes, all leaves have symptoms.*** A uniform damage pattern on all leaves and all plants can be the result of a photosynthetic inhibiting material such as an herbicide. If only a portion of the leaves have the problem and affected leaves cannot be segregated by age, suspect insects as the cause especially if the damage is notching or dry veins with tissue missing.

***No the problem is only on older leaves.*** Nutrients such as N, P, K, or Mg move from the older growth to newer growth. Symptoms are first seen, sometimes only seen, or prevalent on older leaves. A difficult problem to trace is salt damage or margin scorch on older growth when the problem occurred weeks ago. A fertilizer application or delayed irrigation can cause the problem. If irrigation after the time of stress was adequate, new growth will be normal and no abnormal salt concentration will be measured in the soil.

***No, the problem is found only on newer leaves, those not fully expanded and at the tips of shoots.*** The nutrients, S, Ca, B, Zn, Cu, Fe, and Mn, are not mobile in plants and discoloration of new growth is an indication one of them may be deficient. Sulfur deficiency is not likely in blueberries.

#### **How are the symptoms expressed?**

The progressive spread of damage on a plant, onto other plants, or over an area indicates the damage caused by living organisms. In contrast, damage that does not spread to other plants or plant parts and has a reasonably clear line between damaged and healthy tissue indicates a non-living casual factor.

The performance of the plant should be considered. Plants with poor growth and poor yield are most likely to be suffering from different problems than plants that look poor with adequate growth and yield. Note if plants have poor yield or fruit load with adequate color and vigorous growth. Plants with poor growth and yield may suffer from a problem with roots, low water, or a variety of other problems. Plants with adequate growth and yield with leaves that are discolored (a reddish tan or salmon color but not yellow) may have a large fruit load and mid or late season nitrogen deficiency. Plants with vigorous growth, dark green color and little or no fruit might have been subjected to disruption of fruit set during bloom or may have blueberry shock virus.

#### **Do the symptoms occur uniformly over the entire field?**

If yes and the symptoms are reasonably uniform throughout an entire field, the cause usually is an application of fertilizer, herbicide, or water. Other causes could be lack of water or weather related stress or injury. If the symptoms do not occur uniformly across the entire field, do they occur by row, cultivar, or another regular pattern? Does a soil type difference such as a low area correspond with the problem?

#### **What else should be considered?**

1- What is the field history? 2- Where are wet or dry spots, (possibly different soil types) gravelly vs poorly drained, or lower areas? 3- When and how were the plants pruned? 4- What was/is the weather like this year and last year? 5- Are the plants physiologically early or late? 6- Do the soil and tissue sample results make sense? 7- Are they compatible? 9- Has any land leveling been performed?