

FERTILIZING OLIVE TREES

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Nutrition is Less Important than Water

Olive trees are not big feeders. They are semi-wild, hardy, tough plants that will tolerate poor growing conditions, especially low fertility, better than almost any other fruit tree. They also tolerate a very wide range of soil pH. Look at where they grow around the Mediterranean. Most of those soils are dry gravel and rock. The good soils are used for peaches, cherries, apples, vegetables, or other crops. Deep fertile soils that would be important for above-standard growth and production for other orchard crops are actually a negative for olives. In great soils, olives tend to be excessively vigorous vegetatively, grow too tall, and produce little fruit. When excess shoot growth is pruned to keep olive trees smaller, they respond by sending out long, vigorous, non-fruitful shoots, in most cases. Olive trees trend to fruit better under conditions of low vigor including minimal nutrition without being deficient. They respond quite amazingly to adequate irrigation water with good growth, large fruit size, and much better yields without making any changes to their nutritional status. They also do much better with no weed competition.

It is difficult to really starve an olive tree for nutrients to such an extent that production becomes limited, unless there is a clear deficiency. Even in serpentine soils that are excessively high in magnesium, olive trees do comparatively better than other orchard crops, but these soils are rare. The claim that olive trees will do so much better with high fertility, lots of organic matter, and supplemental foliar sprays is just not founded. In fact, they may become overly vigorous, fruit poorly, and have lower oil quality if over fertilized, especially if combined with good irrigation and weed control practices. A recent scientific paper from Spain indicated that excessive fertilization of olive trees with nitrogen, led to a measurable decline in oil sensory quality.

One of the common mistakes I see being made by some new olive growers in California is to respond with heavy fertilizer or compost applications when their trees are not growing adequately, but are really lacking water and good weed control. All the fertilizer in the world will not get trees to grow adequately if they are dying of thirst and suffering from root competition. Adding compost, with its combination of slow release nutrients and the addition of organic matter won't make up for drought stress. Olive trees do not respond as much to nutritional changes as they do to water and weed control.

If olive trees are having problems, one of the last things likely to be causing it is a nutritional deficiency. Unfortunately it is one of the first things people look to, because it is so easy to do something about and occasionally when there is a severe deficiency corrected by a fertilizer application, the results look so impressive. We all want the easy way. I once visited an orchard where the trees had been killed, deader than a doornail, from root rot caused by wet feet. I showed the grower the rotted brown roots, demonstrated the cause, and provided information on solutions such as replanting in better-drained soil or on top of mounds. As I was getting into my truck to leave, he leaned over the window and asked: "But isn't there a fertilizer I might be able to apply to help the trees."

There really is a big myth and many exaggerated claims that the magic of good nutrition through "healthy soil" will prevent all kinds of problems like diseases or insect attack, plus provide better quality olives or oil. With olives, it likely is just the opposite.

Diagnosing Nutrient Deficiencies

A lack of nitrogen (N) is the only common nutritional deficiency in olives. Potassium (K), and boron (B) deficiencies exist, but are very uncommon. Deficiencies of other nutrients are extremely uncommon. Another characteristic of olives is that the amount of each nutrient needed is usually much less than most other orchard trees. Critical nutrient levels are best measured with tissue testing of mature leaves from the middle of nonbearing current season shoots in July. Measurements taken at other times of the year are meaningless, in most cases, because nutrient levels within the leaves are much less stable. Nitrogen is adequate at 1.5 to 2.0% and deficient below 1.4%. Potassium levels in leaves should be over 0.8% and are deficient below 0.4%. Boron is deficient in olives below 14 parts per million (ppm), adequate at 19-150 ppm, and in excess if over 185 ppm. Phosphorous, calcium, zinc, copper, manganese, and magnesium deficiencies in California are extremely rare and very unlikely.

Trees with very low nitrogen levels have leaves with a yellow tinge and poor shoot growth. This symptom often occurs in heavy soils that are cold and wet during the winter when nitrogen is not as readily available, but disappears in the early summer. Potassium deficiency is not common but does appear, once in a while, as light green leaves, or when severe, as tip burn on leaves with dead areas in the trees. These symptoms also appear sometimes due to poor soil drainage. Boron deficiency shows up as misshapen fruit, short branch growth, limb dieback, rough bark, and small leaves with tip burn. It is very rare in most of California.

Soil analysis is not accurate enough to be used to diagnose fertility in olives. This reminds me of the time I went out to an orchard where the grower had planted the trees upside down on a hot day in July. He had been spraying them every week with compost tea to encourage good growth. When I got there the trees were all drooped over and had turned crispy brown. As a good Farm Advisor, I said I was not sure of the cause of the demise of the trees, but that I would have to take a soil sample.

Fertilizing Trees

Of course you don't want to have nutrient deficient olive trees and adequate fertility is very easily achieved in olives with ground applications of the proper nutrient. Nitrogen can be applied with either organic materials such as feather or blood meal, compost, or a leguminous cover crop. Rates of application should be in the area of about 40 to 100 pounds of actual nitrogen per acre, per year in a mature orchard, taking into account the percentage of nitrogen in the fertilizer. Considering that most composts contain about 2% nitrogen that would mean an application rate of about one to two tons per acre, per year. Organic fertilizers such as compost can take quite a while to decompose and release their nitrogen in a form that the plants can absorb. They decompose over about a 15-year period with most released within the first year or two. Annual applications over many years can buildup high nitrogen levels. Concentrated organic fertilizers that are high in nitrogen such as feather meal or blood meal will work fine. Their normal concentration of nitrogen is about 6 to 10%, so these materials should be applied at a rate of about 400 lbs. to 1,650 lbs. per acre

The important thing about nitrogen is to make periodic applications in accordance with leaf analysis and to achieve adequate shoot growth of between 8-20 inches. Nitrogen may not need to

be applied every year. It can carry-over in the soil for several years, especially in heavy clay. In sandy soils it tends to leach and can cause ground water and run-off pollution, so make sure not to apply too much at once – lighter frequent applications are better. Conventional nitrogen fertilizers such as urea, ammonium nitrate, ammonium phosphate, ammonium sulfate, potassium nitrate, or calcium nitrate also work. As a starting point, nitrogen is normally applied, at the following approximate rates (per tree or per acre based on large wide-spaced mature trees – 150 trees/acre). For other spacings, use the per acre rate.

- 0.6 to 1.5 lbs. of urea (46%) per tree – 90 to 220 lbs. per acre
- 0.8 to 2.0 lbs. of ammonium nitrate (33%) per tree – 120 to 300 lbs. per acre
- 1.3 to 3.2 lbs. of ammonium sulfate (21%) per tree – 190 to 475 lbs. per acre
- 1.6 to 4.0 lbs. of CAN-17 (17%) per tree – 235 to 588 lbs. per acre
- 1.7 to 4.2 lbs. of sodium nitrate (16%) per tree – 250 to 625 lbs. per acre
- 1.7 to 4.3 lbs. of calcium nitrate per tree (15.5%) – 258 to 645 lbs. per acre
- 2.0 to 5.1 lbs. of potassium nitrate per tree (13%) – 307 to 770 lbs. per acre
- 2.4 to 6.0 lbs. of ammonium phosphate per tree (11%) – 363 to 909 lbs. per acre

For dry-farmed trees, nitrogen fertilizers should be put on just before a rain in mid to late winter. Under irrigated conditions, it can be applied periodically throughout the growing season and watered in. For drip irrigation it can be placed right under or through emitters.

Olive trees cannot tell the difference between nitrogen that comes from an organic source or if it comes from a conventional source; it's all the same nutrient. Plants only absorb nitrogen in two forms: Nitrate (NO_3^-) or Ammonium (NH_4^+). That is what conventional fertilizers are made of. Organic fertilizers contain their nitrogen tied up in proteins, which break down into amino acids, which break down by microbial action into nitrate and ammonium, which the plants take up. The choice to use either an organic or conventional form of nitrogen should not be based on nutrient content, because it's all the same nutrient. Organic materials have the benefit or disadvantage of being slow release and are less likely to leach into ground or surface waters. Conventional fertilizers have traditionally been used because they are cheap, less bulky, and easy to apply. The line between the two is becoming blurred with slow release conventional fertilizers and high analysis organic fertilizers that are easily applied and less bulky. Costs vary considerably.

Potassium fertilizers are almost all mined from natural sources and most are classified as organic. If a deficiency is noted, potassium sulfate is usually applied to the soil at a rate of 10 to 20 lbs per tree at the drip line. It can be dug in to be more effective, takes several months to create a response in the trees, but will last for many years. It can also be applied right under the drip emitters or through the drip system in a soluble form. When potassium is notably deficient, a foliar spray of 10 lbs. per 100 gallons of potassium nitrate applied in the spring can be effective. Composts and other organic fertilizers all contain some potassium, so regular application would most likely never allow a deficiency to arise.

Boron deficiency has only been observed in Butte County, but could possibly be a problem in any really poor soils, though very unlikely. It is corrected by applying one-half to one pound of borax to each tree, broadcast onto the soil within the drip line, which lasts many years. Be very careful not to apply too much boron, because toxicity might occur. When foliar analysis indicates low Boron leaf levels, a foliar spray of 7 ounces of borax per 100 gallons of water has temporarily and rapidly removed the deficiency.

Foliar Snake Oil

Foliar sprays can be important and very profitable – usually more for the fertilizer sales person, laborer or consultant – than for the grower. All the necessary nutrients for olives are readily available via ground application and the effect is much more lasting. Research trials have proven that all nutrients can be taken up, just fine, by olive tree roots. Foliar sprays of nitrogen, boron, and potassium will be rapidly taken up by the tree and levels will increase dramatically in the leaves. Unless those nutrients are quite deficient or the spray material is applied in with an application of something else that is already being applied, it can and likely would not be cost effective.

Most of the time, what happens from most foliar sprays is that higher levels of nutrients occur in the leaf for a short time, usually just a few weeks. There is usually, however, no measurable effect on shot berries, fruit set, shoot growth, number of flowers, number of perfect flowers, fruit yield, or fruit size. Many comparison trials all over the world have looked at foliar nutrition in olives for many years. In most cases, foliar sprays also have no effect on alternate bearing. Foliar applied compost tea will not control or prevent peacock spot on olives nor has it been shown to have any other positive effect. This whole lack of effect is predicated on having adequate nutrition from the beginning, which again, is very easily and inexpensively achieved by ground application. So, unless there is a demonstrable benefit, foliar feeding is a useless expense of tractor, spray equipment, and labor.