Fertilizing Temperate Tree Fruit and Nut Crops at Home

Extracted from: Growing Temperate Tree Fruit and Nut Crops in the Home Garden
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Successful fruit production requires an adequate supply of essential nutrients to trees. The primary nutrient that home gardeners need to supply is nitrogen (N) on a regular basis. Potassium (K) is usually required because most of the soils of California are somewhat deficient, however phosphorus (P) deficiency is very rare in tree fruits and nuts. Phosphorous is, however, sometimes added to the soil underneath fruit trees to produce a better legume cover crop. In rare instances, magnesium, iron, zinc, manganese, copper, calcium, boron, or molybdenum may be deficient or even in excess. The symptoms of many of these micro nutrient problems are very difficult to identify properly. The solution, which is to apply compost, is often less complicated than trying to find the exact micro nutrient missing. Most composts contain a small amount of all of the needed plant nutrients and as the organic material decomposes it slowly releases these basic minerals back into the soil for the trees to take up.

There are many plant problems that may limit the fruit or nut tree's ability to take up the proper quantity of nutrients even though there might be an adequate quantity of the nutrients in the soil. Cold or wet soils can limit root growth and activity to the point where some nutrient deficiency symptoms are visible. Extremely dry soils may cause a similar situation. This is usually a temporary condition until the soil warms up or is properly irrigated and normal growth is resumed. In severe cases tree roots or crown areas become rotted or partially rotted and unable to pick up soil nutrients. Adding additional fertilizers to try to control the visual symptoms of nutrient deficiency while the roots are rotted is useless. Some plant viruses, herbicide injury, or other pesticides can sometimes cause symptoms that could be confused with nutritional problems. It is therefore important to properly identify the cause of the problem if possible.

Nitrogen Fertilization and the Pre-Bearing Years

Young temperate fruit and nut trees in the pre-bearing years (the first 2 -3 years) can use more nitrogen per canopy area than mature, fully-bearing trees. In the pre-bearing years, fruit and nut trees should be fertilized adequately to encourage maximum early growth. Neither commercial fertilizer nor manure should be put in the planting hole when planting temperate fruit and nut trees because the fertilizers may burn the roots. On most soils, fertilizer is needed during the first growing season, but wait until early summer when there is 6 to 8 inches of new growth. Then apply about 2 oz of a nitrogen fertilizer, such as ammonium sulfate (21-0-0), or 16-16-16 or 1 oz of urea (46-0-0) or 2 pounds of compost once a month until leaf fall. Either scatter the fertilizer on the soil under the tree, keeping it at least one foot from the trunk and water it in or place it directly under the drip emitters. If nitrogen fertilizers lie on the soil surface without being watered into the soil, some of their nutritional value can volatilize and be lost into the air. The same is true for compost, but to a lesser degree because it is releasing its nutrients more slowly during decomposition.

The second year, apply approximately two times the first year rate and in subsequent years the rates should increase proportionately with the size of the trees. Keep the trees well fertilized, especially with nitrogen so that they grow rapidly to fill their allotted

space. Once the trees enter the flowering and bearing years the fertilizer rates should be reduced somewhat.

Fertilization of Mature Bearing Fruit and Nut Trees

The total amount of fertilizer used on mature trees is less than that used on similar sized trees that are still young and actively growing. Nitrogen status can have a profound effect on the vigor of fruit and nut trees. It is one of the ways to manage shoot growth and influence fruit set and bearing. Lower N levels leads to less vigor and shorter shoot growth, which may be perfect for apples or pears, but may not be enough for peaches or walnuts. By limiting nitrogen, fruit set is often enhanced, tree shoot growth is less, which leads to better light penetration, and less need for pruning. It may also help to limit the size of overgrown trees.

Fully-bearing, average-sized mature trees in the home orchard should be fertilized at the rates stated in **Calendar of Backyard Gardening Operations for Selected Temperate Fruit and Nut Trees**.

Nitrogen (N). Nitrogen deficiency appears as a general light green color or yellowing of the leaves; in peaches & nectarines, the leaves also appear reddish on the margins. Very low N trees have stunted growth, poor fruit set, and smaller size, compared to high N trees.

There is not one "blanket" rate of N fertilization recommended for all tree types; the rates vary from 1 lb. to 1.5 lb. to 2 lb. of *actual* nitrogen per tree per year (N)/tree/year, depending on the commodity. Often, the N fertilizer program recommended for mature trees is divided into two applications -- during the spring bloom season and the fall harvest season. For young trees and certain commodities, it is recommended that N fertilizer be applied monthly during the summer growing season as well as during the spring and fall. Since urea (46-0-0) is 46% actual N, a mature tree will need approximately 2.2 lb. urea to provide 1 lb. *actual* N, or 5 lb. of ammonium sulfate (21-0-0) or 3 lb. ammonium nitrate (33-0-0).

When selecting a fertilizer, extremes in soil pH should be taken into consideration, otherwise the fertilizer type really does not matter much. Soils with very low acidity or high pH (above 7.0) should be fertilized with a type of fertilizer that gradually will reduce the soil pH like ammonium sulfate, ammonium nitrate, or urea. For soils with high acidity or very low pH use a neutral fertilizer like calcium nitrate. Check the list of ingredients on bags of complete fertilizers for the original source of the form of nitrogen. It does not really make any difference to the plant what the source of the nitrogen is. Plants take up N primarily in the form of $N0_3$ (nitrate) and some in the form of NH_4 (ammonium). The ammonium forms of fertilizers are gradually broken down into the nitrate form in the soil. Even the organic fertilizers that are made up of nitrogen containing proteins and amino acids eventually break down into the nitrate form for plant uptake.

When considering how much N to use, more is not necessarily better. Excessive N fertilization will over-invigorate vegetative growth on bearing trees, which will reduce light into the canopy and result in reduced flower bud formation and reduced fruit yield. It is important to provide enough N to maintain healthy nutritional status, but to not

oversupply N. It is also a waste and has the potential to pollute surface and groundwater resources.

Phosphorous (P). As far as we know, there has never been a documented case of phosphorous deficiency in California in fruit or nut trees. There is apparently enough phosphorous in the soil and it is readily available to the trees. In some cases where there has been land excavation or very poor soils an application of phosphorous tilled into the soil pre-plant might be necessary. It could also be applied in a complete fertilizer on a regular basis. In most cases, however, it is a waste of money and resources.

Potassium (K). Potassium may be deficient in home-grown fruit and nut trees. Deficiencies are sometimes found in peaches, plums, and nectarines and in kiwi vines in the Sacramento Valley. When potassium is deficient, leaves are pale green -yellow and tend to curl inward (boating) and burn along the margins and tips. Poor fruit size is commonly associated with low potassium. Because potassium is required in large amounts by fruit and nut trees, deficiency symptoms may be induced when there are other problems in the root zone, such as root diseases or excess water. When potassium deficiency does occur, one treatment usually will correct the problem for several years. A fall application of potassium sulfate at a rate of 5 to 10 lbs./tree in sandy soils and 15 lbs./tree in finer-textured soils should be sufficient to correct deficiency symptoms for several years. Compost contains potassium and if used on a regular basis should prevent any deficiency.

Magnesium (Mg). This element when deficient appears as marginal chlorosis on the leaves in an inverted "V" shaped pattern. It mostly affects basal leaves of the shoot while terminal leaves are not affected. It usually occurs where there is very high potassium (K) in the soils and on young trees. To correct this problem the trees can be sprayed or ground treated with small quantities of Epsom salt (Magnesium Sulfate).

Zinc (Zn). Zinc deficiency causes "mottleleaf" -- small, terminal leaves with yellow mottling between the large leaf veins. Leaves near the growing tips are small and bunched together. In the spring, shoots take on a yellowish cast and "mottleleaf" is quite evident. Dieback of twigs may occur in severe zinc deficiency. Zinc-deficient trees may have poor and/or delayed bloom and small fruit of low quality. Foliar sprays and chelated formulations are available to combat the problem. Timing depends on the commodity. An early to mid-November application is recommended for almonds, apples, apricots, cherries, pears, plums, and prunes. Leaf burn and defoliation may occur as a result of this spray, but these are not detrimental at this time of year. (The dormant zinc spray should not be made at the same time as a dormant oil spray.) Use 1 to 2 oz of zinc sulfate (36% metallic Zn) in 1 gallon of water. To correct for zinc deficiency in peaches and nectarines in the home orchard, an application in April of 2/3 oz zinc sulfate is recommended; on walnuts, a fall-winter application is recommended. Liberal applications of compost applied to the soil surface under the trees will eventually correct the problem, but depending of the severity of the deficiency may take several years.

Iron (Fe). Iron deficient leaves are quite striking. Bleached yellow to white leaves with green veins are the symptoms most often seen. Leaf size is usually normal. The fruit tends to ripen early and quality is normal. If the tree is severely deficient, causing shoot dieback and poor growth, then production and fruit quality are reduced. Iron

deficiency is usually caused by high soil pH (alkaline – above 8.0) or very wet soils. Iron chlorosis can be caused by over watering that leads to iron deficiency symptoms. The lack of oxygen that results from the excess water inhibits root function and iron absorption by plants. Iron chlorosis may be caused by high lime content in the soil (lime-induced chlorosis).

Adding only iron to soil seldom corrects iron deficiency symptoms. Correcting or adjusting the soil pH is the most important thing to do. In some cases, symptoms of iron deficiency can be corrected by adjustments in irrigation. Several foliar sprays contain iron and may be used to combat iron chlorosis. Wetting agents are added to the spray to promote good coverage. Several sprays of dilute solution may be preferable to one spray at full concentration. If deficiency symptoms occur on pears, add 1/2 lb. iron chelate to the soil at the same time that you add nitrogen fertilizer in the spring. While the chelated iron may correct many cases of leaf yellowing related to iron deficiency, chelated iron is very acidic and should be used with caution because it can cause leaf burn. Soil-applied iron slurries are longer lasting than foliar chelate sprays.

Boron (B). *Excess boron* can be a problem on the western side of the San Joaquin Valley and in isolated geothermal areas. Peach and nectarine, two of the most sensitive crops to boron toxicity, exhibit the following symptoms: small necrotic spots on the underside of the midrib; cankers along the midrib, on petioles, and on young twigs; leaf yellowing, defoliation, twig dieback and gumming in severe cases; and distorted fruits. Correction is achieved by leaching boron out of the root zone. If you suspect boron toxicity, check your irrigation water; it should not be above 2-5ppm. Additional N fertilizer as calcium nitrate may help to alleviate boron toxicity.

Boron deficiency can occur in some soils in California and may be related to insufficient water. Symptoms include shoot dieback, blossom blast, and fruit abnormalities. Boron deficiency is corrected by watering more, by adding drip emitters, and by making a single application of 1/4 to 1/2 lb. boric acid (H_3BO_3) or borax ($Na_2B_4O_7 10H_2O$) per tree.

Manganese (Mn). Deficiency of manganese appears as interveinal chlorosis with a herringbone pattern affecting only basal leaves; terminal leaves are not affected. It is usually associated with high pH soils. Reducing soil pH and foliar treatments with chelated Magnesium will correct this problem for several seasons.