



Redwood Barn Nursery

1607 Fifth Street Davis, California

Back to Basics: feeding plants.

All plants need four things: light, air, water, and nutrients. Some need protection from pests or weather. Learning about gardening is simply discovering how individual plants differ in regard to these things.

Notice I didn't say 'soil'. You can grow plants without soil, as is done in hydroponics. The nutrients are in the water solution that the roots are immersed in. But soil is very helpful stuff. It anchors the plant, keeping it from toppling over. It provides a perfect medium for absorption of water and nutrients by roots. Soil is ionically charged, holding water and chemical molecules and exchanging positive ions with root hairs.

Those ions that plants need are grouped into major and minor categories, depending on the plant's need: macronutrients and micronutrients.

The first three, called primary macronutrients, are nitrogen, phosphorus, and potassium, abbreviated N-P-K. Those are the three numbers that you see on the front of a fertilizer bag (by law). A 5-1-3 fertilizer is 5% nitrogen, 1% phosphorus, and 3% potassium. We always need nitrogen here, and rarely need additional phosphorus or potassium.

Important secondary macronutrients include calcium, magnesium, and sulfur. There's plenty of calcium in our water! We sometimes see magnesium deficiencies. And we use a lot of sulfur locally, because it lowers soil pH (makes it more acidic).

Micronutrients that may be deficient include iron, manganese, and zinc. Boron, chlorine, copper, and molybdenum, used by plants in very small quantities, aren't deficient here; in fact, we have an excess of boron in our water.

Before you apply anything to correct a micronutrient deficiency, be aware of two important facts.

1. Very, very small quantities are usually needed, and some can be toxic at higher doses.
2. Other conditions such as overwatering can cause deficiencies by harming roots and inhibiting their ability to take up food.

The most common sign that a plant might need some food is yellowing leaves. But leaves yellow for a lot of reasons, including simple seasonal changes. Older leaves yellow? It might need nitrogen. Newer leaves yellowing can indicate a lack of iron. Identify your problem before you apply a plant food.

The importance of nitrogen.

Why this review of soil science now? Because you can prevent problems by taking action at the start of the season.

All summer long I see samples of plants that need food, mostly nitrogen. We live in a region of rich agricultural soils that hold and release plant food very effectively when



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properly managed. Plants in good ag soil, with some fertilizer applied at the time of planting, rarely show problems.

The usual situation is someone with heavy soil who built a raised bed, then filled it with imported topsoil. Rock yards sell sandy loam that drains well and is very easy to work, but it doesn't hold water or nutrients well. You can ask them to blend in compost, which helps. At the time of planting you should add some organic nitrogen as well.

Manure is pretty good, averaging 1 to 3% nitrogen, depending on the animal it came from (steer lower, chickens higher). But people rarely add enough to provide what the plants need over the whole season. You need three to four big bags of manure per 100 square feet of garden bed.

Boxes or bags of organic fertilizer can be simpler to apply, not to mention less smelly. Organic fertilizers are mostly 5 to 10% nitrogen. If it's 10%, you need about 20 to 40 lbs. per 100 sq. ft.; if it's 5%, double that. Sandier soils need the higher end of the range.

Key point: applying slow-acting nitrogen fertilizer at the start of the season is one of the most important things you can do for your vegetables and flowers.

The myth of phosphorus.

Oh, that middle number.

Linda Chalker-Scott and her peers at Washington State Extension service manage a very useful blog called The Garden Professors, where they take on many garden myths. You can also find them on Facebook. From a recent posting: "The Biggest Lie in the world of horticulture today is that you need to flood your plants with phosphorus to get them to flower."

An entire plant food industry segment is based on the premise that high-P equals lots of flowers.

Phosphorus (P) is that middle number. Plants do need it. Plants deficient in P won't grow or flower well. A plant food that's 1 to 2% phosphorus is fine. But higher amounts than the necessary minimum won't increase flowering. Let me give you an example from human nutrition. If you're deficient in iron, you'll be anemic and tired. So you need enough iron to meet your body's needs. More than that won't make you peppy!

So what's wrong with adding extra phosphorus? First, phosphate is a major source of pollution in streams, lakes, and waterways. Second, we now know that excess phosphorus in the root zone inhibits the growth and development of important soil micro-organisms, ironically including some of those that help roots take up nutrients. So it can be counterproductive.

Researchers and plant industry folks have known for a long time that plants really don't need those extra-high P quantities that are in a lot of plant foods. So why is it there? This response, posted on a garden forum from the CEO of Dyna-Gro Nutrition Solutions, is rather telling:

"We market a high P (Liquid Bloom) [because people] 'believe' they need this. ... it is simpler to give the market what they think they need than to try to reeducate it. ... There is little scientific justification for higher P formulas, but marketing does come into play for the vast majority of users who lack any real understanding of plant nutritional requirements."



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So, they make it, and market it, because people want it. Enough said. You don't need to pay for, or apply, extra phosphorus in your garden.

Plants flower as part of their normal growth cycle, or flowering can be triggered by any number of environmental factors: day length, temperature, stress, drought. There is no fertilizer that causes flowering. Don't buy the hype.

The impact of overwatering, and water quality.

Apparent deficiencies do show up on certain plants. Citrus leaves often turn yellow, indicating they need food. Older leaves yellowing means lack of nitrogen, newer leaves yellowing, with veins staying green, means lack of iron. Alkaline soil and water can make iron unavailable to a plant, so sulfur is often needed to correct iron deficiency. Confused? It's simple: most fertilizers labeled specially for citrus have extra sulfur to take care of this. Some have extra iron and other micronutrients as well.

But sometimes a plant just won't green up, no matter what you apply. In most cases where plants are chronically deficient, I find the gardener is watering far too frequently. Plant food is taken up by the fine white root hairs, and those die quickly if the soil stays soggy. Remember, a good soil holds water for several days. Water plants slowly, deeply, and infrequently. A vegetable garden in regular soil can go 5 to 7 days between waterings, so long as you give each plant several gallons of water each time.

This is where that topsoil you bought can be problematic. Sandy soils drain fast, meaning that water runs right through the soil, and, unfortunately, past the roots. At least in the early part of the season, you may need to run your system every couple of days. If you haven't built your garden bed yet, I strongly suggest mixing in some of your native soil from below with the stuff you're bringing in. Our soils, which contain silt and clay, hold water and nutrients better than your new stuff. Adding extra compost every season is also helpful.

How about other plants? House plants, special flowering plants?

I get concerned when people want to feed their houseplants. It is easy to burn the leaves with too much plant food. If your plant isn't growing well, you probably need to move it to a brighter location. If it looks droopy, you may be watering too often. Rather than feed a struggling indoor plant, try repotting it into a faster-draining soil mix. Most soil companies now add organic plant food, so that should take care of any nutritional needs.

Some plants in Davis need special fertilizers. Our water is hard and has a high pH (alkaline), and that makes it difficult to grow "acid-loving" plants. Don't even bother with azaleas and rhododendrons here. But with some extra sulfur to lower the pH, and seasonal fertilizing with special plant foods, you can succeed at blueberries, camellias, gardenias, hydrangeas, and Japanese maples.

In sum:

Apply fertilizers carefully; always follow the label directions. Water thoroughly, deeply, and as infrequently as your soil allows. Your food garden benefits from application of an



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early-season, organic source of nitrogen. Some plants may have special needs. And raised garden beds have special issues.



This well-ordered vegetable garden thrives entirely on native soil enriched with compost. Davis resident Alan Pryor makes his own compost from yard and food waste, supplemented with some chicken manure. Homemade compost rarely contains enough nitrogen for a full season of growth; the food waste and additional manure is an important component. Photo courtesy of Alan Pryor.



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Gardenias are in the category of “acid-loving plants,” which need special fertilizers to offset the effect of our hard, alkaline water. Soil sulfur can help reduce soil pH. Unless special plant food is used, gardenias, camellias, blueberries, and other plants in this category tend to show chronic micronutrient deficiencies.



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Classic iron deficiency on this citrus leaf. Note the veins are green while the rest of the leaf is yellowing. Citrus benefit from additional iron and sulfur, along with regular seasonal applications of nitrogen. Iron deficiency symptoms are on the new leaves.



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Symptom of nitrogen deficiency, shown on this lime tree, is general yellowing of older leaves. Plants move nitrogen internally to the new growth, so these symptoms are most pronounced in spring when a new flush of leaves begins.