

PHOSPHORUS

Too Much of a Good Thing

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For the last two years, I have produced and participated in the Citizen Science Soil Health Project (CSSHP), along with 45 other growers, and received Haney soil health test results each year. CSSHP growers include 16 vegetable producers, 13 ranchers, 10 commodity producers and six home gardeners. Along with five others I am in the home gardening sub-group of the CSSHP and we are coming in with the highest soil health scores of any group in the Project. Way to go home gardeners! All our years of applying manure,

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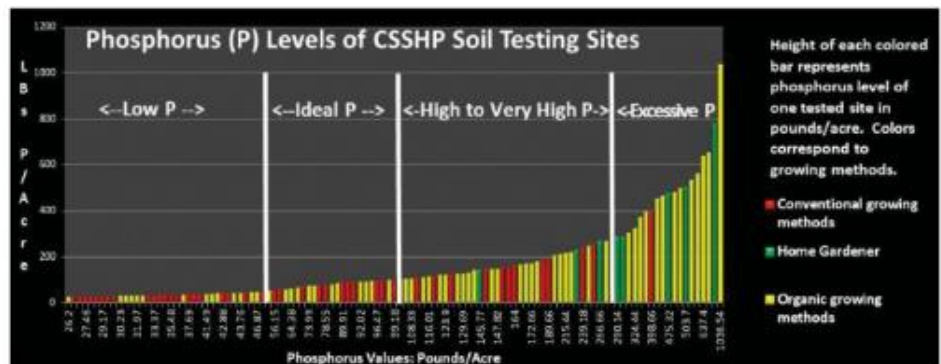
compost, cover crops, and amendments have paid off with healthy rich soil, high in organic matter and teeming with soil microbes. But there is one big problem: almost all of us CSSHP home gardeners also have excessive phosphorus in our soils now, in addition to all those microbes and organic matter.

What is phosphorus anyway? Phosphorus (P) is an essential plant nutrient that is used by plant cells to build DNA and regulate metabolic reactions. It is essential for adequate plant growth and fruiting, and since most veggie production is either leaves or fruits, is essential for a productive vegetable garden. But phosphorus is one of those Goldilocks-type elements: you don't want too much or too little. You want it just right. Phosphorus is the middle number in the N-P-K numbers (Nitrogen-Phosphorus-Potassium) that are on every bag of organic or conventional fertilizer. Bone meal with an N-P-K of 0-10-0 is high in phosphorus, while blood meal with an N-P-K of 12-0-0 has no phosphorus but lots of nitrogen (N).

What is the problem with too much phosphorus? Three things. First, excessive phosphorus can interfere with plants' uptake of micronutrients like iron and zinc, causing chlorosis, stunting, and yellow or bleached foliage. Second, it's a waste of money and our precious labor. And third, during storms or

heavy watering, excessive phosphorus can run off into nearby waterways and cause "eutrophication": excessive algae or waterweed growth, water-oxygen depletion, dead aquatic animals, and poor water quality. Remember the smell of a putrid pond late in summer? That is the smell of eutrophication.

Excessive soil phosphorus is a very common problem for organic vegetable growers nationwide. Our CSSHP research shows that it's a common problem for Colorado's organic vegetable growers too. (See graph.) Many organic growers depend on manure or compost to fertilize. Manure is readily available, cheap, easy to apply, and provides crops with a necessary nitrogen boost. However, manures - and some composts - are rich in phosphorus, which can build up in soils over time. So while using mainly manure and compost fertilizers for years greatly improves tilth and soil health, it can also cause a big phosphorus problem in your soil.



For decades I have conscientiously applied manure and compost to my veggie patch, and have sprinkled beds with bone meal (0-12-0) and Gardeners Special fertilizer (11-15-11), both high in phosphorus. Who knew? I always figured that more was better; what harm could it do, since it was organic? Now I find that my rich black soil has phosphorus levels well into the excessive range, at almost 5 times the highest recommended level. OOPS!

So if you have used manures, composts, and fertilizers high in phosphorus for years, please consider testing your soil, no matter how wonderful your soil seems. None of us wants to be responsible for polluting our rare and precious waterways here in the high

desert. A routine CSU soil test is simple to collect yourself and costs \$35. Google "CSU Soil Test" for instructions and forms. If your test shows "High" or "Very High" phosphorus levels, stop using high phosphorus amendments. As Will Rogers said, "If you find yourself in a hole, stop digging."

However, your soil will still need organic matter, so if your phosphorus is high, switch to amending with cover crops rather than manure. A rye-vetch mix is a weed suppressing, organic matter boosting, Colorado winter surviving fall cover crop. Plant by October, water in, and turn under in the spring - before it gets too big to handle and at least 3 weeks before planting the next crop. (Rye is allelopathic, with root exudates that discourage other plants). Spring legume cover crops like field peas, vetch, and clovers can add necessary nitrogen to your soil. Inoculate before planting, and turn under the entire plant to get full nitrogen benefits. Other high nitrogen, low phosphorus amendments to consider include blood meal (12-0-0), fish emulsion (5-1-1), and urea (46-0-0). A final consideration for high phosphorus levels is to plant water-absorbing buffer strips around your veggie patch, to slow and absorb any nutrient run-off during storms.

All the home gardeners and organic farmers in the CSSHP who have excessive phosphorus levels are conscientious hard-working growers, striving for the healthiest soil possible. They never imagined that their soil amending could risk stunting their plants or polluting waterways. But these practices can run those risks, and yours might too. So please get your soil tested if your gardening practices might result in excessive phosphorus.

Elizabeth Black produces the Citizen Science Soil Health Project and grows trees and veggies at Your Neighborhood Christmas Tree Farm in Boulder.