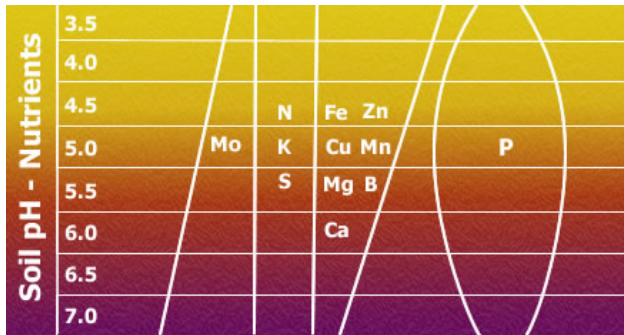


Getting to the Roots of Productivity

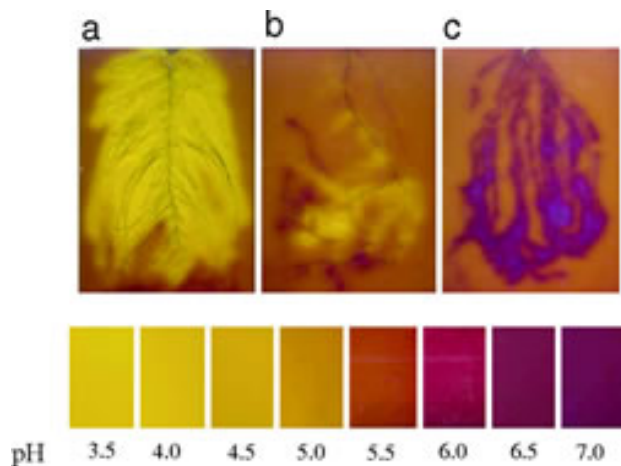
We all learned something about soil chemistry early in our Master Gardener training. I recall becoming resolved to the inevitable challenges of gardening in alkaline soil after seeing this chart showing the effects of soil pH on mineral availability.



However, after reading the agricultural research recently published by Chinese researchers (1) about the acidifying effects of faba bean root exudates in the soil and the effect that has on the mineral uptake of other plants, I have new hope of achieving a more favorable level of pH in the root zone.

Here is the core of what they discovered from the four-year research project. Inter-planting corn with faba beans (small seeded varieties of fava beans) increased the yield of corn by 49% and of faba beans by 26% in phosphorus-deficient soils, when adequate nitrogen was available.

Although there are non-chemical factors that effect the success of inter-species plantings, such as moderating soil temperatures, improving moisture retention, increased soil aeration, aerial support and shading, the increased yield in this combination resulted from the chelation of Ca, Fe and Al thereby increasing the availability of otherwise insoluble Phosphorus.



The chart above shows the change in pH caused by root exudates. (a) is the rhizosphere surrounding faba bean roots, (b) is that surrounding soy bean roots and (c) shows the alkaline exudates from corn roots. Clearly, faba beans create an acidification of the rhizosphere that has a beneficial impact on corn when their roots systems share the same soil space.

So what does this mean to gardeners in alkaline desert soils? An obvious answer is to interplant faba or fava beans with corn and take advantage of the rhizosphere acidification and increased availability of Phosphorus. I have planted Sweet Loraine and Guatemalan Purple faba beans here for the last three years and find them well suited during all months of the year, except June and July. They are cold hardy enough to grow through winter without row covers - at least most winters. They make an edible cover crop through winter, if you enjoy the delicious greens, raw, steamed or wilted. Fortunately, they are also one of the most efficient nitrogen fixers.

Other uses of this knowledge in the garden require more personal inquiry and experimentation. I am experimenting with inter-planting tomatoes and cowpeas to see if that combination makes additional calcium available to the tomatoes. Since the acidification from exudates causes chelation of calcium and iron, it may have some impact on iron chlorosis that is common here.

I would encourage you all to read the original research report, expand on your understanding of soil chemistry and biology and experiment with new inter-planting combinations in your own gardens.

till next time,

Darrol Shillingburg - Doña Ana Extension Master Gardener

(1) Diversity enhances agricultural productivity via rhizosphere phosphorus facilitation on phosphorus-deficient soils

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