

Soil Testing Results at Long Beach Community Gardens
Supporting document
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INTRODUCTION

In the 2nd half of 2021 soil tests were performed on 13 plots in the gardens and an additional test was performed in the orchard with samples taken under the trees. In 2013 two tests were performed in the orchard. One was taken with samples under the trees in areas that were watered and fertilized. The other was taken in areas that had not been fertilized. I will refer to the latter sample as “native soil” as it can be used to compare the difference with fertilized areas.

The samples were analyzed at Wallace Labs in El Segundo, a well-respected soil testing laboratory. The reports provide a comprehensive listing of pH, salinity, the concentration of soluble salts, sodium, 14 essential nutrients and over a dozen toxic metals. Recommendations and interpretations are also provided with the report. Each plot owner paid for their test.

I was unable to find any previous soil testing results despite many informal discussions on the condition of garden soil and suggestions on how to improve it.

As part of the investigation, I interviewed about 20 gardeners and checked the contents of the dumpsters to determine what fertilizers and soil conditioning products gardeners are using to enhance their soil.

NUTRIENTS

Almost all of the samples showed high or very high levels of all macro and micronutrients. Only 1 had low amounts of boron. Four showed moderate levels of sulfur. Some of the nutrients such as potassium and phosphorus were excessively high in several samples. According to Wallace, excessively high levels of potassium may cause wilting due to elevated salinity and may decrease the availability of magnesium. Excessively high amounts of phosphorus may decrease the availability of iron, manganese, zinc and copper. The results do not suggest that this has occurred yet.

The native soil sample showed very high levels of potassium, iron, copper, boron, magnesium and moderate levels of other nutrients. Only sulfur was low.

The orchard sample showed high or very high levels of most nutrients and moderate level of sulfur. The level of nutrients has risen since 2013 with the exception of zinc.

Nitrogen was high or very high in all plots except one which had a moderate amount. Nitrogen was low in the native soil.

ZINC

Wallace says optimum zinc is several parts per million. Sensitive plants need zinc below 30 ppm and herbaceous plants need zinc below 50 ppm. More than half of the samples had more than 30 ppm but none had more than 50 ppm. The native soil showed 22 ppm. The orchard had 51 ppm in 2013 and has now dropped to 29 ppm.

Zinc is found in some fertilizers and soil amendments such as Miracle Gro, Ironite, Azomite and Bumper Crop.

TOXIC METALS

Lead was found in all samples in low to moderate levels including the native soil. Aluminum was found at the moderate level in 2 plots and high level in 2 plots. Wallace says aluminum restricts growth by interfering with the metabolism of phosphorus and calcium. It causes stunting and discoloration. Aluminum is high in poorly aerated soil and in overly acidic soils. Soluble calcium helps to reduce the toxicity of aluminum. Aluminum is usually found in most soils but is generally sequestered.

Other metals were not detected or at very low levels.

SOIL PH

Soil pH ranged from 6.28 (acidic) to 7.63 (slightly alkaline). Preferred range is from 6.5 to 7.5. Ideal is between 6.5 and 7.0. Most samples were in the ideal range, 4 were over 7 and 2 were under 6.5. The native soil was 7.71. The orchard was at 7.68 in 2013 and has now dropped to 6.88.

SALT

The E_c is a measure of the soil salinity. A value greater than 1 affects few plants, over 2 some plants and over 4 many plants. Values ranged from 2.50 to 6.89. Most were well over 3 indicating high salt levels. The native soil was 1.30. The orchard went from 1.07 in 2013 to 2.15 in 2021. This was likely due to the decrease in watering from 14 hours a week to 2 hours a week.

Chloride levels above 150 ppm will create problems. Chloride values ranged from 52 to 627 with only 1 below 150 ppm. The native soil was 156. The orchard went from 61 in 2013 to 45 in 2021.

Manure is high in salt and chloride. Chicken manure measured significantly higher than horse manure. Most fertilizers contain low to moderate amounts of salt.

Wallace suggests using gypsum to break up the soil and allow the salts to leach out with deep watering. UC IPM suggests using manure as a ground cover when plants are mature and less sensitive to salt. This allows most of the salt to leach out before it is mixed into the soil when the plants are removed for the next growing season.

OBSERVATIONS

The data shows that many gardeners are using much more fertilizer than necessary. It is likely that this is due to a lack of knowledge about soil condition. Plants may be growing slowly due to high salt or soil pathogens and the natural reaction is to add more fertilizer. Information from the internet, from garden shops and from other gardeners often persuade people to add products that may be unnecessary or potentially harmful to their soil.

The most common products observed in use were G&B Organics fertilizers and Bumper Crop soil amendment, both Kellogg products that are widely available in most stores. Various brands of chicken manure are also highly popular.

Some gardeners add additional nutrients from Azomite (Hydrated Sodium Calcium Aluminosilicate), SulPoMag or Langbeinite (sulfate of potash-magnesia), Epsom Salts (magnesium sulfate).

I found 2 people using the garden recommendations of ammonium sulfate, gypsum, manure and SulPoMag. Several people said they used it their first year then changed to other products. The primary reason was that they wanted to use organic products.

I found only a few people using gypsum. Few gardeners know what it is and how it helps to break up the soil and reduce salt buildup.

CONCERNS

Azomite contains 11.43% aluminum. The manufacturer claims that the aluminum is sequestered. It is unlikely that all of the aluminum is sequestered but the plant available amount is unknown without testing. It also contains 64.3 ppm of zinc and is high in salt. There is no nutrient deficiency that is addressed by adding Azomite. Any potential benefits of this product are far outweighed by the possible problems it could cause.

Compound fertilizers often add many different nutrients. Gardeners need to carefully read the labels to determine if the contents are suitable in their soil. Many, like Miracle Gro, contain zinc which is not needed and may damage plants if the level rises above 30 ppm. It is very unlikely that these fertilizers supply any nutrients that are deficient.

SulPoMag or Langbeinite contains 22% sulfur, 22% soluble potash and 18% magnesium. All plots showed high levels of potassium and magnesium and only a few had moderate levels of sulfur. Adding gypsum (15% sulfur) should supply adequate sulfur for most gardens. Excessively high levels of potassium will stunt plant growth. There is little to no benefit of adding this product and it could contribute to lowering soil pH.

Epsom Salts or magnesium sulfate contains 13% sulfur and 10% magnesium. It is unlikely that this product will have any benefit to the soil and could acidify the soil if used with other products containing sulfur.

I was able to find a soil analysis of Bumper Crop soil amendment online. It showed the following:

Phosphorus 302 ppm	Potassium 1726 ppm	Calcium 3950 ppm
Magnesium 400 ppm	Boron 4 ppm	Manganese 1.6 ppm
Zinc 10.5 PPM	Copper 1.1 ppm	Iron 6.5 ppm
Sulfur 432 ppm	Plant available aluminum 1 ppm	

Gardeners should be cautioned about using this product which will increase boron, zinc and aluminum. Using enhanced compost products like Bumper Crop with other fertilizers containing phosphorus and potassium could lead to excessively high levels of both.

RECOMMENDATIONS

Wallace recommends adding a pH neutral nitrogen fertilizer such as calcium nitrate, fish emulsion, feather meal, blood meal along with gypsum¹. The amount of gypsum varies with salt and chloride levels but generally ranges from 20 lbs. to 100 lbs. per 1000 sq. ft. UC IPM strongly advises to add compost to vegetable gardens. These 3 things, nitrogen, gypsum and compost are all that most gardeners should add to their soil. Adding additional nutrients would unlikely provide any benefits and could potentially cause lasting damage to the soil.

The current recommendations specify 30 lbs. of ammonium sulfate (24% sulfur), a bag (unspecified size) of gypsum (15% sulfur), compost, and a box (unspecified size) of SulPoMag (22% sulfur). Using this combination will likely lower the soil pH value. As previously mentioned, there is no evidence to show any benefit from the addition of SulPoMag. Ammonium sulfate should only be used in gardens with a high (over 7) pH value.

CONCLUSION

It is important for gardeners to know what they need. We should provide them with a message about needing just 3 things which they can easily remember: nitrogen, gypsum and compost. Each gardener will have a different philosophy and having the flexibility to choose different options will help them make a plan that fits these guidelines.

¹ In cases of low pH, he recommends not adding sulfur and to use lime.