Too Much of a Good Thing: Over-Fertilization in Home Gardens

By Sue Gwise, *Consumer Horticulture Educator*

All gardeners know that plants need nutrients in order to grow and thrive. Plants derive many nutrients from the soil and fertilization may be helpful in supplying those nutrients. The soil should be thought of as a 'bank'- it has a certain amount of nutrients (money). When you grow a crop you are 'withdrawing' nutrients from that soil bank. More nutrients need to be deposited so the bank doesn't collapse. This is a good analogy but problems occur when gardeners randomly add fertilizers and organic matter without the benefit of soil testing. People know fertilizer and organic matter are helpful, but they over-do it- thinking that more is better and will lead to the largest, most juicy tomatoes ever. This is not the case. A problem of nutrient overload can develop and it is very difficult to reverse.

These tomato plants produced lush, leafy growth but no fruit due to excessive application of nitrogen. (HGTV)

Before you add anything to your soil, you should do a soil nutrient analysis. It will tell you what you need to do to improve that soil for the crop you are growing. Most of the time nutrient levels are fine and you don't need to add anything other than a source of nitrogen. This frustrates people because they want to DO SOMETHING to improve their garden. Actually the best thing you can do is to till or work in a 2-inch layer of organic matter like compost, peat moss, or composted manure each year- either in the spring or fall. Additional tilling or working of the soil should be avoided as it ruins the soil structure and disrupts beneficial soil organisms. As long as your plants are healthy and yielding well nothing else needs to be done.

Problems occur when gardens don't do well and gardeners assume there is 'something wrong' with the soil. Fertilizers and organic matter are over-applied thinking it will solve all of the problems. Most of the time when gardens under-perform it is not a soil issue. It is usually caused bad weather conditions, disease, or poor weed control. When things don't improve the following season more products are applied leading to a vicious cycle. Now there really is a problem with the soil!

Referring to the internet won't help. Most of the time you will get an opinion or suggestions to purchase a particular 'miracle' product, or information that is not relative to the conditions in NNY. Also keep in mind that many fertilizer recommendations are for intensive, commercial production, not home vegetable gardens. The nutrient requirements for acres of processing beans are totally different from the four rows of string beans in your garden- they cannot be used interchangeably! If you want researched-based information on home gardening you should visit .edu sites from your land grant university (in NYS that is Cornell University).

After a few years of problems, most gardeners succumb and have a soil nutrient analysis done. The results from over-amended soils have several things in common:

1. Phosphorus and potassium levels are excessive. Over-application of manures can lead to high phosphorus levels. High potassium levels can be caused by the addition of wood ash. Phosphorous or potassium fertilizers should not be applied unless indicated by a soil test.

2. The pH is high. Garden plants grow best when pH levels are between 6.0 and 7.0. Often soils will have a pH that is much higher (7.5+). This is due to the indiscriminate application of lime or wood ash. Neither should be applied unless you know your existing soil pH. High pH levels can cause nutrient deficiency and

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toxicity.

3. The organic matter (OM) levels are high. Typical NYS soil OM levels of 2 to 5% are fine. Many times soil analysis reports show OM levels that are double that number. This is due to the over-application of peat moss, compost, and manures- this leads to nutrient imbalances.

4. Soluble salt levels are high. This is caused by the over-application of synthetic fertilizers and manures, both of which are high in salts. Water soluble fertilizers especially can burn plants and leach into ground water.

And a word about nitrogen- everyone knows that it is essential for plant growth, but it is not measured in soil tests. That is because soil nitrogen levels are always in flux due to biological activity and soil conditions. Over-application leads to lush, green growth that fools gardeners into thinking they have done a great job. This growth happens at the expense of the root system which may not be able to keep up with the rapid growth and the plants begin to decline. Another problem caused by too much nitrogen is the lack of reproductive growth. The plant puts so much energy into vegetative growth that fruit yields are low. The plants look great, but there are few tomatoes, peppers, squash, etc. Also, too much nitrogen will make plants more susceptible to disease and insect infestation. The *annual* recommended nitrogen rate is 3.5 ounces per 100 square feet or 2.2 pounds per 1,000 square feet. If you have adequate levels of organic matter, this amount should be reduced.

So what is a gardener to do? If your plants are healthy, do nothing but add that yearly 2-inch layer OM. Do a soil analysis every three years for a baseline and to pick up on any potential problems. If soil tests indicate high nutrient levels, do not apply any form of OM until levels stabilize. If you have been adding many products to the soil and plants are still struggling, it could be nutrient over load. Symptoms on plants include:

1. Wilting or yellowing of lower leaves.

2. Browning of leaf tips and edges.

3. Black, brown or rotting roots- healthy roots should be white.

4. Poor growth.

5. Leaf drop.

If this is the case, get a soil test and do not add anything to the soil until you get your results.

Nutrient over-load in soils can be reversed, but it takes time. It is often recommended that nutrients can be flushed from the soil by applications of water, but this does have environmental consequences since all that water has to go somewhere, possibly into water bodies and wells. A better way to remediate the soil is to plant a cover crop at the end of the season to absorb residual nutrients. When fully grown the cover crop should be cut and removed from the garden.

To sum everything up I'll leave you with a few words of wisdom related to soil nutrition:

'More is not always better.'

-AND-

'Test, don't guess.'

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GARDEN SOIL TESTING at CCE of Jefferson County

>pH Testing-

There is no charge for this test for up to 3 samples. Additional sample testing is $2 per sample. Just drop off a soil sample at our reception desk and we will call you with the results.

>Complete Soil Analysis-

Garden soil testing is done for trees, shrubs, home vegetable, fruit, and flower gardens. The cost is $15 per sample. Contact Sue Gwise (sjg42@cornell.edu) with any questions. This test should be done if soil pH levels are out of the normal ranges, or if you have been having problems with your gardens.

You will receive a soil analysis report via regular mail or email (your choice) in about 2 weeks. Specific recommendations will be listed on the report based on your soil and the crop you are growing.

>How to take a soil sample-

Using a hand spade and a small container, take 5 to 6 random samples from the planting area. Remove any organic material on the top of the soil and dig down to a depth of about 8 inches to take the sample. Mix all of the samples together and bring in two cups of the mixture. If the sample is wet, it should be left out to dry overnight. Place the sample in a zip-lock bag, or a glass or plastic container. Do not use metal containers. Soil samples are accepted at the CCE Jefferson reception desk from 8:30 AM to 4:00 PM, Monday through Friday.