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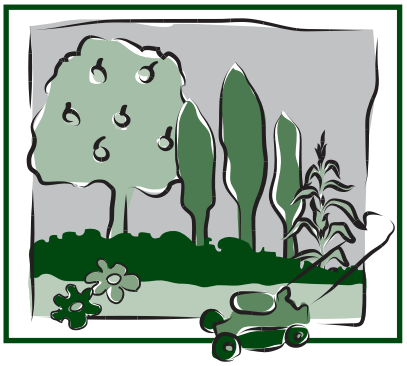

Fertilizing the Vegetable Garden

Fact Sheet No. **7.611** Gardening Series | **Fruits and Vegetables**

C.E. Swift and J. Self*

Fertilizer nutrients required by vegetables in the highest quantity are nitrogen (N), phosphorus (P) and potassium (K). Other nutrients, including iron, copper, manganese and zinc are needed in much smaller amounts. With the exception of nitrogen and phosphorus, most of these nutrients are most likely available in the soil at adequate or even excessive amounts. Adding nutrients that are not needed can cause deficiencies of other nutrients and can cause an imbalance of nutrients. Nobody can tell you what your soil really needs without referring to a soil test conducted by an analytical laboratory.

A common recommendation for vegetables is to apply 1 pound of a 10-10-10 fertilizer or 2 pounds of a 5-10-5 (or 5-10-10) fertilizer per 100 feet of row. The first number is the percentage by weight of nitrogen, the second the percentage by weight of phosphorus and the third number is the percentage by weight of potassium in the fertilizer product. Thus, 100 pounds of a 5-10-10 fertilizer contains 5 pounds of nitrogen, 10 pounds of phosphorus and 10 pounds of potassium. As already mentioned, applying nutrients not needed can cause problems with the vegetables you are growing.

When an excess amount of nitrogen is applied to fruit crops such as tomatoes and squash, it is common to have all vines and no fruit. With corn, missing a nitrogen fertilizer application as the corn starts to tassel can result in poor ear production. When excessive amounts of nitrogen are applied to root crops such as turnip, carrot and parsnips, you may end up with many leaves and small roots.

When phosphorus is applied but not needed, it can kill off the symbiotic mycorrhizal-forming fungi required by the plant and reduce the vegetables' ability to absorb iron and other micronutrients. Excess soil phosphorus also shuts down the plant's ability to produce phytochelates, organic molecules produced by roots to increase its iron uptake.

Prior to applying any fertilizer product, collect a soil sample and send to the soil testing lab at Colorado State University or another analytical lab for analysis. If you have already added compost, collect the soil sample after the compost has been thoroughly worked into the soil. It is recommended compost be added after you receive the test results. Soil tests can cost less than $25 and should not be neglected. Testing your soil on a three to four-year cycle is usually adequate.

The soil test parameters will provide information on what type of compost should be added. For example, salt-affected soil may require the addition of low salt compost or organic matter such as peat moss.

If you have not had a soil test conducted on your garden soil but still want to fertilize, apply small amounts of a nitrogen fertilizer several times during the growing season. Prior to planting, spread fertilizer (not manure) over the growing area and incorporate it into the soil with a rototiller, spade or garden rake. Apply up to 1/2 pound of nitrogen per 1,000 square feet for this application. This fertilizer should only contain nitrogen and no or minimal amounts of phosphorus, potassium and other nutrients.

If using ammonium sulfate (~20-0-0), apply two and one-half (2 1/2) pounds of this fertilizer per 1,000 square foot area of garden. If using blood meal (~15-1-1), use three and one-third (3 1/3) pounds of this product per 1,000 square foot area. Water the fertilized area to help move the fertilizer into the soil. Avoid applying dry fertilizer on foliage as burning can occur.

Occasionally during the growing season, i.e. every four to six weeks, apply a nitrogen fertilizer such as ammonium

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Quick Facts

- The most common recommendations are for nitrogen and phosphorus.
- Excessive amounts of nitrogen can reduce production and quality, and increase insect and disease problems.
- Applying phosphorus when it is not needed can increase chlorosis.
- The amount and type of fertilizer for vegetables should be based on a soil test.

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sulfate (20-0-0) or bloodmeal (15-1-1) at the rate of no more than 1/10th pound of nitrogen per 100 linear feet of row.

Calculate the amount of the fertilizer product needed by dividing the pounds of N needed by the percent of N in the product.

For example, if you need one-half pound of nitrogen for a given area and are using bloodmeal (15-1-1), divide .5 (= one-half pound) by .15 (the percent of N in the product). This tells you 3.33 pounds of bloodmeal are needed to apply one-half pound of nitrogen.

Once you have a soil test report on your garden area, use the following charts to determine the amount of nutrient you need to add.

Soil Test Levels (ppm)

Recommendations Based on a Soil Test Report

Soil Test Levels (ppm)	**Percentage of Organic Matter Present**		
NO_3-N (nitrate nitrogen)[1]	0 - 1 %	1.1 - 2.0 %	> 2.1 %
1 ppm = 0.08 lb. N/1000 sq. ft.	**Lbs. Nitrogen to add per 1000 sq. ft. area**		
0 - 9 parts per million (ppm)	5.5	4.4	3.3
10 - 19	4.4	3.3	2.1
20 - 29	3.3	2.1	1
30 - 39	2.1	1	0
40 - 49	1	0	0
>50	0	0	0

P (phosphorus)[2] 1 ppm P = 0.1 lb. $P_2 0_5$/1000 sq. ft.	**Level of sufficiency**	**Lb. $P_2 0_5$/1000 sq. ft.**
0 - 3 ppm	very low	5
4 - 7	low	4
8 - 11	medium low	3
12 - 14	moderate	1
Greater than 14	sufficient	0

The phosphorus values are based on AB-DPTA extractable phosphorus – use the table below to determine the level of sufficiency if another extraction method was used.

Level of Sufficiency	**AB-DTPA ppm**	**Bray-1 and Mehlich-II ppm**	**Mehlich-III ppm**	**Olsen ppm**
Very low	0 - 3	0 - 5		0 - 3
Low	4 - 7	6 - 12	<10	4 - 9
Medium low	8 - 11	13 - 25	11 - 31	10 - 16
Medium	12 - 14	26 - 50	32 - 56	17 - 31
Sufficient	>14	>51	>56	>32

These are general phosphorus ranges for different extractants. The ranges may change according to the laboratory's location and how phosphorus response was calibrated with crop yield.

K (potassium)[3] 1 ppm K = 0.06 lb. $K_2 0$/1000 sq. ft.	**Level of sufficiency**	**Lb. $K_2 0$/1000 sq. ft.**
0 - 60 ppm	very low	3
61 - 120	low	2
121 - 181	medium low	1
Greater than 181	sufficient	0

Fe (iron)[3]	**Level of sufficiency[4]**	**Lb. Fe chelate/1000 sq. ft.[5]**
0 - 5.0 ppm	low	0.25 (or 10 lbs/acre)
6.0 - 10.0[6]	moderate - high	0 for non-Fe sensitive crops 0.13 for Fe sensitive crops (or 5 lbs/acre)
Greater than 10[7]	sufficient for all crops	0

Zn (zinc) 1 lb. Zn = 2.48 lb. $ZnSO_4$	**Level of sufficiency[8]**	**Lb. $ZnSO_4$/1000 sq. ft. area**
0 - 0.9 ppm	low	0.6 pounds $ZnSO_4$/1000 sq. ft.
1.0 - 1.5	moderate	0.3 pounds $ZnSO_4$/1000 sq. ft.
>1.5	adequate	0

[1] Add nitrogen each year. It can be surface applied and watered in. Base the amount of N to apply on the organic content of the garden soil.
[2] Work phosphorus and potassium into the soil prior to planting.
[3] If liquid is used, apply according to label directions.
[4] Low levels of available iron may indicate over watering, poor soil preparation, excessive phosphorus levels, soil compaction or high pH.
[5] Incorporate iron chelate (Sequestrene 138Fe) into the soil if available.
[6] Fe-sensitive plants need higher levels of Fe in the soil.
[7] An over-application of iron can cause other micronutrient disorders.
[8] Based on *Zinc and Iron Deficiencies* by R.H. Follett and D.G. Westfall, Extension Fact Sheet 0.545