# GETTING THE MOST OUT OF YOUR HOME VEGETABLE GARDEN SOIL TEST REPORT

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Soil testing and fertilizer applications are an important part of any productive home vegetable garden. However, soil test reports often include terminology and concepts that may not be completely clear to gardeners. This publication is designed to provide supplementary information that will enable gardeners to get the most out of their soil test report and recommendations.

## Understanding Fertilizer Recommendations and Terminology

### Fertilizer FAQs

#### Why does pH matter?

Soil pH describes the acidity or alkalinity of the soil. It affects the availability of nutrients because pH that is too low or too high can result in plants being able to access too little or too much of the nutrients in the soil. High or low pH can cause the nutrients that are present in soil to take on a form that may not be good for plant uptake. This happens often with phosphorus, a nutrient that can be found in different forms. Phosphorus availability will start to decrease at too low of pH (lower than 5.5) and too high of pH (above 7.0). pH also affects micronutrient availability. Aluminum can become toxic at low pH and iron and manganese may become deficient when pH is too high. The activity level of important biological organisms in the soil also is impacted by pH, and it can even determine whether herbicides are effective. When managing pH, use lime to increase it and elemental sulfur to lower it. Following recommendations as to the amount of lime or sulfur is important because excess lime additions can increase the pH, and it then can be challenging to bring down with sulfur applications. Soil pH may also decrease over a period of years with nitrogen fertilizer applications. This is partly why testing every 2 to 3 years is important.

*Figure 1. A complete granular fertilizer being applied pre-plant to the garden.*

#### What do low (L) , medium (M), high (H) and very high (V) mean in reality?

When your garden soil tests indicate a low phosphorus (P) and potassium (K) level, that means plants are likely to respond when these nutrients are added (assuming the pH is appropriate). If soil tests indicate a medium level, the plants may respond. However, if the level tested is high or very high, your garden plants are not likely to show any response to the addition of these nutrients. Remember, if your pH is not in the correct range, you may not get a response from fertilizer at any level.

#### Why is there no nitrogen listed on the soil test report?

Nitrogen (N) has the ability to leave the soil rooting zone in a growing season. Testing for N can be unreliable for gardeners because results can vary through the season, and early season testing often shows low amounts present.

So, annual nitrogen fertilizer applications are based on the N demand of the plants being grown instead of the amount tested in the soil.

### What is the difference between natural or organic fertilizer and chemical fertilizers?

Chemical fertilizers are formed using industrial processes or are mined from deposits in the earth and then processed, purified, mixed and blended. Organic or natural fertilizer materials are generally from previously living things (composts; manures; and bone, feather or blood meal) or mineral deposits (rock phosphate, muriate of potash). Organic, synthetic and mineral types of fertilizers provide similar types of nutrients. Organic types may be more slowly available because microbial activity is needed for conversion to forms that can be readily taken up by plants. (In certified organic production, only certain fertilizers are allowable.) The slower release of nutrients from organic fertilizers can be a drawback, but it also can reduce nutrient losses. Organic fertilizers often contain lower nutrient percentages by weight, so more may be needed to supply the same amount of nutrients compared to chemical fertilizers. Rock phosphate may have a slower release when applied to a soil with a high pH.

### If some fertilizer is good, more is better, right?

No, exceeding recommendations for fertilizers will not help plants at all. Recommendations are made based on your soil conditions and will provide nutrients in optimum ranges for plant use. Exceeding this amount will not provide benefits and can even lead to nutrient deficiencies because excesses of some nutrients can lead to poor uptake of others. Additionally, excess nutrients can be lost to the environment and degrade streams and rivers in Tennessee.

## Fertilizer Terms and Methods of Application

Broadcast — The most common method of fertilizer application involves spreading material evenly over the surface of the soil. Tilling is an option to evenly mix the fertilizer within the top 3 to 4 inches of the soil. Fertilizer also can be broadcast in areas that will not be tilled.

Banding — This method is the placement of fertilizer approximately 3 inches on each side and 3 inches below the planting row (see image). It can be used to add fertilizer before or at planting instead of broadcasting. For gardeners, broadcasting or banding can both work well. To convert broadcast recommendations to banded, use the table below.

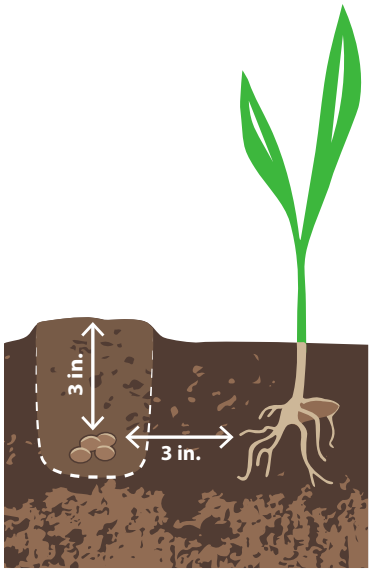


*Figure 2. Granular fertilizer being applied beside the crop in a band can be done at planting or as a sidedressing during the growing season.*

| **Amount of broadcast fertilizer material recommended per 1,000 sq. ft.** | **Amount of banded fertilizer material in pounds per 100-ft. rows (for various row widths)** | | | | |
|---|---|---|---|---|---|
| | 18 inches | 24 inches | 30 inches | 36 inches | 48 inches |
| 10 lbs. | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 |
| 15 lbs. | 2.25 | 3.0 | 3.75 | 4.5 | 6.0 |
| 20 lbs. | 3.0 | 4.0 | 5.0 | 6.0 | 8.0 |
| 25 lbs. | 3.75 | 5.0 | 6.25 | 7.5 | 10.0 |
| 30 lbs. | 4.5 | 6.0 | 7.5 | 9.0 | 12.0 |

Sidedressing — This term refers to fertilizers adding during the crop growing season in a similar manner to banding (although often only added to one side of the row) to provide certain plant nutrients, like nitrogen, that may be more quickly taken up by plants or lost by leaching (water moving through the soil and taking nutrients with it). While sidedressing can be helpful, it should be done carefully because excessive fertilization can actually reduce fruit production. So, follow directions for specific crop needs and timing during the growing season.

## Converting Fertilizer Weight to Volume

| Fertilizer or liming materials | Cups of fertilizer to provide 1 pound of fertilizer (Source: UC-Davis) |
|---|---|
| Sulfur, dried blood | 3 |
| Ammonium nitrate, urea | 2.5 |
| Potassium chloride, gypsum, mixed fertilizers (10-10-10, etc.) | 2 |
| Calcium nitrate, superphosphate, potassium sulfate, ground limestone | 1.5 |

## Fertilization and Irrigation Connections

Water plays an important part in providing proper nutrition for vegetables. Nutrients added through fertilizers must dissolve in water in the soil to be able to be taken up by plants. That means that proper moisture is essential for plants to access water and nutrients. So, lack of water in your garden can cause poor nutrient uptake. However, excessive irrigation can leach nutrients away from plant roots.

# In-Season Nitrogen Fertilization for Vegetable Crops

| Crop | Timing in season/ fruit or plant size | Application rate/100-ft. row 36-inch centers | | | |
|---|---|---|---|---|---|
| | | 33-0-0 or 34-0-0 Ammonium nitrate or urea | 15.5-0-0 (calcium nitrate) | Bloodmeal, feathermeal (12-0-0) * | Soybean (7-1-2), cottonseed (6-2-1) meal or fish fertilizer (5-1-1)* |
| Tomato | First fruits are 1 in. diameter | Not recommended | 1.5 lbs. | 2 lbs. | 4 to 5 lbs. |
| Pepper | First fruits are 1 in. diameter | Not recommended | 1.3 lbs. | 1.5 to 2 lbs. | 3 to 4 lbs. |
| | Later in season (if needed) | 0.5 to 1 lb. | 1 lb. | 1.5 lbs. | 3 to 4 lbs. |
| Vine crops (Cucumbers, melons, pumpkins, squash) | Vines are 1 ft. long | 0.5 lb. | 1 lb. | 1.5 to 2 lbs. | 4 lbs. |
| Sweet corn | Plants are 12-18 inches tall | 1 lb. | 2 lbs. | 3 lbs. | 6 lbs. |
| Okra, eggplant | 3 to 4 weeks after seeding/ transplanting | 0.5 to 0.75 lb. | 1 to 1.5 lbs. | 1.5 to 2.5 lbs. | 2 to 4.5 lbs. |
| | 6 to 8 weeks after seeding/ transplanting | 0.5 to 0.75 lb. | 1 to 1.5 lbs. | 1.5 to 2.5 lbs. | 2 to 4.5 lbs. |
| Broccoli, cabbage, cauliflower, Brussels sprouts | 2 to 3 weeks after transplanting | 0.75 lb. | 1.5 lbs. | 2 lbs. | 3 to 5 lbs. |
| | 5 to 6 weeks after transplanting | 0.4 lb. | 0.8 lb. | 1.2 lbs. | 2 to 4 lbs. |
| Kale, collards, lettuce, spinach, mustard | 3 to 4 weeks after seeding | 0.4 lb. | 0.8 to 1 lbs. | 1.2 to 1.5 lbs. | 2 to 3.5 lbs. |

* Natural or organic fertilizers will be available more slowly than chemical (often 1-4 months).

** Adapted from Southern Vegetable Crops Production Guide

# General Recommendations of P and K Fertilizers Based on Soil Tests

Triple blends of straight N, P and K fertilizers do not always meet the specific needs of a garden and can deliver more of some nutrients than required. It may be best to tailor fertilizer applications to P and K needs by buying separate bags of P fertilizer and K fertilizer. This is especially important when P tests are in the high or very high range.

| | Soil Test P | |
|---|---|---|
| | Low | Medium |
| Fertilizer rate | lbs. per 1,000 sq. ft. | |
| Single super phosphate 0-18-0 | 8 | 4 |
| Triple super phosphate 0-46-0 | 3 | 1.5 |
| Bonemeal 2-14-0 | 11.5 | 5.7 |

| | Soil Test K | |
|---|---|---|
| | Low | Medium |
| Fertilizer rate | lbs. per 1,000 sq. ft. | |
| Potassium sulfate 0-0-50 | 3 | 1.5 |
| Potassium chloride 0-0-60 | 2.5 | 1.25 |
| Greensand 0-0-6* | 25 | 12.5 |

* varies

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