

GETTING THE MOST OUT OF YOUR RAISED BED OR POTTING MIX TEST REPORT

*Natalie Bumgarner, Assistant Professor and UT Extension Specialist,
Department of Plant Sciences*

Robert Florence, Director, UT Soil, Plant and Pest Center

Soil or potting mix testing and fertilizer application are an important part of any productive vegetable garden, whether in ground, raised beds or containers. However, these test reports often include terminology and concepts that may not be familiar to gardeners. This publication provides supplementary information that will enable gardeners to get the most out of their potting mix test report and recommendations.

Understanding Media Tests and Fertilizer Recommendations

Media and Fertilizer FAQs

Are soil and potting mix different?

Yes, they are. Soil is a mixture of minerals (sand, silt, clay) and organic matter. It functions to supply water and nutrients to plants and physically support them. Most potting mixes are composed of primarily organic matter (peat moss, coconut coir or shredded bark), and are often called soilless mixes or growing substrate. These soilless mixes fill the same roles as soil, but they are better for containers and raised beds because they drain better and are less likely to become compact over time. They also are lightweight and can be prepared largely free of plant pathogens. Rapid drainage in soilless substrates can require more frequent irrigation and fertilization as water and some nutrients move more quickly through the profile. Soilless substrates also require closer management because there are limited volumes of substrate from which the plants can take up water and nutrients. However, these mixes often warm up faster in the spring due to their drainage and darker color.



Why are soil and potting mix tests different?

Fertilizer recommendations are based on tests that extract nutrients from the mixture to determine what nutrients are available for plant use and what the estimated nutrients needs will be for specific crops. Because of the physical and chemical differences in soil and soilless substrates, different extraction methods are used. The methods used for soil tests will not provide accurate results for soilless mixes, and vice versa. So, selecting the appropriate test is quite important. As a rule of thumb, if there is 25 percent or more organic material (peat, bark, compost), then a potting mix test should be selected instead of a soil test.

Why does pH matter?

Soil or substrate pH 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 substrate. The pH affects the chemical form of nutrients,

and high or low pH can result in nutrients being present in a form that is not ideal for plant uptake. Different growing substrates can affect the pH range required. For instance, organic soils or substrates do not have clay minerals that can release aluminum and cause toxicity at low pH. Because of this, media pHs may be lower than mineral soil pH with a lower probability of aluminum toxicity.

What are soluble salts (SS) and why are they important?

Soluble salts describes the total amount of ions in the substrate, and they are usually measured by electrical conductivity, or EC. EC includes nutrients and non-nutrient ions, such as sodium. While SS can give an overall view of possible nutrients available, it is best to also measure specific plant nutrients. Soluble salt measurements are important in making sure that the mixture does not contain so many dissolved ions that it could impede water and nutrient uptake or lead to salt stress. Salt stress can also be caused by using water that has gone through your water softener. These systems generally add sodium to replace other ions, so always water your garden from a separate faucet installed before the softener.

Why are two values for nitrogen provided?

Nitrogen (N) can be taken up by the plant in more than one form, including nitrate (NO_3^-) and ammonium (NH_4^+). In soil systems, microbes carry out important reactions that transform nitrogen from organic forms found in living organisms to chemical forms used by the plant. Because the forms of nitrogen are in flux, any measurement is a snapshot in time and doesn't describe the longer term availability of nitrogen. In potting mixes (that are soilless), microbial communities are less commonly found than in soil, so N forms mostly reflect what forms were present in added fertilizers. Use caution in providing all ammonium to crops (especially fruiting crops). It can lead to lower fruit quality or even root issues because of the way it is taken up by and utilized in the plant. A fertilizer that has both N forms is often best.

Can I use compost alone to provide needed nutrients for my garden?

Compost is an excellent source of organic matter and is often added to garden soil or used to make growing mixes. However, the typical available nutrient content of finished composts make them difficult to use as the sole source of fertilizer. For instance, common composts are often listed as a 1-1-1 fertilizer, which means 10 times the amount of compost would be needed to provide nitrogen as a 10-10-10 fertilizer. That can be especially challenging when growing in containers or raised beds where the volume is limited. Additionally, some nutrients found in compost are in forms not immediately available to the plant, so biological breakdown may be needed, which takes time and appropriate environmental conditions. Because of space and time, it is best to use compost as an amendment and other fertilizers to provide the majority of needed plant nutrients.

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

No, applying more fertilizer than recommended will not support additional plant growth because recommendations are based on plant needs. Exceeding recommendations can even lead to nutrient deficiencies because excesses of some nutrients can lead to poor uptake of others. Excess nutrients in soilless mixes can also lead to an accumulation of salts that can reduce plant growth and health. Additionally, excess nutrients can leach from containers and raised beds into soil and streams that lead to accumulation in other larger bodies of water.

Fertilizer Terms and Methods of Application

Granular Fertilizer — Applying granular fertilizers prior to planting is the most common type of early season fertilization. For a pre-plant application, the material is spread evenly over the surface of the substrate prior to planting according to recommendations. Then the substrate can be turned or mixed in place to evenly distribute the fertilizer. Alternatively, fertilizer can be surface applied and the watered in to undisturbed areas, rather than mixing the substrate and fertilizer.

Pre-Plant Fertilizer Recommendations for Raised Bed/Container Vegetable Crops

Recommended rates per 1,000 sq. ft.		10-10-10 fertilizer rates for common raised bed sizes (1 ounce is approximately 2 tablespoons of 10-10-10)			
N	10-10-10 fertilizer	10 gallon container	4 feet x 4 feet x 12 inches deep bed	4 feet x 8 feet x 12 inches deep bed	4 feet x 10 feet x 12 inches deep bed
1 lb.	10 lbs.	0.2 ounces	2.5 ounces	5 ounces	6.4 ounces
1.5 lbs.	15 lbs.	0.3 ounces	3.8 ounces	7.5 ounces	9.6 ounces
2 lbs.	20 lbs.	0.4 ounces	5 ounces	10 ounces	12.8 ounces
2.5 lbs.	25 lbs.	0.5 ounces	6.3 ounces	12.5 ounces	16 ounces
3 lbs.	30 lbs.	0.6 ounces	7.5 ounces	15 ounces	19.2 ounces

Controlled Release Fertilizers — These fertilizers are formulated to provide nutrients over time rather than immediately dissolving when wet. Often release time is three to four months. This longer availability of nutrients is achieved by different types and/or thicknesses of coatings on the nutrients. Because of the range of controlled release fertilizer products, it is best to **follow product directions about timing and incorporation** for use in vegetable crops. Another method of providing nutrients slowly is to use natural fertilizer sources, such as bone meal, blood meal, and others that require microbial breakdown over time. See UT Extension publication W 661 Conventional and Organic Product Overview for Home Vegetable Gardeners in Tennessee for more information on these fertilizer materials and estimated release times. (extension.tennessee.edu/publications/Documents/W661.pdf)

Water Soluble Fertilizer — These fertilizers are formulated to completely dissolve in water and do not contain the insoluble materials found in many granular fertilizers. Their solubility makes them rapidly available for plant uptake. It also makes them more likely to leach away from plant roots as water moves through the substrate, so soluble fertilizers are often applied at more frequent intervals. Soluble fertilizers are simple to use. Although more costly than some other formulations, soluble fertilizers are useful for small spaces and containers. They are also used in irrigation systems because there are no materials that will clog nozzles or drippers.

Fertilization and Irrigation Connections

Proper moisture is essential for plants to access nutrients dissolved in water in the substrate. So, lack of water in your garden can cause poor nutrient uptake. However, excessive irrigation can leach nutrients away from plant roots. These relationships are especially important in soilless mixes because they do not hold as much water as soil. In these systems, it is common to provide regular fertilization with irrigation to be able to provide water and nutrients consistently for plants. A possible downside of applying water and fertilizer together would be when high rainfall provides adequate water for plants, but leaches nutrients. So, being able to provide either fertilizer alone or fertilizer with irrigation can be helpful. It is also possible to cause salt damage from connecting fertilizer and irrigation. This occurs when fertilizer added to irrigation water creates a high salt water. Allowing rain water or irrigation water alone to flush the salts periodically, may be beneficial.

In-Season Soluble Fertilizer Recommendations for Raised Bed/Container Vegetable Crops*

Vegetable garden crops	Timing	Soluble Fertilizer Weekly Application Rate for 100 sq. ft. dissolved in at least 3 gallons of water (1 ounce is approximately 3 tablespoons of water soluble fertilizer)	
		All purpose (~24-8-16) formula	Balanced or fruiting (~18-18-21 or 20-10-20) formula
Tomatoes	Weekly 0 to 6 weeks after transplanting	----	$\frac{3}{4}$ ounce
	Weekly 7 weeks or more after transplanting	----	1.5 ounces
Peppers, eggplant, okra	Weekly	----	1 ounce
Vine crops (cucumbers, melons, squash)	Weekly	----	1 ounce
Broccoli, cabbage, cauliflower, Brussels sprouts	Weekly starting 2 to 3 weeks after transplanting	1.3 ounces	----
Turnip greens, kale, collards, lettuce, spinach, mustard	Weekly starting 3 to 4 weeks after seeding	1.5 ounces	----

* Adapted from Southern Vegetable Crops Production Guide



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