



**CORNELL
COOPERATIVE
EXTENSION OF
ONEIDA COUNTY**

HOME GROWN FACTS

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Soil Preparation and Fertilizers for the Home Flower and Vegetable Garden

A well-drained soil is preferred for flower and vegetable gardens. Avoid low areas where water tends to collect or the soil remains soggy well into spring or after rain. Avoid planting on sub-soil fill. Coarse sandy soil that dries rapidly is satisfactory if properly prepared with organic matter and water is available for irrigation. Because gardeners usually have to work with soil available on the property, modification of the soil and proper selection of suitable plants is essential.

General Information

Organic Matter

Organic matter loosens and improves the structure and drainage of heavy clay soils and in medium and light sandy soils, helps to hold moisture and nutrients. Sources of organic matter are peat moss, compost, plant residues, leaf mold, manure, wood chips, sawdust and ground corn cobs. The last 3 materials tend to reduce the nitrogen available to plants when mixed into the soil; use 1 ½ times the normal rate of fertilizer before planting to supply additional nitrogen.

Soil Reaction or pH

The term pH refers to the acidity or alkalinity of the soil. A pH of 7.0 is neutral, while soil with pH of 7.1 or above is alkaline or "sweet." Most plants grow best in soils with pH of 6.0 to 6.8. When the pH is below 6.0, ground agricultural limestone is added to raise the pH. Peat moss and many soluble fertilizers tend to lower the pH. If a soil is too alkaline, iron sulfate or sulfur are used to lower the pH. Moss or a green color on the soil are not definite indications that the soil is too acid; in fact, many mosses prefer an alkaline soil. A pH test is recommended every 2 or 3 years.

Fertilizers

For good growth ornamental plants need various elements especially nitrogen, phosphorus, and potassium; these are supplied in commercial complete fertilizers. Commercial fertilizers bear a label that gives the analysis such as 5-10-10, 10-10-10, etc. A 10-10-10 fertilizer, for example, contains 10% nitrogen (N), 10% phosphoric acid (P2O5) and 10% potash (K2O). Dry fertilizers are used in soil preparation before planting and can be used in established gardens if applied carefully along plants or along the rows. Fertilizer on the leaves causes leaf injury. Fertilizer solutions are useful for fertilizing annual and perennial flower borders because of ease of application and uniform distribution among plants. Minor or trace elements are usually not a prob-

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lem in garden soils if one adds organic matter and uses complete fertilizers. Often, foliar chlorosis attributed to nutrition is due to root injury by too much fertilizer, soil pests, or inadequate aeration because of poor drainage of water.

In vegetable gardens where the plants have been well fertilized for several years, 1 or 2 pounds of 10-10-10 or 5-10-10 fertilizer may give the best results.

Often good results are obtained when half of the fertilizer is mixed in thoroughly while the soil is being prepared and the remainder applied as a side dressing during the growing season.

If a soil test shows adequate nitrogen but inadequate phosphorus and potassium, a commercial fertilizer of 0-20-20 or similar analysis should be applied at 2 or 3 pounds per 100 square feet.

Fertilizers During The Growing Season

For annual or flowering plants, apply fertilizer in the spring after plants have started to grow and are 4 to 6 inches tall. A second application is made 4 to 6 weeks later. For some late flowering plants such as chrysanthemum and hardy asters, a third application is made a month later. If you find it difficult to apply dry fertilizers among plants, consider fertilizer solutions, which can be applied right over the plants.

Commercial dry fertilizers: These are 10-10-10, 5-10-10, or similar analysis applied at 2 pounds of fertilizer per 100 square feet of area. Spread the fertilizer among the plants and then cultivate lightly to scratch it into the soil without injuring the roots. Don't allow the fertilizer to fall on the plant; it will cause leaf injury unless washed off immediately. In a flower border, it often is easier and safer to apply fertilizer solution.

If the plants are in rows such as in a vegetable garden, sprinkle fertilizer in bands along each side of the row about 2 to 4 inches away from the plants using 1 ½ pounds on each side of the row for each 100 feet of row. Then cultivate the fertilizer lightly into the soil.

Readily soluble high-analysis fertilizers: These are dry fertilizers which dissolve quickly in water making a fertilizer solution easily applied among plants.

Fertilizer solutions: Dissolve 1 ¼ ounces of 15-15-15, 15-30-15 or similar analysis OR 1 ounce of 20-20-20, 23-19-17 or similar analysis in 2 ½ gallons of water. If directions are given on the fertilizer container, follow them instead. Give the soil a good watering with the fertilizer solution, about 1 quart per square foot of soil area. Two waterings with these solutions are equivalent to about 1 of the aforementioned applications of dry fertilizers. A home postal scale is useful in weighing small amounts of fertilizer.

It's sometime easier to use volume measurement. Fertilizers vary somewhat in their weight per unit volume, but in general two level tablespoons of a 20-20-20 or similar fertilizers weigh about one ounce. Thus, you can use 3 tablespoons of a 20-20-20 or similar fertilizer in a 2 ½ gallon watering can, stir it well, and water the plants.

Fertilizer proportioners: For larger garden areas, it may not be convenient to apply liquid fertilizer with a 2 ½ gallon watering can. There is available a small brass proportioner which is attached to the faucet and then the garden watering hose is attached. “A plastic tube is attached to the proportioner, and one end placed in a pail of concentrated fertilizer stock solution. When you turn on the water, fertilizer solution is sucked up through the small tube and mixes with the water as it goes out through the hose. You can figure that the concentrated fertilizer solution is diluted about 15 to 16 to 1. Therefore, a pound of 20-20-20 or similar soluble fertilizer dissolved in 2 ½ gallons of water will result in a stock solution coming out the end of the hose equivalent to 1 ounce in 2 ½ gallons of water.

Soil Preparation Before Planting

Organic Matter

For a new garden or an area being rehabilitated where there are no plants, spread organic matter such as peat moss or compost on the soil at the rate of 2 bushels per 100 square feet of area. You can use more peat moss or compost if you wish. Weathered sawdust and wood chips also are satisfactory.

For vegetable gardens where control of weeds by cultivation is easier than in a mixed flower garden, farm manure can supply most of the nutrients needed by vegetable plants if the manure is supplemented with 1 pound of superphosphate per bushel of manure, which is enough for 50-75 square feet of garden area. Unless the manure is well rotted, apply and turn under by plowing, spading or rotary tilling. Poultry, sheep, or goat manure is used at no more than 1 bushel to 100 square feet of garden area.

For a vegetable garden, organic matter also can be supplied by sowing rye or ryegrass seed in late summer or early fall and then plowing or spading it into the soil early in the spring. For an established flower garden, organic matter is added by mulching plants with peat moss or leaf compost, which is cultivated into the soil in the fall or spring when the soil is not too wet. Compost is prepared by putting leaves, grass clippings, straw and waste plant material (unless it is diseased) from the garden and kitchen in a pile where the materials gradually break down and then are applied to the garden before soil preparation. A cup of agricultural lime and a cup of 10-10-10 or 5-10-10 fertilizer with each bushel of material added to the pile hasten decay. Keep the material moist. A cylinder of woven wire or snow fence lined with a sheet of plastic is a good holder for compost. However, it takes a lot of plant material to make a small amount of compost.

Soil pH

The first step after soil test results are received is to amend the soil pH. Soil pH is a measure of how acidic or alkaline the soil is. A pH value of 7 indicates a neutral soil. A pH below 7 is an acid or “sour” soil while a pH above 7 means an alkaline or “sweet” soil. Soil pH greatly influences the availability of nutrients in the soil. Most garden soils should be slightly acidic with a pH between 6 and 7.

Soil pH is amended by applying either lime or sulfur. Lime raises a soil's pH while sulfur lowers it. It is best to apply lime or sulfur 3-4 months prior to planting crops. For maximum effectiveness, the amendment should be mixed into the upper 6" of soil after surface application. The quantity of lime or sulfur needed to attain a proper pH will depend on your soil's texture and current pH.

For raising the pH:

Use lime only when a soil pH test has been done and the soil is shown to be too acidic.

For lowering the pH:

If the pH is 7.5 to 8.0, one can lower the pH by applying 2 pounds of finely ground sulfur or 6 pounds of iron sulfate per 100 square feet of area and mixing it thoroughly into the soil before planting.

The application of sulfur should be done as far as possible in advance of planting. Unlike lime that dissolves and immediately begins raising the pH, sulfur is utilized by soil organisms which in turn begins the acidification process. Very little reaction takes place in the colder months and even during the warm periods the process is slow.

Fertilizers Before Planting: Apply 10-10-10 or 5-10-10 complete fertilizer at the rate of 4 or 5 pounds per 100 square feet. If manure has been worked into the soil, apply only 2 pounds. After amending the pH, the next step is to establish a basic soil fertility level by applying a fertilizer according to the soil test results. This first application is usually heavy and will not be needed every year. Once a basic fertility level is achieved, it is maintained by using light annual fertilizer applications, applying seasonal side dressings, and maintaining high organic matter levels.

Complete liquid fertilizer: These are similar to readily soluble fertilizers except that they are liquid concentrates, which are diluted with water according to manufacturer's directions to make a fertilizer solution to be applied to the soil.

Slowly available fertilizers: Some relatively new fertilizers are manufactured by a special process so that the nutrients are released slowly. One fertilizer with an 18-6-12 analysis will supply nutrients for 8 to 9 months, making it possible to apply the fertilizer at time of planting, with the nutrients being released slowly into the warm soil all season long. Some formulations released for 3 to 4 months. Most research information relates to its use for greenhouse and nursery crops. Follow the manufacturer's recommendations on the container for home gardens.

Foliar fertilization: This refers to application of fertilizer solutions to the foliage of growing plants and is sometimes called "Foliar feeding." Research has shown that small amounts of nutrients enter the leaves. Foliar applied nutrients may improve the appearance and growth of some plants especially when absorption through the roots has been inadequate. Not all plants are equally adaptable or responsive to foliar fertilization.

One can apply the fertilizer solutions to the foliage, and drippings from the leaves will provide nourishment through the soil and roots. Foliar applications, however, are only a supplement, not a substitute, for soil applications which are essential for good growth and flowering plants.

If you have limed and fertilized properly, yet your garden is not producing, perhaps other factors may be the cause of your problem:

- Is your garden receiving 4-6 hours of sunlight daily?
- Is the soil poorly drained?
- Have you used recommended vegetable varieties?
- Have you planted too early, too late?
- Have you controlled insects, diseases and weeds?

Additional Recommendations For Flowers

Flowering Bulbs

Spring Flowering bulbs—crocus, hyacinth, narcissus, tulips

At time of planting—2 lbs. 5-10-10/100 sq. ft.

Maintenance—when plants flower, apply: 2 lbs. 5-10-10/200 sq. ft.

In addition, apply 2 lbs. of bone meal/100 sq.ft.

Summer flowering bulbs—amaryllis, canna, dahlia, glad, iris

At time of planting—1 lb. 5-10-10/100 sq. ft.

Maintenance—when plants flower, apply: 1 lb. 5-10-10/100 sq. ft.

Annuals

Fertilizer practices:

At time of planting—4 lbs. 5-10-5 or 5-10-10/100 sq. ft.

Apply ½ in upper 6” at time of plowing.

Apply ½ prior in transplanting or seeding.

Maintenance—six weeks after planting use a water soluble fertilizer

Perennials

Fertilizer practices:

At time of planting—4lbs. 5-10-5 or 5-10-10/100 sq. ft.

Apply ½ in upper 6” at time of plowing

Apply ½ prior to transplanting

Maintenance:

Apply 2 lbs. of 5-10-5 or 5-10-10/100 sq. ft. in early spring

Apply 2 lbs. of 5-10-5 or 5-10-10/100 sq. ft. early June.

Apply 1 lb. of 5-10-5 or 5-10-10/100 sq. ft. mid-July (with longer growing season)

*This publication may contain pesticide recommendations. Changes in pesticide regulations occur constantly and human errors are still possible. Some materials mentioned may no longer be available, and some uses may no longer be legal. All pesticides distributed, sold or applied in New York State must be registered with the New York State Department of Environmental Conservation (NYSDEC). Questions concerning the legality and/or registration status for pesticide use in New York State should be directed to the appropriate Cornell Cooperative Extension Specialist or your regional NYSDEC office. **Read the label before applying any pesticide.***

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