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S-5

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 a 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 the soil available on the property, modification of the soil and proper selection of suitable plants is essential.

GENERAL INFORMATION

Organic Matter - loosens and improves the structure and drainage of heavy clay soils, and helps to hold moisture and nutrients in medium and light sandy soils. Sources of organic matter are peat moss, compost, plant residues, leaf mold, manure, wood chips, sawdust and ground corn cobs. The last three materials tend to reduce the nitrogen available to plants when mixed into the soil. Use 1-1/2 times the normal rate of fertilizer before planting to supply additional nitrogen.

Soil Reaction or pH - The tern 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 (*acidic* or *"sour"*), 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. A pH test is recommended every two (2) or three (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. For example, a 10-10-10 fertilizer contains 10% nitrogen (N), 10% phosphoric acid ($P_2 0_5$) and 10% potash ($K_2 0$). Dry fertilizers are used in soil preparation before planting and can be used in established gardens if applied carefully among 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 problem in garden soils if one adds organic matter and uses complete fertilizers. Often, foliar chlorosis attributed to nutrition is due to root injury caused by too much fertilizer, soil pests or inadequate aeration because of poor drainage of water.

SPECIFIC GUIDELINES

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 two (2) bushels per 100 square feet of area. You can use more peat moss or compost if you wish. Weathered sawdust and wood chips are also 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 one (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 billing. Poultry, sheep or goat manure is used at no more than one (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 hastens 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. See the Bulletin reference on the last page.

Soil Reaction (pH) - A slightly acid soil (pH 6.0 to 6.8) is favorable for growth of most plants.

Raising the pH - Use line only when a soil pH test has been made and the soil is shown to be too acid.

If the pH of the soil is between 5.5 and 6.0, apply three (3) pounds of ground limestone to each 100 square feet of garden area on sandy soils, or five (5) pounds on heavy soils. Spread the material on the soil before digging, spading or rotary tilling. If the pH is between 5.0 and 5.5, make another application of the same amount after digging the soil but before raking and leveling. If the pH is 4.9 or below, apply 12 pounds on sandy soils and 20 pounds on heavy soils, half before digging and half after digging.

Wood ashes have the same effect on soil acidity as does lime and should not be applied in large quantities unless the soil is definitely known to be acid. To correct an acid soil, use wood ashes at approximately double the rates as suggested for lime.

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

Fertilizers Before Planting

Apply 10-10-10 or 5-10-10 complete fertilizer at the rate of four (4) or five (5) pounds per 100 square feet. If manure has been worked into the soil, apply only two pounds.

In vegetable gardens where the plants have been well-fertilized for several years, one (1) or two (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 two (2) or three (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 four (4) to six (6) inches tall. A second application is made four (4) to six (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 - are 10-10-10, 5-10-10 or similar analysis applied at two (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 two (2) to four (4) inches away from the plants using 1-1/2 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 - are dry fertilizers which dissolve quickly in water making a fertilizer solution easily applied among plants.
Fertilizer Solutions: Dissolve 1-1/4 ounces of 15-15-15, 15-30-15 or similar analysis **OR** one (1) ounce of 20-20-20, 23-19-17 or similar analysis in 2-1/2 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 one (1) quart per square foot of soil area. Two (2) waterings with these solutions are equivalent to about one (1) of the aforementioned applications of dry fertilizers. A home postal scale is useful in weighing small amounts of fertilizer.

It is sometimes easier to use volume measurement. Fertilizers vary somewhat in their weight per unit volume but, in general, two (2) **LEVEL** tablespoons of a 20-20-20 or similar fertilizer weigh about one ounce. Thus, you can use three (3) tablespoons of the soluble

15-15-15 fertilizer **OR** two (2) level tablespoons of 20-20-20 or similar fertilizer in a 2-1/2 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 2-1/2 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 or 16 to 1. Therefore, a pound of 20-20-20 or similar soluble fertilizer dissolved in 2-1/2 gallons of water will result in a stock solution coming out end of the hose equivalent to one (1) ounce in 2-1/2 gallons of water.

Complete Liquid Fertilizer: These are similar to readily soluble fertilizers except that they are liquid concentrates which are diluted with water, according to manufacturers 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 the nutrients are released slowly. One fertilizer with an 18 -6-12 analysis will supply nutrients for eight (8) to nine (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 release for three (3) to four (4) months. Most research information relates to its use for greenhouse and nursery crops. Follow the manufacturers 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 of plants.

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

Is your garden receiving four (4) to six (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?

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PUBLICATIONS

Many gardening publications of the New York State College of Agriculture and Life Sciences are available from your County Cooperative Agricultural Extension Office. You may obtain a catalog which lists available publications from the Distribution Center, Building 7, Research Park, Cornell University, Ithaca, NY 14850.

The following bulletins may be of interest to you:

The Home Vegetable Garden

Similarly, there are many excellent bulletins on gardening available from other Colleges of Agriculture. For publications of the US Department of Agriculture, call your County Cooperative Extension Office or write to the Superintendent of Documents, US Government Printing Office, Washington, DC 20407

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