



# *Cedar Rim Nursery* *Class Information*

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## SOIL PREPARATION

Ideal vegetable garden soil is deep, friable, well drained, and has high organic matter content. Proper soil preparation provides the basic for good seed germination and subsequent growth of garden crops. Careful use of various soil amendments can improve garden soil and provide the best possible starting ground for your crops.

Just before planting, break up large clods of soil and rake the bed level. Small-seeded vegetables germinate best in smooth, fine-surfaced soil. Do not pulverize the seedbed soil. This destroys the structure and promotes crusting and erosion problems.

Types of equipment used to prepare your garden include hand digging with a spade or shovel, tilling with a power rotary tiller and using a small garden tractor or a full sized farm tractor.

Garden plowing, still a common practice (turning the soil completely over) has been found to be detrimental as it can cause soil compaction; upset the balance of microorganisms and cause layers of coarse organic material to be buried below the influence of insects and microbes that, would otherwise cause breakdown of the material.

Rotary tilling (rototilling)

Is sufficient for most home gardens. When Rotary tilling mixes the upper layers of soil rather than completely turning the soil over. Use of deep-rooted cover crops or double digging can do much to prevent or alleviate this problem when it exists. Some small gardens can be designed using raised beds, which may be worked entirely by hand if the area is small enough.

Whether to plow in spring or fall is a common dilemma for gardeners. Working the soil in fall has several advantages over the traditional, spring cultivation. This allows early spring planting, since basic soil preparation is already done when spring arrives. Turning under large amounts of organic matters is likely to result in better decomposition when done in the fall, since in autumn

temperatures are higher than spring temperatures, and there is more time for the process to take place. Killing or inactivating them through burial or exposure to harsh winter weather may reduce disease organisms, insect, and perennial weeds. Heavy clay soils may be improved by the alternate freezing and thawing, which breaks up tightly aggregated particles. Applications of Limestone or Rock Fertilizers in the fall gives them time to become integrated with the soil and influence spring plant growth.

When winter cover crops are grown to improve soil and prevent erosion, the ground will have to be tilled in the fall to prepare the soil for seed and again in spring to turn under the green manure. Spring cultivation is better for sandy soils and those where shallow tilling is practiced.

## **SOIL TESTING**

Once every three years you should have your soil checked for fertility and pH by a soil analysis. Soil pH will measure the degree of acidity or alkalinity of the soil. Most garden crops will do well with a soil pH of 6.2 to 6.8. This is a little below neutral, or slight acid. If your pH is too high or low, poor crop growth will result due to the effects of pH on the availability of nutrient to plants. Testing your soil will give you an idea of the relative nutrient level of nitrogen, phosphorus and potassium in the soil.

## **SOIL AMENDMENTS**

Amendments to change pH and nutrient levels

### **LIME**

Lime is a common amendment used to change soil pH. Soil pH is essential for optimum growth. Dolomite Limestone adds calcium and magnesium as it increases pH. Wood ashes could also be used as a soil amendment. Wood ashes contain potash, phosphate, boron, and other elements. Wood ashes raise the soil pH almost twice as much as limestone given the same volume of material.

The ashes should not come in contact with germinating seedlings or plants roots as they could cause root burn. By spreading the ashes in the fall you will have to have soil tested for pH level again in the spring.

Adding lime neutralize soil acidity; supplies calcium and magnesium; promotes root growth; creates an excellent environment for soil organisms that will break down organic matter and it improves soil structure. Liming is highly recommended for our area.



**QUESTION;**

*Does your garden need lime?*

**ANSWER;**

*To understand the role of lime in the garden, it is necessary to know the soil type of the Fraser Valley. People describe soils in general as acid or "sour", neutral and alkaline as "sweet". These terms refer to the level of acidity in the soil. Chemically, they refer to the concentrations of either hydrogen ION (an acid soil) or hydroxyl ion (an alkaline soil). The pH scale runs from 0 – 14 with 7.0 considered "neutral". Lower numbers than 7.0 are considered acid, numbers higher than 7.0 are considered alkaline.*

*Garden books generally provide information on which plants or crops require acid or alkaline soil.*

Soils in the Lower Mainland develop acidity in part because wet conditions cause leaching of nutrients from the top layers of soil. Some nutrients washed down are the positive ions of magnesium, calcium and potassium that help to raise the soil pH. When these ions are removed, they are replaced by hydrogen and aluminum, which increase soil acidity.

High pH levels also tend to occur where the native rock is calcium-rich limestone. Growing plants also removes magnesium and calcium from the soil. Continuous applications of some forms of nitrogen fertilizers can increase soil acidity; ammonium nitrate, ammonium sulfate, and urea are all common sources of nitrogen that tend to increase acid-forming hydrogen ions in the soil. With a neutral pH higher levels of nutrients are available to be accessed by roots. The plants need mineral elements like phosphorous, nitrogen and potassium, which are used in larger amounts than other minerals and are called 'primary nutrients'.

Next in importance are calcium, magnesium and sulfur. Trace elements like copper, zinc and iron are also needed. PH levels between 6.0 and 7.5 provide the broadest availability of nutrients. If the pH gets too high or too low, nutrient availability drops. The soil microbes are also active at these pH levels. These microbes contribute to plant health by digesting nutrients and converting them into forms that can be taken up by root cells.

**QUESTION;**

*What does the average gardener do with this information?*

Landscape shrubs and trees; if the landscape consists mainly of shrubs and trees that are growing satisfactorily, there may be no concern necessary about liming soil. Conifers, azaleas, rhododendrons, heathers and pieris must have acid soils to thrive best. They will grow without additional lime.

**Lawns; What *about the lawn?*** No lime may be needed. Turf grasses prefer pH between 5.5 and 7.0. Use 3 parts nitrogen, 1 part phosphorous and 2 parts potassium as a fertilizer throughout the spring and summer. It is advisable to get ones soil tested when installing new lawn. If your pH level is below 5.5 do not apply lime and fertilize at the same time. Lime should go on first; wait at least 2 weeks and then apply fertilizer.

**Vegetable gardens;** The best soil pH level for vegetables is 6.0-7.0. You generally need to apply lime to vegetable gardens. Dolomite lime is most often used because it supplies magnesium as well as calcium. Add it in late fall after the crops are harvested to prepare soil for planting the following spring. Be careful to avoid liming areas where potatoes are planted as increased levels of calcium can cause scabbing in these root crops.

**Soil testing;** if ones wishes to test only soil pH, it's possible to use a kit from a local garden center. Be sure that all ingredients in it are fresh.

### **Amendments to improve soil quality**

Coarse sand or perlite is sometimes added to clay soil to attempt to improve texture. Adding too little sand can cause clay to react much like concrete becoming hard and impermeable. Compost, manure and other amendements usually serve the purpose better and more economically by improvement of the structure or the way the soil binds together.

Use of organic matter is a great soil improver for both clay and sandy soils. A good source of organic matter may include manures, sawdust, leaf mold, straw and compost. These materials are decomposed in the ground by microorganisms. Various factors, such as temperature, moisture and nitrogen available, determine the rate of decomposition through their effects on these organisms. The availability of adequate water and warm temperatures will increase the rate at which the microbes work. The proper balance of carbon and nitrogen in the organic material is needed to ensure adequate nutrients to both the growth of the plants and the decomposing organisms. Adding nitrogen may be necessary if large amounts of dry decaying material are added. If sufficient amounts of nitrogen are not available, soil microbes have no qualms about stealing the plants share, causing yellowing and stunted foliage of nearby plants. Fresh green wastes, such as grass clippings are higher in nitrogen than dry material and can be added when nitrate levels are low.

The use of compost is one other way to get around the decomposition problem. A correct composting is an art that can result in a valuable nutrient and humus source for any garden. When processed properly, microbial decomposition of

raw organic materials turn into a dark, fluffy rich soil, which is then spread and worked into the garden soil.

Another soil amendment is animal manures. Fresh sheep, rabbit, horse and poultry manures are quite high in nitrogen and may even burn plants if applied directly to a growing garden. Tilling these manures in the gardens in the fall is the best. Manure usually has fewer total nutrients than synthetic fertilizers in terms of K, P, and N; but is a valuable soil builder. Manures may be a source of weed seeds; if this is a problem, composting in a hot pile may help.

### Green Manure

Fast growing plants make green manure. "Green Manure" is cover crop of plants tilled into the soil. Fast growing plants, such as wheat, oats, rye, can be grown as cover crops between garden crops. Cover crops will reduce weed growth during the fall and winter months.

Green manures, or cover crops, such as ryegrass, annual rye, and oats, are planted in the garden in the fall for incorporation in the spring. For the best result, seed should be sown a month before the first killing of frost. In the fall, plant cover crops between the rows and in any cleared areas. Cover cropping provides additional organic matter, holds nutrients that might have been lost over the winter, and helps reduce erosion and loss of topsoil. A deep-rooted cover crop allowed to grow for a season in problem soil could help break up hardpan and greatly improves till. Legume cover crops can increase the amount of nitrogen in the soil and reduce fertilizer needs as well. Incorporate green manures at least two weeks before planting vegetables; they should not be allowed to go to seed before incorporation.

With regular addition of manure, compost, cover crops and other organic materials can bring soil nutrients to a point at which the addition of synthetic fertilizers is greatly reduced. All this comes about not only through the intrinsic fertilizing value of the amendment, but also through the increased action of microorganisms on soil and humus particles. The Humic acid helps to release previously locked-up nutrients naturally present in the soil, and the extra surface area provided by humus serves as a reserve, holding nutrient elements until plants need them. Highly desirable soil quality does not come about with single or even several additions of organic material, but rather requires serious, long-term, soil-building programs. Your soil is alive and constantly changing. By maintaining your soil, keeping it fertile and rich, many gardening problems may be diminished. Soil is the basis for plant growth, and much attention should be paid to getting and keeping it in the best possible condition.

## CLAY SOIL

*How to improve clay soil:*

*When you walk about your yard on a wet day, do your shoes stick in the mud?*

*Could you make ceramic pots out of the soil in your garden?*

Odds are you have clay soil, one of the biggest problems home gardeners deal with.

*Finely textured clay soils are difficult to work up and develop into a good seedbed. Dry clay is very hard and lumpy. Wet clay is very sticky and difficult to manipulate. To improve clay soil, is to mix organic materials thoroughly with existing soils.*

Sawdust, bark, manure, leaf mold, compost and peat moss, are among the organic amendments commonly used to improve clay soil. Two to three inches of organic materials should be spread and tilled, forked or dug into the top six inches of your garden bed.

Using sand will help make clay soil more workable, but it should be added only after the addition of organic matter, or a cement-like mixture may result. Put two inches of sand along with two inches of organic matter will further improve the texture of clay soils. When large amounts of organic materials are added to the soil, microorganisms multiply rapidly. Soil nutrients may be relatively unavailable for a time after an addition of manure or compost and this condition will persist until the organic material is broken down and nutrients are released.

To overcome the lack of nutrients, add organic materials to the soil in the autumn, or small amounts at a time in the spring, when warm weather will break it down sooner. You may want to add fertilizer, such as ammonium sulfate at the time of tilling to give an immediate source of nutrients.

Organic matter in soil serves as food for earthworms, bacteria, insects and fungi they transform it to soil nutrients and humus. Through this decomposition process, nutrients are made available as foods to growing plants. With finely- textured clay soils, organic material creates aggregates of the soil particles, improving drainage and making it easier to work.

## HEALTHY SOIL

A healthy garden soil contains tiny creatures most home gardeners do not know a thing about. But these creatures, visible with the help of a high power microscope are important indicators of a healthy, productive soil.

Healthy soil facts:

Each cubic foot of soil contains:

- There are 600 million or so individual bacteria, species mostly unknown to scientists. Bacteria break down easy-to-use organic material in the soil thus retaining those nutrients in the soil. Healthy garden soil should contain more bacteria than any other kind of organisms.
- 150 to 500 feet of fungal strands. Fungi break down difficult to decompose organic matter, retaining those nutrients in the soil. Gardens require some fungal biomass for greatest productivity. Some fungi cause crop diseases, but in healthy soils, these are kept in check by beneficial organisms, including fungi, protozoa, nematodes and spiders.
- 10,000 to 100,000 protozoa, one celled mobile organisms that feed on bacteria and each other. They release nitrogen, which is then available to plants. About 80 percent of the nitrogen in plants can come from protozoa that eat bacteria.
- 5 to 500 beneficial nematodes, simple wormlike creatures that feed on fungi, bacteria and other nematodes. Many nematodes control garden pests and add nutrients excreted in their wastes to the soil. Some nematodes eat plant roots; but are controlled with by fungi that trap nematodes or by other invertebrates called "microarthropods" that eat nematodes.
- There are several hundred micro arthropods such as orbited mites, which eat fungi, releasing nitrogen for plant growth. Others feed on pest insects or roots.

## TILLING

Don't get too zealous yet with the rot tiller.

Rototilling the wet soil can really ruin soil structure. We have a tendency to over rototill. Too early tilling will dry into hard unbreakable clods. Water will not soak in if soil is compacted to hard. Tilling with the right moisture content is critical.

## Why Garden in raised beds?

Digging is easier in raised beds, because soil is generally drier and easier to work than in ground level beds.

Only the planting areas are worked allowing one to work amongst the plants without over compacting the soil, especially important with the wet weather in spring.

The soil in raised beds is generally warmer in early spring allowing the gardener to get an early start on the spring planting.

## Wet Soils

Soil, which is saturated with water, will soon become depleted of air since water fills up the soil spaces, which normally would allow air to permeate to the root system. Most plants need lots of oxygen for root respiration and are going to feel stressed and will suffer if adequate oxygen is not allowed to permeate the root system. Raised beds, increased drainage or organic matter are the best remedies for this problem.

## TOPSOIL

When buying topsoil be sure you know what you are buying. There is no set standard for top soil and it is important to first check out the soil you are having delivered. The ideal soil should be relatively high in decomposed organic matter, be of a neutral pH and should be free of as many weed seeds as possible.

Be sure to inspect each load of soil before you have it delivered since once you have it sitting in one's driveway it is relatively hard to return it.

Poor quality topsoil can be amended with applications of manure or compost. Top garden soils are usually loam, or sandy loam; with fairly equal proportions by the feel of sand, silt, clay and compost.

