SOIL STRUCTURE AND FERTILIZERS FOR HEALTHY ROSES

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SOIL STRUCTURE: There are four main components of good soil; inorganic minerals, organic matter, water and air. Basically, soil consists of sand, silt and clay particles in addition to any organic matter added by man or nature. It is the proportions of these elements that determine the structure of the soil.

Organic material feeds the bacteria in the soil that facilitates the conversion of nutrients into forms available for absorption by the root system. Increasing organic matter content usually has the effect of increasing water holding capacity. As organic matter decomposes in the soil, it gives off carbon dioxide which replaces some of the oxygen in the soil.

SOIL BALANCE: Balance is the key to successful rose growing. NPK – Nitrogen, Phosphorus & Potassium, plus micro nutrients. Element content is critical. Soil without good drainage will retain excessive amounts of water causing root rot. Soil with too much silt or clay will compact the soil reducing oxygen to the roots. Too sandy a soil will not hold water long enough for nutrients to be absorbed by roots.

SOIL pH: Soil pH is a measure of the hydrogen (acid forming) ion activity of the soil. While roses are tolerant to a wide variation, a slightly acid soil of **6 to 6.5** is generally considered ideal. Periodic pH testing is important in order to sustain good plant growth. Organic material, chemical fertilizer, spray material and sometimes even rain can alter the pH. The use of a pH meter will alert the grower of the necessary amendments needed to keep the pH at the right levels.

To increase soil pH, add lime at any time of year, but it takes time to change the pH. Autumn, winter and early spring are preferred times to apply lime. Avoid adding lime along with other fertilizers. If a soil analysis shows low in magnesium, use dolomite limestone; if high in magnesium, use calcitic limestone. Compost, peat and other organic materials can be used to reduce pH. Sulfate of ammonia adds nitrogen while it lowers the pH. If either sulfur or phosphorus is used to correct a nutrient deficiency, it will also lower the pH.

WATER & ROSES: A plant takes nutrients through the roots only in inorganic/ionic form, requiring water as a carrier. In-adequate water leads to wilting and death. Too much water in the soil can be just as harmful. "Roses don't like wet feet"!! Good drainage is important so the water can percolate through the soil. A balanced soil structure allows water to pass through the soil slow enough to permit nutrients to be taken up by the plants roots. Overhead watering can be beneficial if done properly. Water early enough in the day to allow the foliage to dry completely prior to nightfall.

FERTILIZERS – THE BASICS: Carbon, hydrogen and oxygen are obtained in air and water. The following will deal with others influenced by the soil acidity. Understanding the inter-relationship of different fertilizer elements is the first step to developing a suitable fertilization program.

NPK, THE 3 NUMBERS ON FERTILIZER: These can be stated very simply by a general rule of: **"first number targets foliage, second number targets blooms and third number targets roots"**. Of course there are other contributing benefits included.

NITROGEN – FIRST NUMBER: Nitrogen stimulates growth of tall strong canes, good blooms and **rich dark green foliage** are evident when nitrogen is in balance in the soil. A lack of nitrogen is indicated by a lightening of the green color and even yellowing of leaves in extreme cases. Excesses of nitrogen can be even more harmful, resulting in weak, soft canes, small blooms and decreased plant resistance to disease. Decomposed organic material will return some nitrogen to the soil. Fresh organic material uses nitrogen from the soil in order to decompose. This is most apparent when materials like lawn clippings, sawdust, straw, wood chips, etc. are added to the soil. Soil temperature

also has an important effect on the transformation of nitrogen. With a temperature of 40-50 degrees, transformation is very slow, but as the temperature increases, so does the availability of nitrogen.

PHOSPHORUS – SECOND NUMBER: Phosphorus stimulates root growth, producing quality plants and **big blooms**. It also hastens plant maturity. The most important factor controlling the availability of phosphorus is soil acidity. As the pH drops below 6.5, so does the availability of phosphorus. A higher pH than 6.5, the availability of phosphorus is slightly decreased.

POTASSIUM (POTASH) – THIRD NUMBER: Potassium promotes **root growth**, vigor and bloom color. Excessive amounts of potassium can cause serious problems for the rose bush. A deficiency can cause leaf margins to brown and mottled leaves, weak stems and many blind canes.

OTHER MINERALS: SULFUR: Sulfur is used by the plant in the development of essential organic compounds of proteins, vitamins, etc. Sulfur has been removed from the air, many fertilizers, and spray formulas, to the point that it is becoming the most deficient element in our soils. Sulfur lowers pH and is present in organic material.

CALCIUM & MAGNESIUM: Calcium holds cell walls together and promotes stability and early growth making a sturdier plant. Magnesium promotes chlorophyll formation and interacts to produce greener foliage and healthy disease-resistant plants. One of the important functions of these minerals is to neutralize certain toxic acids which form as a by-product of metabolism.

MICRO ELEMENTS: These are usually sufficient in a well-prepared fertile soil.

IRON aids chlorophyll formation and sugar burning enzymes. Iron will be unavailable in an alkaline soil until the pH is lowered to below 7.0.

MANGANESE aids chlorophyll formation and activates other enzymes and helps in photosynthesis.

BORON helps move sugars from cell to cell, controls starch formation, stimulates cell division, flower formation and pollination.

ZINC stimulates stem growth and flower bud formation.

COPPER enzyme activator for vitamin A forming enzymes, stimulates stem development and pigment.

MOLYBDENUM is needed for nitrogen fixation and nitrogen use in the plant. Specifically needed to make amino acids to stimulate plant growth and vigor.

In a soil with a high pH, boron deficiency may occur because of an unfavorable calcium content. Acid soils may be low in molybdenum. Iron will be unavailable in an alkaline soil until the pH is lowered to below 7.0. Only small amounts of trace elements are needed in a rose's diet, but a lack of one or more may cause a serious decrease in the availability of major elements.

SYMPTOMS OF NUTRIENT DEFICIENCY OR TOXICITY: Older leaves drop rapidly or the main vein remains green as the leaf first turns yellow then brown on mature foliage. Younger plants are affected with chlorosis, root loss and wilting of young shoots. Overall, the deficiency or toxicity reduces growth with reduced leaf size, weak stems and spindly small flowers. Do not mistake oxygen deficiency and heat stress symptoms with a nitrogen deficiency. Though the symptoms look alike, no amount of nitrogen will correct the symptoms.

CHEMICAL FERTILIZERS: Regardless of the method used, the main objective is to supply the best concentration in balance of all the essential elements at all times. Chemical fertilizers are quick-acting

and are readily available food for the plants. However, the exclusive use of chemical fertilizers can impoverish the soil.

ORGANIC FERTILIZERS: Organic fertilizers release nutrients ovevr a fairly long period. The potential drawback is that they may not release enough of their principal nutrient at a time to give the best growth. Organic fertilizers depend on soil organisms to break them down to release nutrients and are effective only when soil is moist and soil temperature is warm enough for the organism to be active.

SLOW RELEASE FERTILIZERS: These are beneficial to provide a balance of nutrients throughout the growing season. Obviously, slow release fertilizers need not be applied as frequently as other fertilizers. Caution should be used in timing the application of slow release fertilizers as they may keep the plant growth going late into the fall.

WATER SOLUBLE FERTILIZERS: These are in a form that makes them immediately available to the plants. The nutrients are easily absorbed by the leaves, and in the soil by the roots. Water soluble fertilizers makes a good tonic for a quick "pick-me-up' for the plants. Water soluble fertilizers may be more suitable for container grown plant than a granular fertilizer.

HEAT AND MOISTURE STRESS: Visual symptoms will vary depending on the severity and longevity of the stress. Heat stress is often noticed after a period of cloudy, rainy weather promoting succulent top growth, followed by hot, dry, sunny days. When air temperature is high, relative humidity low and air is moving across the leaf surface, the demand for water is greatest. Under these conditions, it is essential to provide water to the soil to reduce the total stress on the plant. During the hottest part of a the day, it may be beneficial to water overhead. This will reduce the air temperature while providing moisture for the plant.

EFFECTS OF SOIL SALTS: Since roses are relatively heavily fertilized, an accumulation of soluble salts is not uncommon. This is quite evident in container grown roses, where the salts can be seen at soil level on the container. This could result in foliage injury and retarded growth. The higher the salt content of the soil, the greater the stress on the plant to obtain moisture from the soil. Small applications of water at a time tends to develop the highest salt concentration. Leaching (water running out the bottom of the container or deep soaking landscape roses) gives good distribution of applied fertilizer and helps remove high salt accumulations from the soil. If drainage is not satisfactory, it may be advisable to add gypsum before leaching. A high salt content may not be as harmful in winter as in summer. Injury is most likely to result during hot, dry days of summer.

TEST FOR WATER RETENTION: Fill a pot ½ full with dry garden soil. Place each pot over a quart jar and pour 1 quart of water into each pot. Mark the amount of water that falls into the jar after 15 min. –30 min. and 1 hour. Use the same size jar to measure results accurately. The percentage of water retained in the soil after an hour is measured by subtracting the percentage of water in the jar from 100% to 60% range. If the soil retains too much water, add sand, perlite or pumace and retest. If not enough water is retained, add a water retaining material and retest until the desired results are attained.

TEST FOR DRAINAGE: Cut the end off a coffee can and push down into moderately moist soil about an inch. Fill the can with water. If it takes more than 1 hour for the water to disappear, steps should be taken to improve drainage. If the water disappears too quickly, a water retention material (peat moss, compost or other water retaining material) should be added to the soil.

While drainage is extremely important, so is water retention. A well-balanced soil structure is one that allows water to pass through the soil at a rate slow enough to permit nutrients to be taken up by the

plant's roots. It is also important that the water continues to pass down into the soil bringing with it the oxygen important to plant life.

A soil with poor drainage and/or too much water retention fills the small spaces in the soil with water forcing out the oxygen and compacting the soil. Soil imbalance of nutrients, water and air can result in poor growth of rose bushes. A well balanced soil is the answer to many problems.