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SOIL TESTING

Presented at the 1957 Cornell Florists Short Course

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Here are a few thoughts about soil testing and its use in crop production

TOTAL SOLUBLE SALTS

By total soluble salts in the soil we mean the various chemical materials which are in the soil and dissolve rather easily in water. In our laboratory we mix one part of dry soil with 2 parts distilled water and stir frequently for 30 minutes. Chemicals in the soil dissolve in the water. Then the solution is tested with an electrical gadget called a "Solu-bridge." This instrument tells how easily an electrical current is carried through the soil solution; the more soluble salts in the soil solution, the more easily the current is conducted, and the greater the conductivity reading.

Why is the Test Useful? It would be too expensive and difficult to test for all of the elements in the soil. Therefore this is a "catch-all" test which is expecially valuable in finding out whether an excessively high concentration of fertilizer materials is accumulating in the soil.

When the soluble salt concentration gets too high, plant roots are injured; plant growth and flowering are reduced and the plant may die. That is why young snapdragons, stocks, poinsettias, chrysanthemums, etc. often start off slowly when planted in excessively fertile soils.

The plant injury may show up as root injury, chlorosis or yellowing of leaves, stunting of the plant, leaf burn, poor seed germination, and stunting of seedlings.

Where Do Excess Salts Come From? There are several sources that contribute to the problem.

1. Fertilizers--

The chemicals can come from fertilizers which contain soluble materials such as calcium, magnesium, potassium, nitrates, chlorides, sulphates, carbonates, etc.

2. Overfertilization--

A heavy fertilizer application can cause a quick build up. Therefore frequent applications of small amounts usually are better than few applications of large amounts.

3. Fertilizer residues--

When you put fertilizer on the soil, you usually are adding some materials which are not absorbed by the plant, but remain in the soil and contribute to an excessively high concentration of soluble salts, or what is commonly called a "high salt content." For instance, you apply nitrate of soda; nitrogen is used by plants and most of the sodium is left behind. You use ammonium nitrate; the nitrogen is abosrbed by plants and the sulphate remains in the soil. Superphosphate is half gypsum (calcium sulphate) which adds to the salt content. The chloride of muriate of potash remains after the potassium is used.

Taper off on the use of fertilizer at the end of one crop so the soluble salt content can decrease gradually and will be low when the next crop is planted.

4. Water supply--

Sometimes a water supply has large amounts of chlorides or carbonates which contribute to the soluble salt content of the soil.

5. Soil sterilization--

After steaming or gas treatment of soils, some of the chemical salts in the soil may be released and become soluble causing an increase in total soluble salts.

6. Watering practice--

Light watering with little drip from the bench favors soluble salt accumulation. Luckily the solubility of the soluble salts can help prevent trouble. The grower who waters well so that some water drips out of the bottom of the bench will leach out some of the chemical materials and prevent a build-up. By keeping the soil continuously moist, a high salt content tends to be diluted and there is much less danger of injury as compared to the grower who likes to "run soils on the dry side."

How Do I Interpret the Test? With the 1 to 2 soil to water ratio we are using, a grower should watch out when the reading is 175 to 200 because there is liable to be trouble especially if the soil is allowed to become dry.

Different species of plants vary in their susceptibility to high soluble salt concentrations, and young plants are more easily injured than older well established plants. Injury may occur quicker in light sandy soils than in heavier soils or soils with more organic matter.

Some soil test labs use a 1 to 5 ratio and a reading of 75-80 indicates "danger--watch out."

What is a Cure for High Soluble Salts? If plants are in the soil, you will have to leach the soil. Water until some drains from the bench. Then go ahead on some other job for 30 to 60 minutes to give time for the salts to dissolve in the soil moisture. Then come back and water the bench a second time, putting on enough that water drains out of the bench. This will wash out the excess soluble salts. Sounds drastic but it works.

The amount of water required will depend on the type of soil, but 2, 3, or 4 quarts per square foot of bench area, or maybe even a little more water, will be needed each time.

It is easier to leach raised benches than ground

beds. This is another good reason for having a well prepared soil and good drainage in ground beds.

If the soil with high soluble salts is not yet planted, mix in some low nutrient soil and some peat moss to help dilute the original soil. The amount of dilution would be governed by the test of the original soil.

UREA FERTILIZERS

If you use urea, or the newer urea formaldehyde fertilizers or organic fertilizers, tell us how much was applied and the date of application. Because of their reserve supply and slower availability, it is necessary to have this information in order that the results of the soil tests may be interpreted properly.

pH OF THE SOIL

Most florists' crops grow well over a soil pH range of 5.5 to 7.0. We usually aim for 5.8 - 6.8 except for those special crops where a lower pH is desired.

When the pH of a soil is to be adjusted, there are several things to be kept in mind.

1. The rate of change in soil pH varies with the soil type, lighter soils with little organic matter changing quicker than heavier soils.

2. The rate of change varies with temperature, moisture, and aeration conditions.

3. It is easier to change the soil pH before a crop is planted than after plants are in the soil.

4. For general pH control with growing crops, proper fertilizer programs will usually solve your problem. If you need help on this, contact your county extension specialist or experiment station.

To Make the Soil More Acid--To lower the pH of your 1/2 to 1 unit, apply one of the following:

1. 1/2 to 3/4 pound dusting sulphur per 100 square feet of bench area.

2. 1/2 to 3/4 pound dusting sulphur per 40 bushels of potting soil.

3. 1 ounce dusting sulphur per 4 bushels of potting soil.

4. 3 to 4 pounds of iron or aluminum sulphate per 100 square feet.

5. 3 to 4 pounds of iron or aluminum sulphate per 40 bushels.

6. 5 to 6 ounces of iron or aluminum sulphate per 4 bushels.

To Make the Soil More Alkaline--To raise the pH of the soil 1/2 to 1 unit, apply one of the following:

1. 4 pounds of ground limestone per 100 square feet of bench area.

2. 4 pounds of ground limestone per 40 bushels of potting soil.

3. 1/4 pound of ground limestone per 2 1/2 bushels of potting soil.

If the soil pH is very low or very high and there is no crop in the soil, you can increase the rates if you wish, but if a crop is growing, use the rates given above, and repeat the application a few weeks later if necessary. A soil test three to four weeks after the initial application should indicate whether a second application is necessary.

For proper soil sampling techniques, refer back to your New York State Flower Growers Bulletin #129 in 1956.

MINOR ELEMENTS

Boron--During the last few years, deficiencies of boron in carnation and rose plantings have been reported. We should be aware of the problem. If your plants develop symptoms which appear to be boron deficiency, check with your college floriculture specialists. Not all plant abnormalities are due to boron and manganese deficiencies.

Presumably a grower may wonder whether his plant growth and production are being restricted by insufficient boron or some other micro-element such as manganese. Soil tests are of practically no value for determining lack of boron or manganese in the soil.

The best method is to make trial applications in your own greenhouse by dividing a bench or two into 4 or more plots and making applications to alternate plots and then watching the plant response.

Very little boron or manganese are needed and just a little too much can cause serious trouble. Many regular dry complete fertilizers contain boron and many soluble greenhouse fertilizers contain both boron and manganese. Therefore recommended rates are not being given here. For this information, contact us. The recommended rates will be adjusted according to the seriousness of the trouble, the nutrient content of the soil, the fertilizer program, etc.

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