REPORTING SOLUBLE SALT READINGS

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The soluble salt analysis is perhaps the most important reading in a greenhouse soil test. Surprisingly, it is also the least accurate.

After all, what is a soluble salt reading? It is only an index of the capability of a soil-water mixture to conduct electricity. The more electricity it will conduct, the more salts are present.

One might wonder why salts harm plants. There are two general effects. Some salts are toxic in themselves. A very low concentration of, say, sodium nitrite will kill a plant. But salts generally exist as a mixture in soils where no one salt is toxic. The total effect of these salts is to raise the osmotic concentration of the soil solution so high that the root can no longer absorb water.

So from a simple reading we attempt to measure a complex situation. Many variables exist that influence this reading of the conductivity. Let's think about some of them.

1. The water:soil ratio changes the solubility of the salts in the soil. The more water used, the more salts dissolve. Three extraction procedures are commonly used:

a. paste extraction. Only enough water is mixed with the soil to produce a glazed appearance. The water is extracted with a vacuum and the conduc-

tivity measured. This is the most accurate method since it more closely approximates normal soil water than when more water is used.

b. 2:1 water:soil extraction. Two parts of water to one of soil provides a simple, fairly accurate salt reading and is used by the UConn Soil Testing Laboratory and the majority of greenhouse soils labs around the world.

c. 5:1 water:soil extraction. Five parts of water to one of soil results in a rather dilute solution, allowing more salts to dissolve. This is not necessarily the situation that roots encounter in the soil but it is some indication.

2. Salts in the soil solution tend to travel with water as it evaporates. On the surface of the soil or porous containers, salt crystals form. Soil samples are normally taken from an inch below the surface to the bottom of the root zone, or from the central portion of a pot. If some of the surface soil is inadvertently included, the reading may not represent the zone in which the roots are active.

3. The electrical conductivity of a soil-water mixture varies not only with the total quantity of salts but also with the kinds of salts present. Similar readings for different kinds of salts may indicate salt conditions which affect the plant quite differently. Thus, some high salt readings reflect salt situations which may not be as injurious as others.

4. During extraction, prolonged waiting periods may result in increased readings. With standardized procedures, this variable is minimal.

5. Drying of samples during processing increases salt crystal formation, decreasing solubility of some salts. At the same time, some soil microbes die, releasing some salts. The net result is usually a decrease in reading, sometimes as much as 10%.

With all of these variables, one can understand why the tolerances are expressed in ranges as follows:

Soluble Salt Tolerances
1:2 Extraction

Conductivity mhos x 10^{-5}		ppm Total Salts
Under 50	usually indicates insufficient fertility	Under 650
70-150	normally fertile soils	910-1950
100-120	maximum for planting rooted cuttings or seedlings	1300-1560
150-200	maximum for established crops	1950-2600

Even these ranges are not absolute. In some instances, normal fertility can occur with a salt reading of less than 70. Good carnations have been observed growing with a level of 250. But in most instances, a reading of over 120 will delay growth or produce obvious damage when planting rooted cuttings or seedlings.

Salts may be reported in other ways. The above readings are expressed as mhos x 10^{-5}, as we report them, or as parts per million (ppm) salts. The ppm is an emperical determination based on average salt contents and vary with the salt present. The usual figure to multiply by is 6.5 (U.S. Regional Salinity Laboratory) or 7.0 (University of Florida). This result is then multiplied by 2 to account for the 1:2 dilution factor. The ppm readings in the table are based on the 6.5 factor.

No matter how soluble salts are reported and in spite of the frailties of the analysis, remember that this is one of the most important tests in the soil analysis. Treat it with respect.

NEW TELEPHONE NUMBER

The University of Connecticut has outgrown its switchboard and has installed a Centrex system. You will no longer have to go through the operator to reach the Plant Science Department. Dialing 486-3435 will connect you with Drs. Ashley and Koths as well as all other personnel in horticulture. The county office numbers remain the same as listed on the inside back cover.