Soluble Salts as a Factor in Weak Growth

by C. William Sauer /2

This discussion of total soluble salts will be narrowed down to five basic questions:

1. What are total soluble salts and how are they measured?
2. Where do soluble salts come from?
3. At what levels should we keep our salt readings for optimum growth of carnations?
4. What effects do excess salts have on carnations?
5. If we feel our salts are too high, how can we reduce them?

What are total soluble salts? As the name implies they must be dissolved in the soil water or must be capable of being dissolved, if enough water were present. Salts are usually made up of such chemicals as potassium, sodium, chlorides, sulfates, nitrates and phosphates. In fact, salts are really the sum total of all the chemical compounds in the soil.

We are able to measure these salts by dissolving them in a specific amount of water and shooting an electric current through this solution. The better this solution conducts electricity, the higher are the salts.

As to how these salts get in our soils--salts may and usually do come from many sources. The most common, of course, is from the fertilizer we add to our soils. Nowadays we are all feeding much more often than we did in the past. Some of us are feeding each time we water. If we are not careful this constant addition of chemicals to our soils will result in a build-up of the soluble salts. Secondly, we may unknowingly add a high quantity of salts by mulching with leaf mold or manure which contains a high amount of salts. The last way we might run into salts trouble is that we start with a soil that is either very high in salts or has the physical structure that makes it easy to build up salts. If there is any phase of this problem that merits our attention, it is the basic structure of our soils. If your soil is the type that runs together when it is watered and prevents good leaching action, you have a real problem. This is caused by poor basic structure, and soil structure is difficult to change. Constantly adding organic matter in the form of peat or leaves and the root action of growing plants are the two best methods of correction we can use. However, in severe cases of this type the best and cheapest solution in the long run is to discard the soil giving trouble and start again with new soil.

At what salt level can one expect optimum growth? This is a question that must be answered with 'it all depends'. Each of us has a different soil from our neighbor; in fact, we may have several different soils in one place. Some of us have light sandy soil, others heavy soil. Some have six inches of soil, others eight inches. All these things and others make every case different. The best answer to this question is for the grower himself to decide what is best for his greenhouse. He can compare the soluble salt readings on his soil tests with previous months. If he has a general upward trend, he may be headed for trouble. John White did

some excellent work on this very problem at Colorado State University. He found that the lower the salts, the greater the yield and the better the quality. Following this study CSU recommended a salt level somewhere between 25 and 50. But again they were quick to point out this depends on the type of soil. Salt readings as high as 50 might result in damage to crops growing in a sandy soil. Conversely, plants growing in a soil high in organic matter or clay would stand higher salt levels without damage. It seems that White's work and that of others would indicate that the lower we can keep our salt levels and still provide good fertilization, the better off we are going to be.

Can high salts cause soft growth or is there no relationship of the two? To answer this I should first tell how excess soluble salts affect plants in general.

The first effect and probably the most important of high salts is a decrease in root activity, if not a complete halt in root growth. This root loss will usually be followed by a hardening of the plant and in severe cases wilting even though the soil is wet. Such injury occurs because the roots cannot function well enough to keep the top supplied with water. However plant injury doesn't have to go as far as causing wilting of the plants for it to be serious. The mere fact that our salts are high enough to cause a decrease in root action will damage our crop. For example, interference with root activity will prevent the root system from absorbing adequate nutrients and water into the plant, even though we provide an abundance of both around the roots. Such a shortage, of course, would result in more spindly growth. This would be especially true if this damage should occur while the plants are suffering from a shortage of light, or some other limiting factor.

Finally, the last of our five questions. What can be done if we feel our salts are too high? First, are we applying enough water to get leaching action each time we water? At Park Floral Company we make it a practice to water each bench until it drips from two to three minutes before we shut the water off. If an abundance of water is put on the soil and it still won't drain, the problem is one of structure of the soil. Again I would like to repeat, get some new soil with a better structure--at least for one bench--and try it for one year. I would be willing to bet that the next year new soil will replace all the old soil. Also check the water supply. Well water can be very high in salt content. Possibly the type of fertilizer being used can be changed to a type that leaves less residue in the soil after the plants have taken what they want. Potassium nitrate or ammonium nitrate are examples of this type of fertilizer.

In conclusion, I would like to say that in viewing the problem of soft growth during the winter months, I personally don't think that soluble salts are a major factor. However, I definitely think they can contribute to this problem. Since the salt content of our soils is certainly within our control, it will behoove all of us to make certain that our soluble salt readings are low enough to insure that there is no damage to our plants.

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