High Soil Salts Injury to Field and Forage Crops
General Principles Information Note 2 (VDIN-002)
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Actively growing annual crops require a continuous supply of balanced nutrients in the soil. These are usually provided by the application of fertilizers which include soluble salts. However, if the concentration of any soluble salt in the soil, including those from fertilizers, becomes too high, the roots and later the plant tops are injured. In North Carolina, the majority of soluble salt problems originate from the improper use of fertilizers; in a few cases by using irrigation or municipal water high in salts.

Symptoms of "salt" or "fertilizer" injury may be variable, but usually include: slow and spotty seed germination, sudden wilting, stunted growth, marginal burn on leaves (especially lower, older leaves), leaf yellowing, leaf fall, dead roots, restricted root development, and sudden or gradual death of plants. While the major effect of high soil salts are to the roots, the tops of plants may show "salt injury" while the roots are apparently unaffected. In this case, the soluble salts enter the roots and are moved through the plant vessels to the leaves where the water evaporates and gradually concentrates the salts to toxic levels. When soil soluble salts are excessively high, the roots are unable to absorb water and the plant wilts. The problem is apt to be more pronounced after fertilizing, or during excessively dry conditions. Allowing the soil to become too dry for even a few hours can result in "salt injury".

Plants may recover from "salt injury" provided the high salt level in the soil is reduced. This may occur naturally after a rain, or be alleviated by irrigation. Some plants are more prone to salt injury than others. Examples of easily damaged plants are, peanut, soybean, corn, alfalfa, clovers, timothy and vetch.

How to Avoid High Salt Injury

1. Have soil tested prior to planting by the Agronomic Division (Blue Ridge Road Center, N.C. Department of Agriculture, Raleigh, N. C. 27607) and fertilize according to the recommendations, including placement.

2. Use the correct amount of fertilizer of the proper analysis. If the recommendation calls for 200 lb of an 8-8-8, do not get mixed up and use 200 lb of 12-12-12 or 20-20-20 or a 0-0-60. High analysis fertilizers have less salt problems per unit of plant food than low analysis fertilizers. The salt index of sodium nitrate is 100 while the salt index of ammonium nitrate is 104. However, because ammonium nitrate contains more than twice as much nitrogen as sodium nitrate, the salt index per unit of plant food is half as much (sodium contributes to salt index, but is not a plant nutrient). Try to avoid the use of high-salt fertilizers such as "soda" (sodium nitrate).

3. Place the fertilizer correctly. There is less danger of salt injury when fertilizers are broadcast and then disked-in. Banded fertilizer applications require care. Do not seed or plant on top of the banded fertilizer or closer than 4 inches to it. "Sidedress" the plants so that the fertilizer is dispersed over the root zone--not concentrated close to the stem, or concentrated in a narrow band over the roots.

How to Treat a High Soil Soluble Salts Problem

1. The excess "soil salts" must be leached (washed) from the root zone. This can be done by overhead irrigation with three to four inches of water. For slight "salt" problems, maintain good, uniform soil moisture and avoid drought conditions by irrigation to supplement rainfall; this will gradually eliminate the problem as plants assimilate nutrient portions of the salts.

2. In some cases, banded fertilizers can be dispersed by shallow cultivation.