SOIL HEALTH & LAND MANAGEMENT

NDSU EXTENSION SERVICE

CORN RESPONSE TO SOIL SALINITY

Corn is sensitive to soil salinity, resulting in $48 million of crop losses annually in the Red River Valley of North Dakota. Losses in productivity are often not observed on a “whole field basis” and typically reflect portions or zones of a field that may have reduced productivity when planted to a salt-sensitive crop like corn.

The first step for management is to know how much salt corn can tolerate for conditions specific to North Dakota. There is previous research on corn tolerance to salts, but results do not apply to soils or salts found in our region. From 2013-2016, research was conducted to evaluate corn response to low levels of salinity both in the greenhouse and field (photos below).

Corn above-ground and root biomass were measured in the greenhouse for low levels of salinity. Aboveground biomass declined by 42% and root biomass declined by 37% with each unit increase in electrical conductivity (EC) after a certain threshold. Observations from the greenhouse were then taken to the field where yield response to salinity was measured in both silty clay loam and sandy loam soil textures on six different fields in Richland County.

Corn grown on sandy loam soils responded negatively to soluble salt contents of 1.96 mmhos/cm, which is higher than previous study reports of 1.30 mmhos/cm. Fifty percent reductions in yield occurred at an EC of 3.57 mmhos/cm (figure on next page). Corn grown on silty clay loam soils did not show any yield response for soluble salt levels measured (<2.95 mmhos/cm).

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NORTH DAKOTA CORN COUNCIL

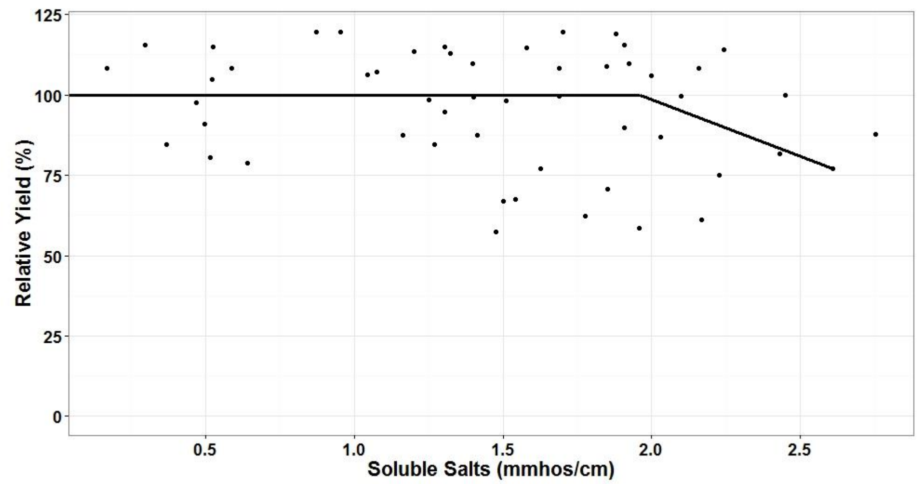
Salinity Management Tips:

1. Soil sample in zones – salinity is very patchy across a field, but a farmer or agronomist know where yields are taking a hit and can see salts on the surface or in the soil. Sampling these areas separately from other more productive parts of the field is key for soil testing followed by effective management planning.

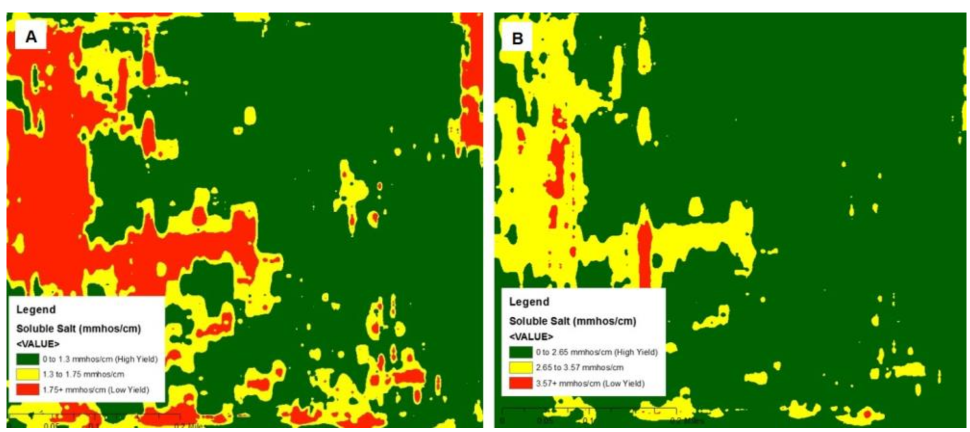
2. Know your soil texture – we are finding that crop response to salinity is related to soil texture. Coarser textured soils may not contain as much water as finer textured soils, making the salts more potent. So, if you have a sandy loam, your crop salt tolerances will be lower than if you have a silty clay loam.

3. Use your soil test results – In a sandy loam soil, you are probably ok planting corn if the soluble salt level is < 1.96 mmhos/cm. In a silty clay loam, you likely won't see a yield drag for soluble salt levels <2.95 mmhos/cm.

4. Plant a different crop – wheat or barley are excellent choices to plant in saline zones if corn is not suitable. You don't have to plant the whole field to a more tolerant crop, just the saline zones.



An example of expectations for yield based on information that existed prior to this study (figure below, A) compared to observations in this study (figure below, B) for sandy loam soils. You can see a large portion of the field is highlighted in red (A), indicating over a 75% yield loss based on the previous threshold of 1.30 mmhos/cm. By re-defining the threshold to 1.96 mmhos/cm with this study, this field is identified as more suitable for corn production (B). A majority of the field is now "green" which indicates no yield loss for corn.



Using tips in the sidebar to the left and the knowledge that corn yields decline starting at an EC of 1.96 mmhos/cm in sandy loams soils and no yield declines were observed <2.95 mmhos/cm for silty clay loams is a powerful tool for producers. Salt-affected fields can now be better managed to reduce yield losses associated with salinity. Getting something to grow on saline zones through crop selection is extremely important to keep these areas from growing in size and to regain ground.