Amending High Salt Content Soils

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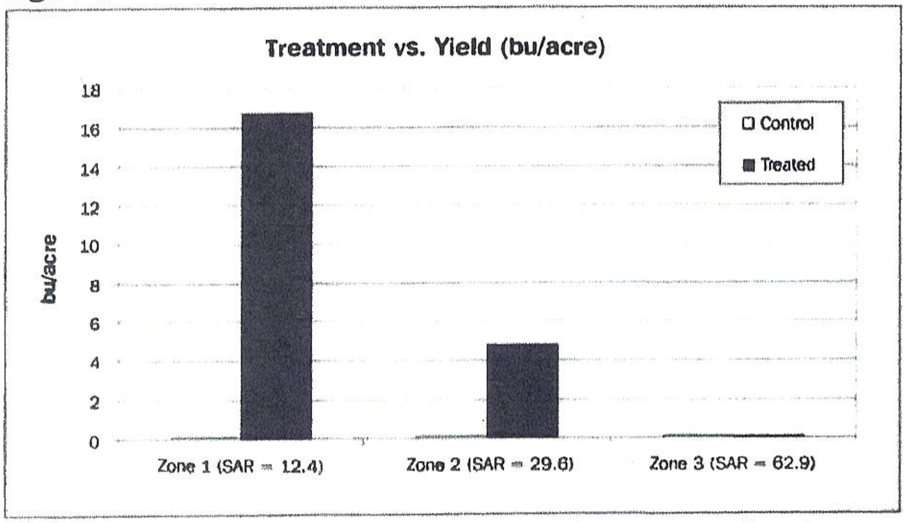
Figure 1



The results of a field trial on a commercial wheat field in Gadsby, Alberta, Canada.

High salt contents result in low soil productivity due to reduced nutrients and water intake by plants, inferior soil structures, as well as reduced growth of some plants and soil organisms. The presence of salts in soil is commonly measured as electrical conductivity (EC) and sodium adsorption ratio (SAR). Based upon its EC, SAR and degree of acidity (pH), the soil can be classed as optimum, high or low pH, sodic or saline and saline-sodic.

Amendments, usually in large amounts, are added with the main objective to adjust a particular parameter, providing a better soil condition for plants to grow. This solution, however, may result in a high material cost and additional challenges in terms of practicability and efficacy in a longer term. Gypsum for example, indeed lowers SAR, but at the same time adds more salts to soil, thus increasing its EC. And so on with other amendments.

Instead of adding amendments to soil and then observing any changes in EC, SAR and pH, Canadian Humalite International Inc. tried a different solution by applying organic matter to soil with the main objective to directly enhance its productivity. The rationale was simple. Due to its unique chemical and physical properties, organic matter has been found to bind nutrients (already present in soil or currently added) making them in the best forms to be up-taken by plants, as well as reducing its leaching to the groundwater table. It can also bind sodium, making it rather insoluble in water that would not adversely affect osmotic pressure in the root zones. Organic matter has also been found to enhance soil water retention, soil structures and the growth of seedlings and soil microorganisms.

A trial was completed on a commercial field located in Gadsby, Al-

Figure 2

Early plant emergences on previously unproductive soils.

berta, Canada. The tested product contained liquefied organic matter of 10 percent strength, made from low-quality coal (a natural non-hazardous material rich in soil organic matter, energy value around 7,000 BTU/lb). The soil was 40 percent dark brown solodized solonetz, 40 percent dark brown solod, and 20 percent orlic dark brown chernozem. Soil organic matter was recorded at 3.6 percent. The 160-acre field had three zones (18 acres in total) with SAR of 12.4, 29.6 and 62.9; pH of 7.1, 7.5 and 7.8; and EC of 1.5, 7.0 and 38.3 ds/m, respectively. The rest of the field had SAR, pH, and EC of 9.7, 7.0, and 0.8 ds/m, respectively.

From 2009 to 2012, the three zones together with the rest of the field were alternately seeded with wheat of "CDC Go" variety and canola. Every year, dry urea (46-0-0) was applied during seeding at 110 lbs/acre. During harvest throughout the years of 2009 to 2012, zero yields were observed from the three zones (identified as "control" in Figure 1). In 2013, these three zones and the rest of the field were again seeded with wheat of "CDC Go" variety. However, this time during seeding on the three zones, liquefied organic matter was sprayed at a rate of 10 USG/acre (or 8.3 lbs organic matter/acre) together with the application of dry urea (46-0-0) at 110 lbs/acre. During harvest (identified as "treated" in Figure 1), 4.8 and 16.7 bu/acre yields were observed from two zones with SAR of 29.6 and 12.4, respectively; something that had never been achieved in four years.

Figure 2 shows early plant emergences on soil with SAR of 12.4. Zero yields were still observed from the poorest zone with SAR of 62.9. Crop yield for the rest of the field was recorded at 27.7 bu/acre. Dry urea (46-0-0) was applied at 110 lbs/acre, however, liquefied organic matter was not incorporated.

Although detailed mechanisms were not investigated, this trial clearly demonstrated the efficacy of liquefied organic matter to make soil with high salt contents productive. Under normal soil conditions, significant yield increases were observed with the application of the same product at a rate as low as 1 USG/acre. In this specific case of soil with high salt contents, a higher rate was required, which was still found to be economical. Should amendments like gypsum or others be utilized, even higher rates could be needed to achieve the same result.

In summary, liquefied organic matter provided a different solution for soil with high salt contents. Yields were observed on previously unproductive soil, providing extra revenue for the grower.

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