The effects of humalite on water infiltration and SPAD

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Introduction

- Humalite is a humic substance which is conposed of fulvic acid, **humic acid** (60%), and humin.
- Humic acids are able to retain cations, such as Magnesium (Mg^{2+}), Calcium (Ca^{2+}), and Potassium (K^{+}) [2], making them more accessible for plants[1]
- Humic acids are negatively charged and can hold onto more cations, preventing them from being washed away. This helps resist nutrient leaching. [1]
- Urea is the most common nitrogen fertilizer which may cause environmental pollution when applied in excess.
- Infiltration is defined as the process in which water seeps through the top layer of ground and enters the soil.
- Different soil types have different rates of infiltration. These rates are affected by the factors within the soil.
- Leaching, the process in which water travels too far through the soil and takes minerals into the groundwater, is a major issue in Alberta. [3]
- This results in an increase in fertilizer purchases and application, which may lead to water pollution.
  ➤The over abundance of nutrients in water is resulting in eutrophication, which essentially means the loss of land locked bodies of water.
  ➤This also leads to urea in our drinking water supplies.

Figure 1. Humalite

Objective

- To access the effect of urea and humalite on the water infiltration rate and SPAD.

Methodology

Experimental Design

- Split plot
- Main plot: Urea application rate
  ➤Zero application (Zero U)
  ➤Recommended rate (Full U)
- Subplot: Humalite application rate
  ➤Zero application (Zero H)
  ➤100 lbs/ac (100H)
  ➤400 lbs/ac (400H)

Figure 2. SPAD device

Sampling

- 250ml of water poured into a cylinder (diameter of 15cm) which was hammered into the soil.
- The time was taken for the water to seep through the soil was recorded.
- To asses plant chlorophyll concentration, three measurements per plot was taken using a SPAD-502Plus.

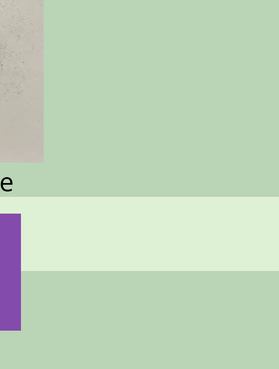

Figure 3.1. Water infiltration trial

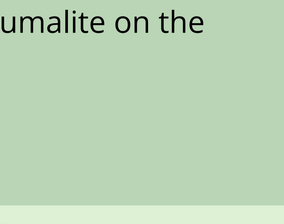

Figure 3.2. Water infiltration trial

Results

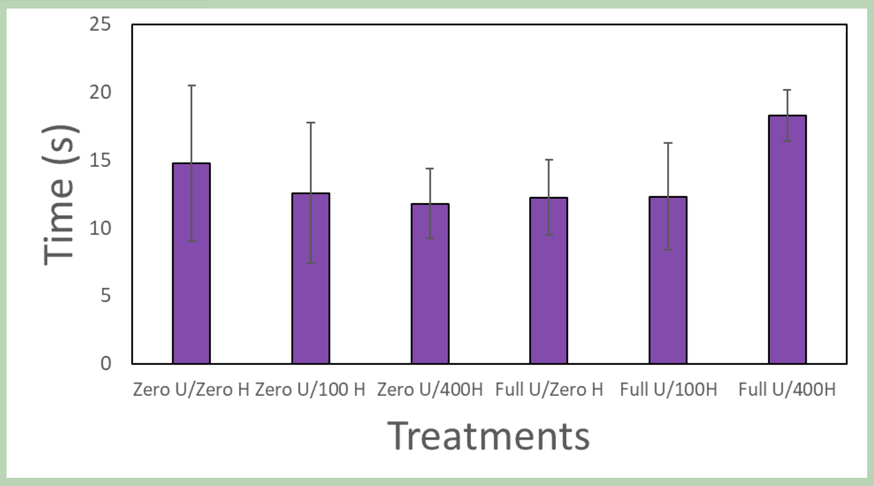

Figure 4. The effect of urea and humalite on water infilteration rates for the six treatments used.

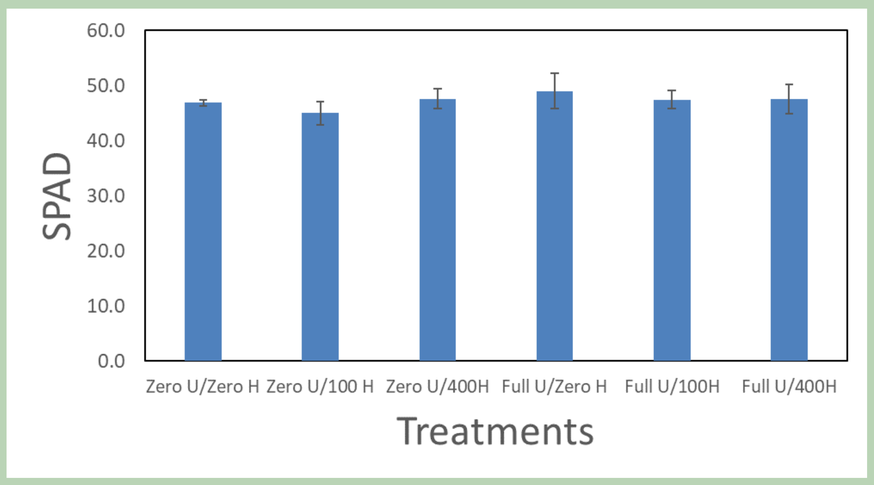

Figure 5. The effect of urea and humalite on chlorophyll concentration (SPAD)

Discussions

- Full U/400H and Zero U/Zero H was observed to have the lowest infiltration rate when compared with other treatments since it took more time for water to seep through the soil.
- Water infiltration was faster with zero U/400H and Zero U/100H when compared with other treatments because water moved faster through the soil pores.
- The results show that the presence of humalite (ie., fullU/400H) improved soil structure due to lower infiltration rate when compared with other treatments
- A high infiltration rate as observed with Zero U/ 400 H can lead to leaching of nitrogen thus causing environmental pollution.
- Humalite can be used to improve soil structure and sustainably preserve soils for food production.
- Full U/Zero H was observed to have the highest chlorophyll content. This treatment promots chlorophyll content in plants which is good for photosynthesis.
- Lowest chlorophyll content was observed in ZeroU/100H.

Acknowledgements

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References

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[2]Down to Earth Fertilizer. (2023, August 2). What are humic acids?. Down To Earth Fertilizer. https://downtoearthfertilizer.com/education/dte-tv/what_are_humic_acids/#:~:text=Molecules%20of%20Humic%20Acids%20are,zinc%2C%20and%20manganese%20can%20attach.
[3]Ma, X., Bai, Y., Liu, X., & Wang, Y. (2023, May 18). Analysis of water infiltration characteristics and hydraulic parameters of Sierozem soil under humic acid addition. MDPI. https://www.mdpi.com/2073-4441/15/10/1915