Determining the Optimum Sowing Depth of Two Kernza Cultivars in Three Minnesota Soils

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Introduction

- Kernza (*Thinopyrum intermedium*) is a novel perennial grain crop who's seed that can be used as an alternative to wheat products.
- The perennial growth habit of Kernza provides several environmental advantages that annual crops do not.
- The effects of sowing depths in varying soil types and their subsequent effects on Kernza seed germination and biomass accumulations have not been understood.
- Different soil types vary in physical and chemical properties that affect plant development.
- For Kernza to continue its development as an agronomic crop for production in Minnesota, the optimum sowing depth must be determined in Minnesota agronomic soils.

Questions

1. How does two recently developed cultivars of Kernza respond to varying sowing depths?
2. How does soil type and sowing depth influence seedling germination and biomass accumulation in Kernza?

Materials and Methods

- To find the optimum sowing depth of Kernza, I performed a greenhouse study with 2 Kernza varieties each planted at 5 different seeding depths, in each of 3 typical Minnesota soil types, with 3 replicates each.
- Kernza cultivars used were CP4 and Clearwater.
- The soil types were Hubbard-Mosford complex, Waukegan silt loam, and a Webster clay loam.
- Growing trays were filled with each soil type and 18 seeds of the two Kernza varieties were planted and a selected planting depth was chosen for each tray.
- The planting depths of 0.25, 0.5, 0.75, 1, and 1.25 inches were used.
- Soil moisture was kept consistent with regular waterings by weight of water loss over time.
- Seedling emergence was recorded daily for three weeks.
- After three weeks, the above ground biomass was harvested, dried, and weighed.

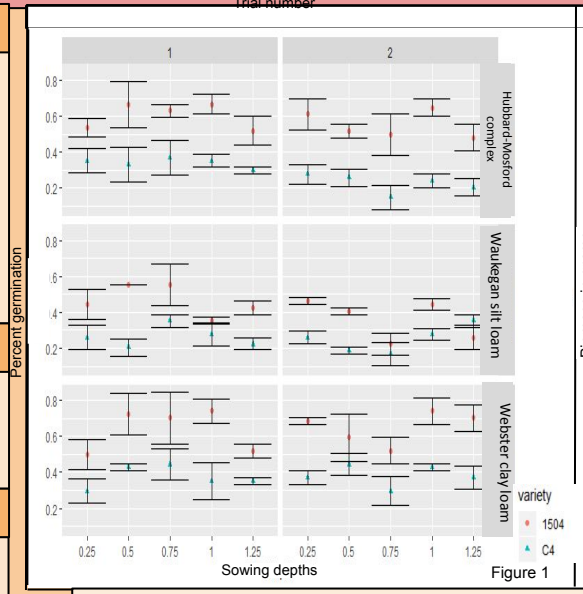

Figure 1

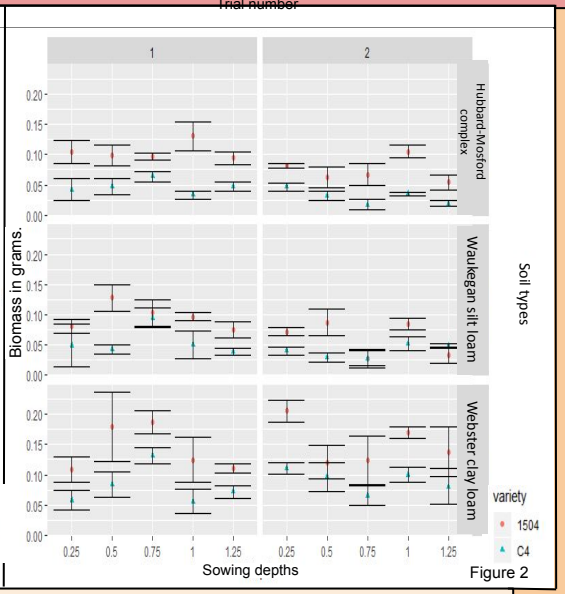

Figure 2

Figure 1 (left) shows the percent germination of both cultivars of Kernza in both trials at the tested planting depths and soil types.
Figure 2 (right) shows the final dry weight of all Kernza seedlings in each treatment after three weeks of growing.

Figure 3 (left) is the layout of the growing trays in the greenhouse. Figure 4 (right) is the emergence of Kernza from the soil surface.

Figure 5 (right) shows the Kernza seedlings after growing in the greenhouse for three weeks.

Results

- The sowing depths of 0.5, 0.75, and 1 inch had similar emergence rates in all soil types and both varieties.
- Above ground biomass accumulations were highest in the 0.75 and 1 inch planting depths across all soil types.

Conclusion

The optimum soil depth for Kernza in Minnesota soils was determined to be between 0.75 and 1 inch across all soil types. In both of these sowing depths emergence and biomass accumulations were at their highest. Soil type did not have a substantial impact on determining the optimum sowing depth, however, soil type did affect the biomass accumulations and germination. The Kernza variety 1504 was more vigorous in biomass accumulation and emergence compared to the C4 variety.

Future Direction

The experimental model that was used in this research project could be applied anywhere to determine sowing depth and two other variables when examining a plant species response to different soil conditions.

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