



# Stratification of Potassium in Tillage vs. No-Till Systems and Uptake in Corn (*Zea mays*) in Western Kentucky

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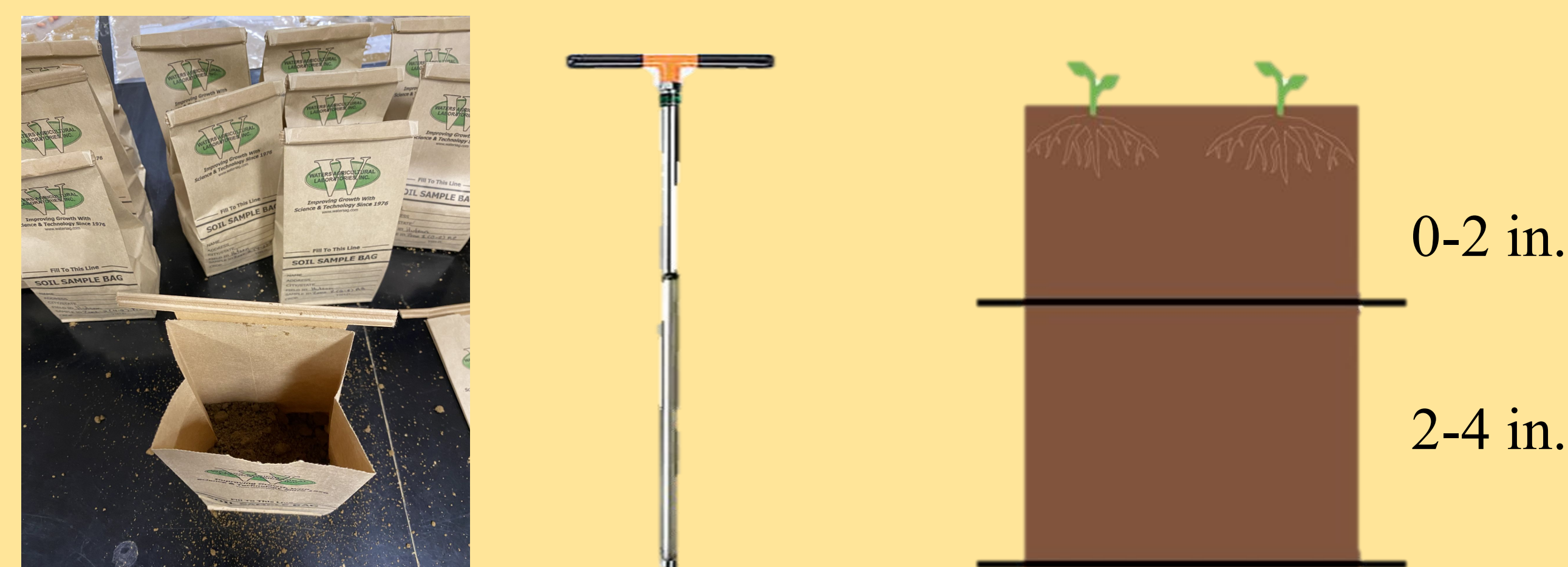
## OBJECTIVES

- Determine if differences exist between tillage and no-till systems for potassium.
- Determine if crop physiological differences exist between tillage and no-till systems.

## INTRODUCTION

Potassium is a macronutrient that is taken up by plants in large amounts in order for them to function properly. Potassium is vital for the proper flow of water, nutrients, and carbohydrates in corn, it is also an important component of plant cell walls and stomatal mechanics as well as other metabolic functions. This affects the ability of the corn plant to resist disease as well as drought tolerance. Potassium availability for uptake in the plant from the soil is dependent upon factors such as soil temperature, soil moisture, and soil aeration. These factors are all affected by disturbance or lack of disturbance in soil, such as conventional tillage and no-till practices. Conventional tillage is the overturning of the soil in order to incorporate crop residue and is used to try and prepare an even seedbed. No-till is a practice that is used with little to no disturbance of the soil. Both the no-till and tillage systems in this study are the same land capability classification.

## MATERIALS AND METHODS



Soil Sampling : 4 depths, 3 reps per depth. Samples taken at Pre Plant and at V6.



Tissue Sampling : 15 - 16 leaves, one leaf above the ear. Samples taken at V6, R1, and R5.



Stalk Strength: 3 reps in 17'5" increments, count each stalk within that measure and test each stalk with a 30 degree push, record how many stalks failed to return to their original vertical position.



Yield : 3 reps in 17'5" increments, harvest all ears from those rows, record moisture, weigh ears, and determine kernel size, grain grading to determine if any effect on grain quality. Samples also sent to Iowa State for nutrient analysis.

## RESULTS

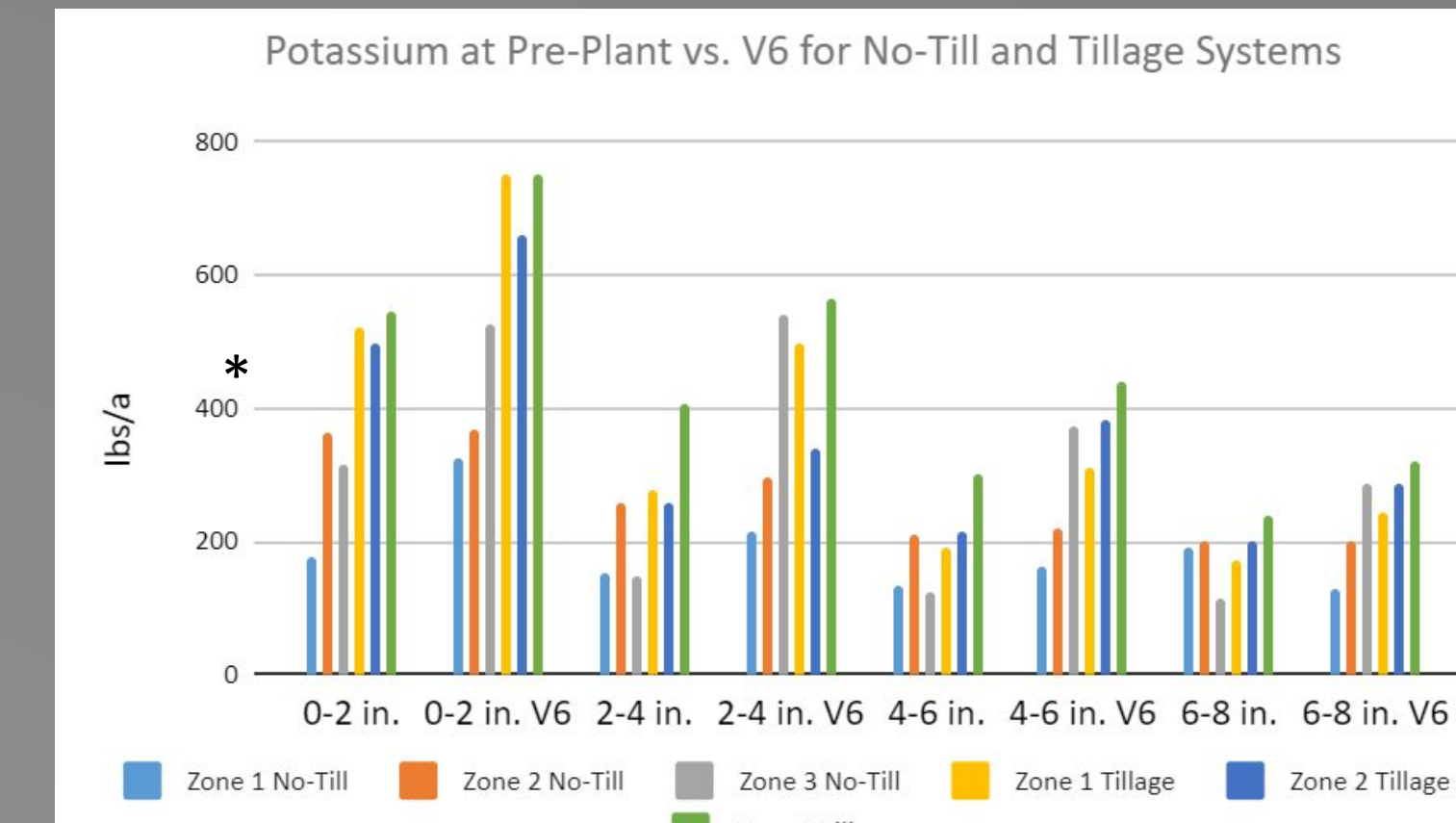


Figure 3. Soil Sample Results for Potassium in Spring and Summer 2023 measured in lbs/ac.

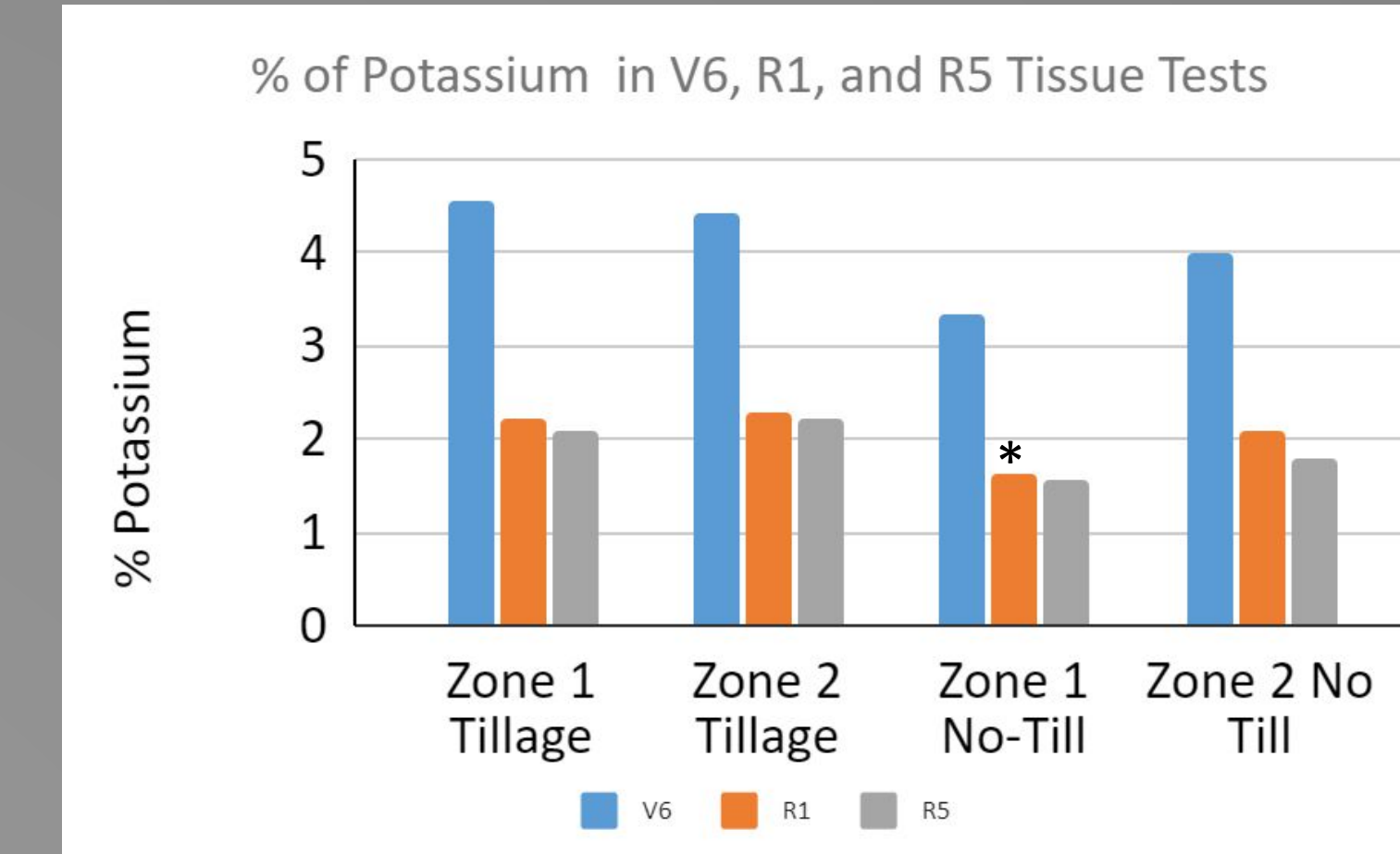


Figure 4. Bar chart showing the percentage of potassium in tissue tests taken at V6, R1, and R5.

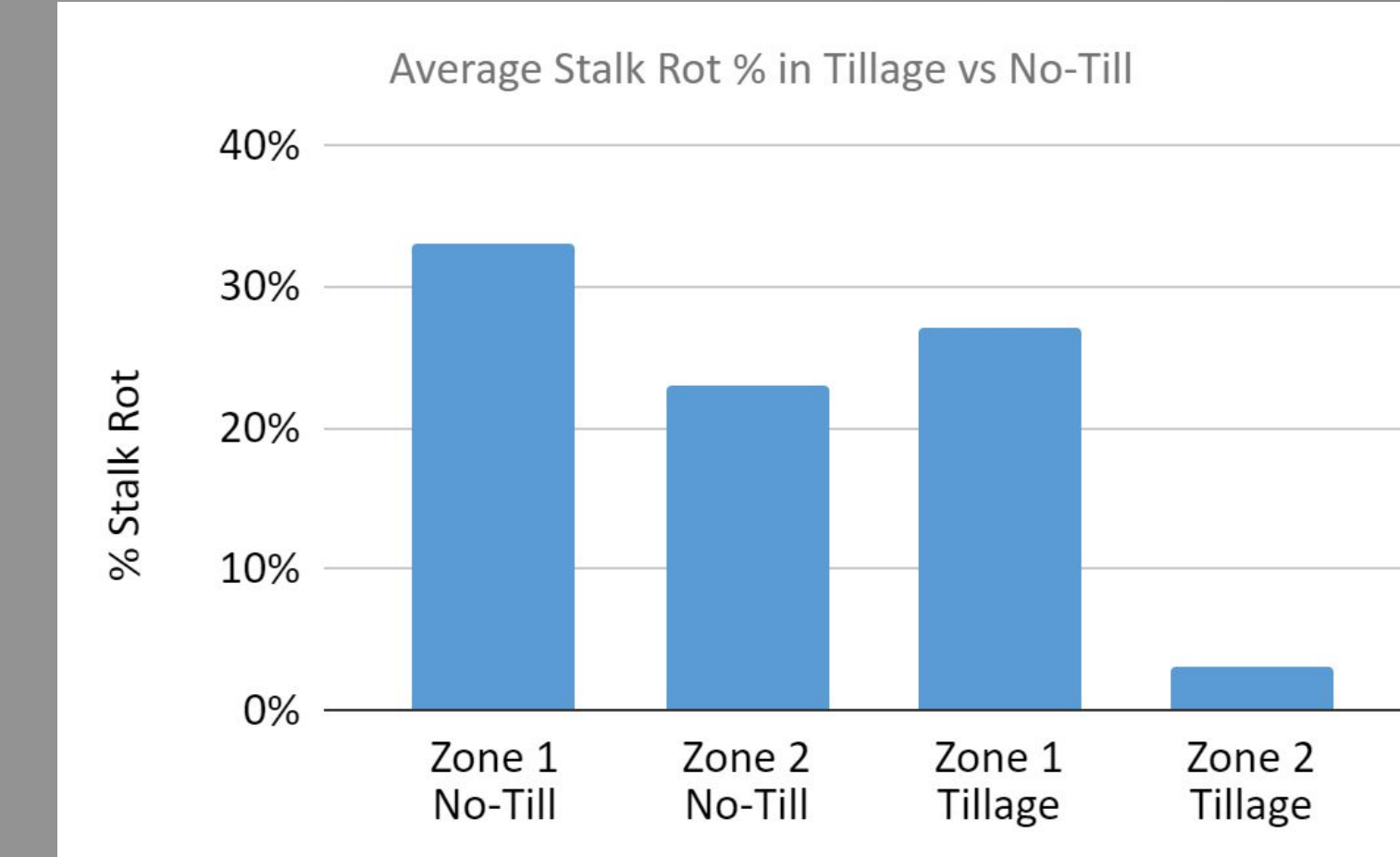


Figure 5. Bar chart showing the percentage of stalk rot in tillage vs no-till systems.

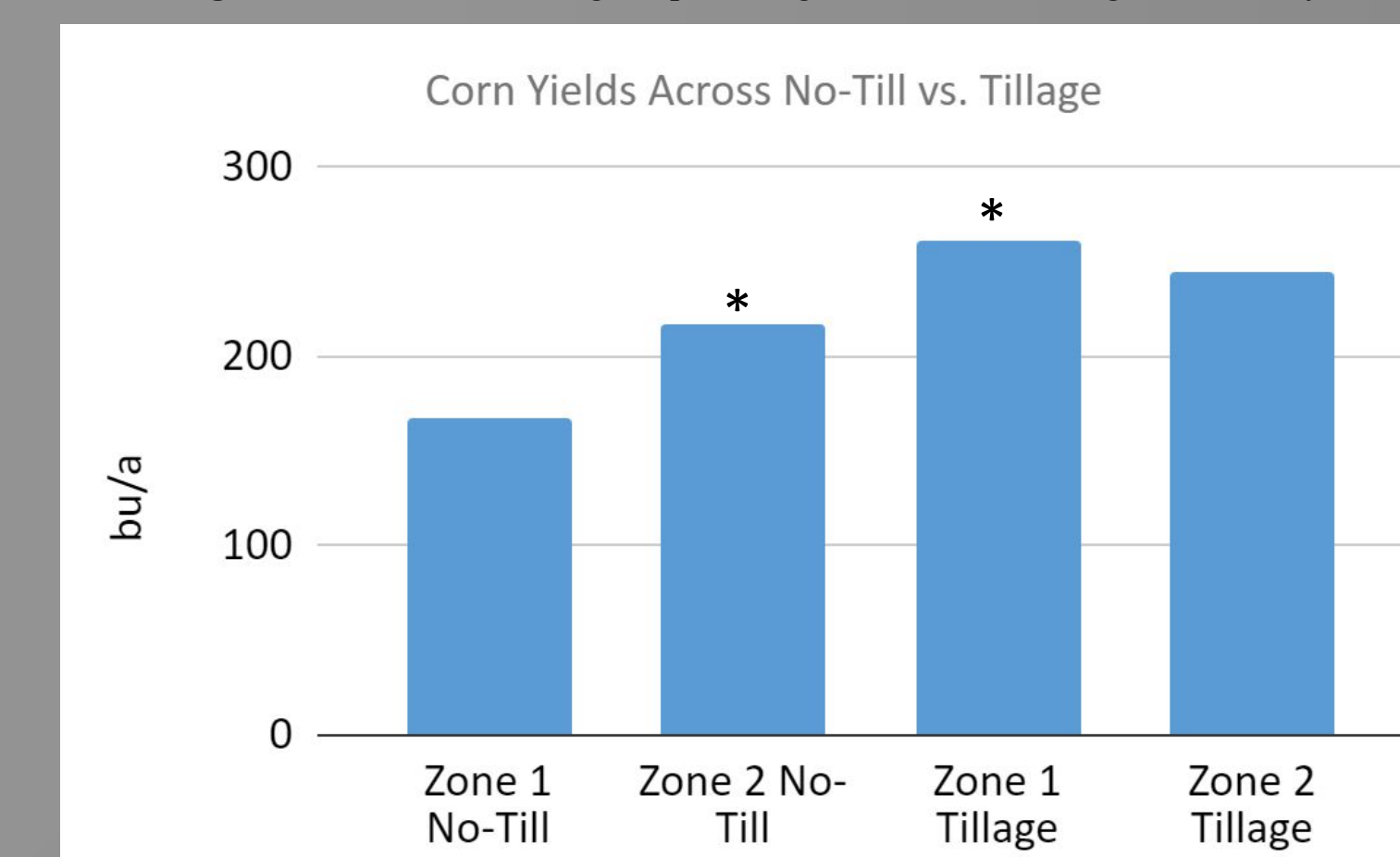


Figure 6. Bar chart showing yield in bu/a across in tillage vs. no-till systems.

Table 1. Summary table showing the significant differences between zones/tillage systems and their depth in regards to potassium in lbs/ac measured at Pre Plant.

Depth	Zone (Pre-Plant)	Relationship
0-2 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.017060527)
0-2 in.	Zone 2 No-Till vs Zone 2 Tillage	No Sig. Difference
0-2 in.	Zone 3 No-Till vs Zone 3 Tillage	Sig. Difference (0.000282408)
2-4 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.033040993)
2-4 in.	Zone 2 No-Till vs Zone 2 Tillage	No Sig. Difference
2-4 in.	Zone 3 No Till vs Zone 3 Tillage	Sig. Difference (0.0003172659)
4-6 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.000096940)
4-6 in.	Zone 2 No-Till vs Zone 2 Tillage	No Sig. Difference
4-6 in.	Zone 3 No-Till vs Zone 3 Tillage	Sig. Difference (0.003442980)
6-8 in.	Zone 1 No-Till vs Zone 1 Tillage	No Sig. Difference
6-8 in.	Zone 2 No-Till vs Zone 2 Tillage	No Sig. Difference
6-8 in.	Zone 3 No-Till vs Zone 3 Tillage	Sig. Difference (0.014313430)

Table 2. Summary table showing the significant differences between zones/tillage systems and their depth in regards to potassium in lbs/ac measured at V6.

Depth	Zone	Relationship
0-2 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.014268947)
0-2 in.	Zone 2 No-Till vs Zone 2 Tillage	Sig. Difference (0.007976461)
0-2 in.	Zone 3 No-Till vs Zone 3 Tillage	Sig. Difference (0.006099416)
2-4 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.03760347)
2-4 in.	Zone 2 No-Till vs Zone 2 Tillage	No Sig. Difference
2-4 in.	Zone 3 No-Till vs Zone 3 Tillage	No Sig. Difference
4-6 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.038035141)
4-6 in.	Zone 2 No-Till vs Zone 2 Tillage	No Sig. Difference
4-6 in.	Zone 3 No-Till vs Zone 3 Tillage	No Sig. Difference
6-8 in.	Zone 1 No-Till vs Zone 1 Tillage	Sig. Difference (0.000657034)
6-8 in.	Zone 2 No-Till vs Zone 2 Tillage	Sig. Difference (0.012536327)
6-8 in.	Zone 3 No-Till vs Zone 3 Tillage	No Sig. Difference

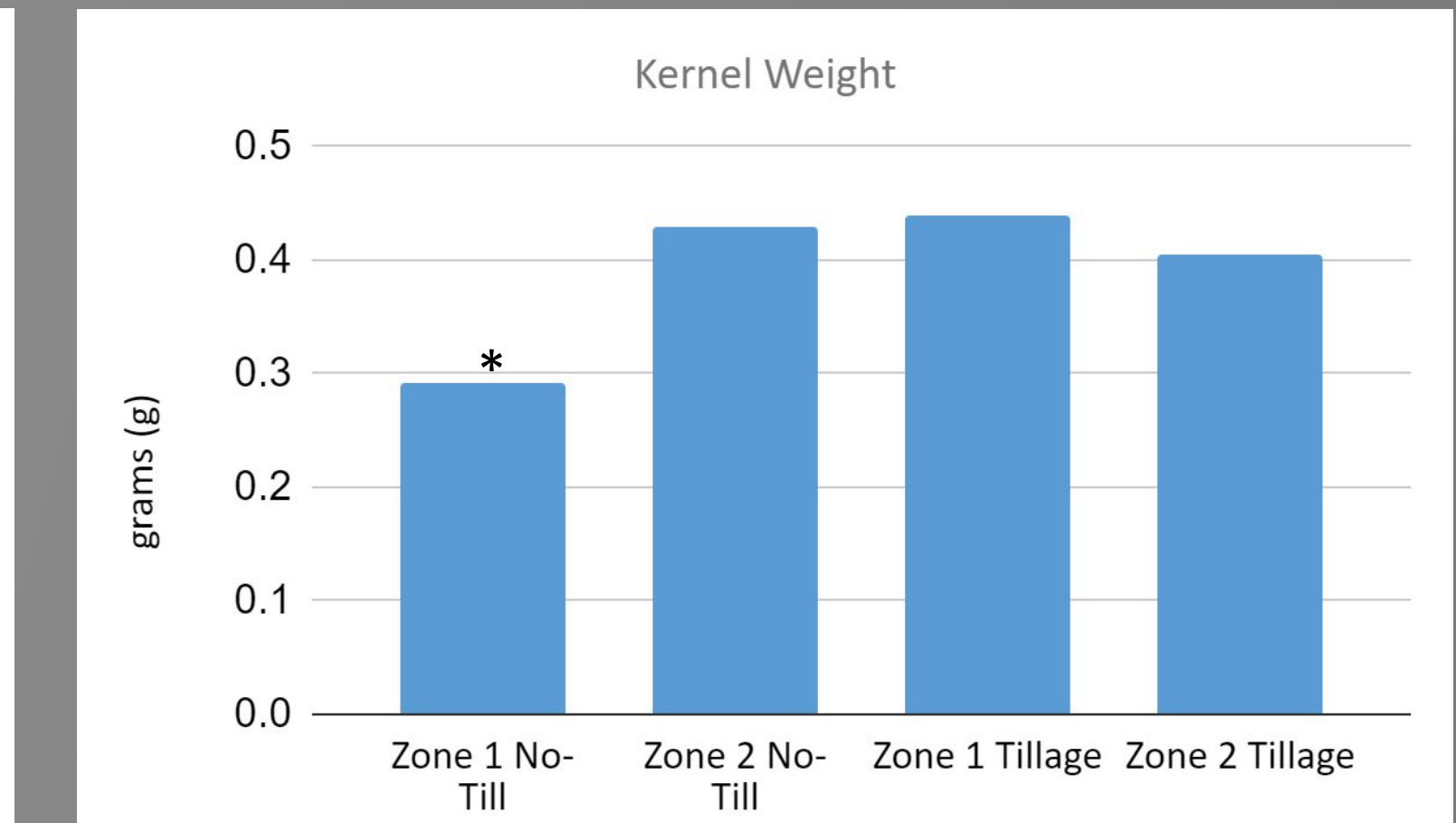


Figure 7. Bar chart showing kernel weight in grams.

## CONCLUSIONS

- The tillage system had significantly higher yields compared to the no-till system in Zone 1 for the two locations.
- There was no significant difference between Zone 2 for tillage versus no-till system for the two locations.
- Zone 3 tended to have higher levels of potassium in the tillage system at pre-plant and V6 when compared to Zone 1 and Zone 2.
- Stalk quality was not significantly different across tillage practices.
- % Potassium within the plant followed a similar trend across sampling times (V6, R1, and R5) in both tillage and no-till systems.
- Many significant differences existed between depth and nutrient content of the soil in both the tillage and no-till systems.
- Grain quality is still being analyzed.

## REFERENCES

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online. Accessed [April/15/2023].

## ACKNOWLEDGEMENTS

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Figure 1. No-Till Field Located at Pullen Farm. GrB2 (Zone 1), GrB3 (Zone 2), and Waterway (Zone 3).



Figure 2. Tillage Field Located at the Hutson Farm. Zone 1 (GrB2), Zone 2 (PIC2), and Zone 3 (Waterway).