

Assessing Corn Growth Response to Row Placement in an RHb PGC system

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Abstract

In the Midwest US, only ~40% of applied nitrogen is taken up by crops, with the remainder causing water quality issues such as hypoxia in the Gulf. Perennial groundcover (PGC) systems may reduce these losses by maintaining year-round soil cover, but good PGC management is key to not causing yield losses. This study examined the early-season effects of one candidate groundcover — Radix hybrid bulbosa (RHb) — on maize in a corn-soybean rotation. RHb was established in 2024 and suppressed before corn planting in 2025. Two corn rows per plot were planted over undisturbed RHb (optimal), and two over disturbed zones from manure injection (suboptimal). Maize height and stem diameter was compared in optimal and suboptimal rows, showing lower growth in the suboptimal case. These results provide additional evidence that crop-PGC proximity can slow maize growth. Future work will assess impacts on yield and refine PGC management practices.

Methods

This study used a randomized complete block design (RCBD) with three replicates. Each plot contained four corn rows with two spacing treatments using *Radix hybrid bulbosa* (RHb) groundcover established in spring 2024 and chemically suppressed before 2025 corn planting.

Treatments:

Optimal: Corn planted over undisturbed RHb, averaging 5.4 inches on each side from groundcover base

Suboptimal: Corn planted 0.5-1 inch from RHb over manure-injection disturbed areas

Data Collection: Soil nitrate measured via Late-Spring Soil Nitrate Test (LSNT). Early-season corn growth assessed in June-July 2025 sampling 21 plants (optimal) and 18 plants (suboptimal) per plot from uniform 10-ft sections. Measurements included plant height, stem diameter, V-stage, and leaf chlorophyll index (SPAD meter).

Classroom Applications

Standard

MOD-H4

Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena and move flexibly between model types based on merits and limitations.

ETS1. A-H2

Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

Applications

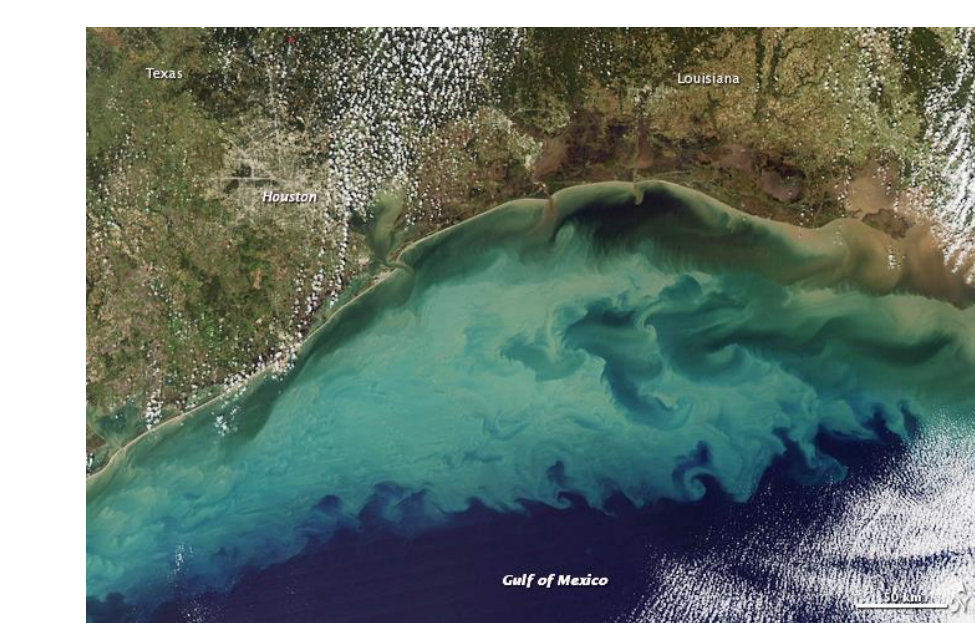
Have students produce their own experiment. Have them test to see if PGC influences other crops like soybeans, pumpkins, fruits, vegetables, etc. They will create an experiment and show their findings to the class.

Understand the impacts of using fertilizers on plants. Understand what causes the algae bloom in the Gulf of Mexico and see how the use of fertilizers and other nutrients has effect on local waters. Have students test the soil near local water sources, and the impacts it may have on the water.

Background

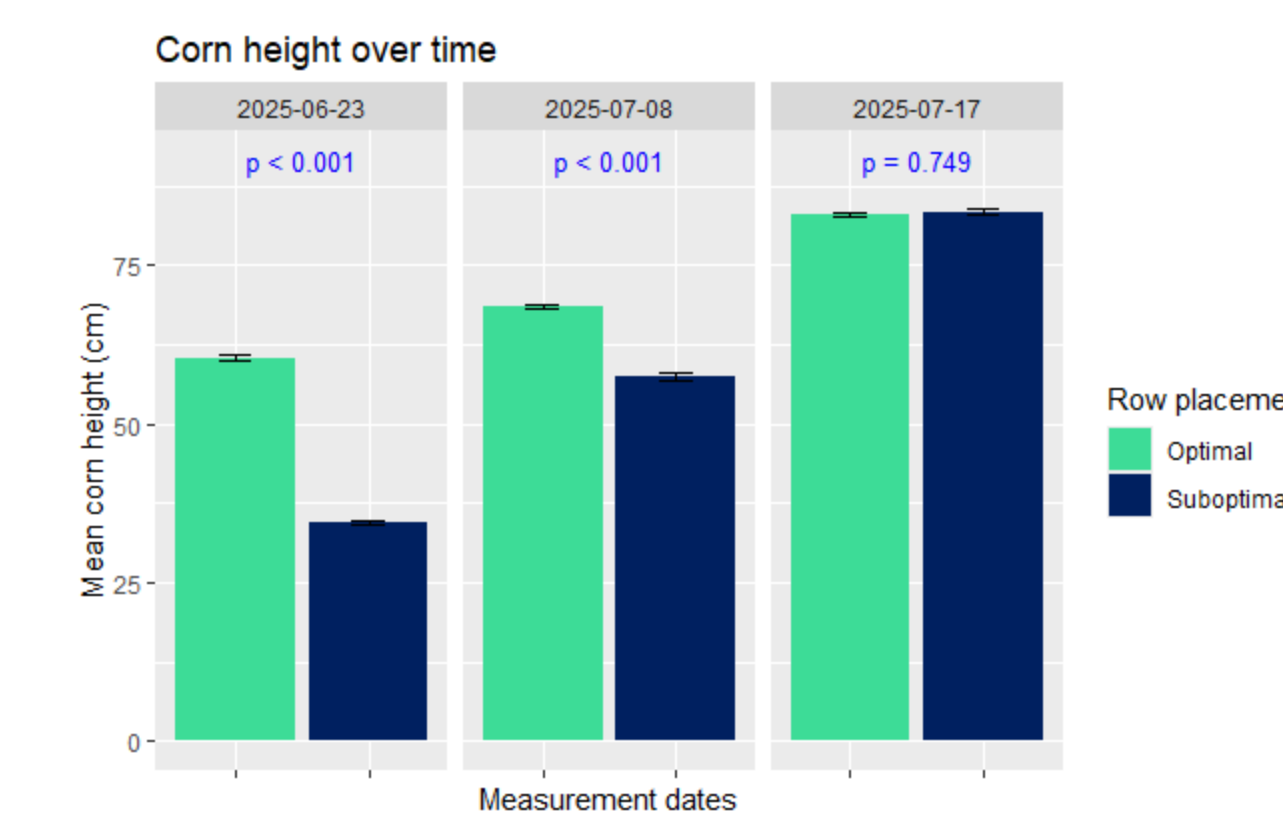
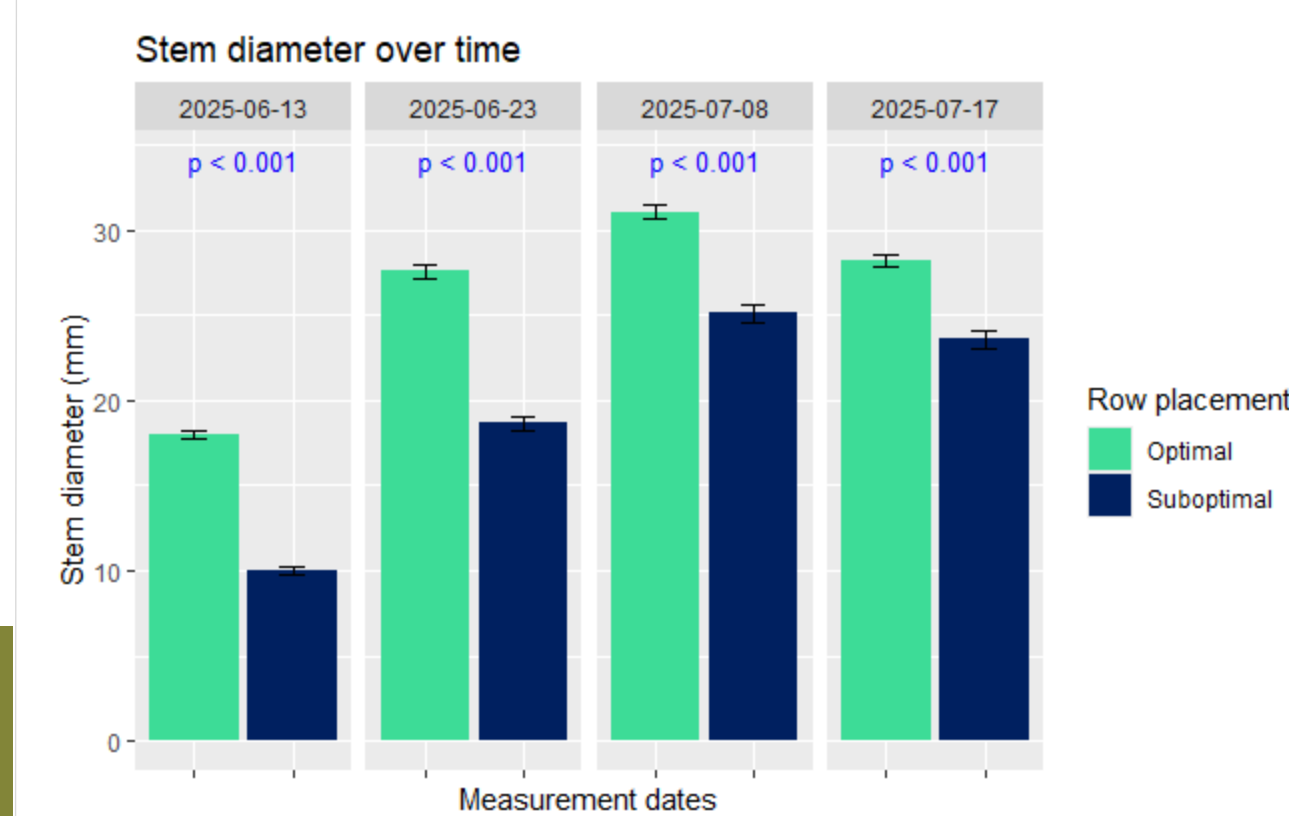
- Midwest Corn Belt monocropping systems are highly productive but cause soil degradation, nutrient runoff, and water quality decline.
- PGC systems helps mitigate these challenges but may compete with cash crops if poorly managed. Understanding PGC-crop interactions is critical for optimizing environmental benefits while maintaining crop performance.

- Failure to maintain crop performance will cause low adoption of PGC, preventing the benefits from being realized



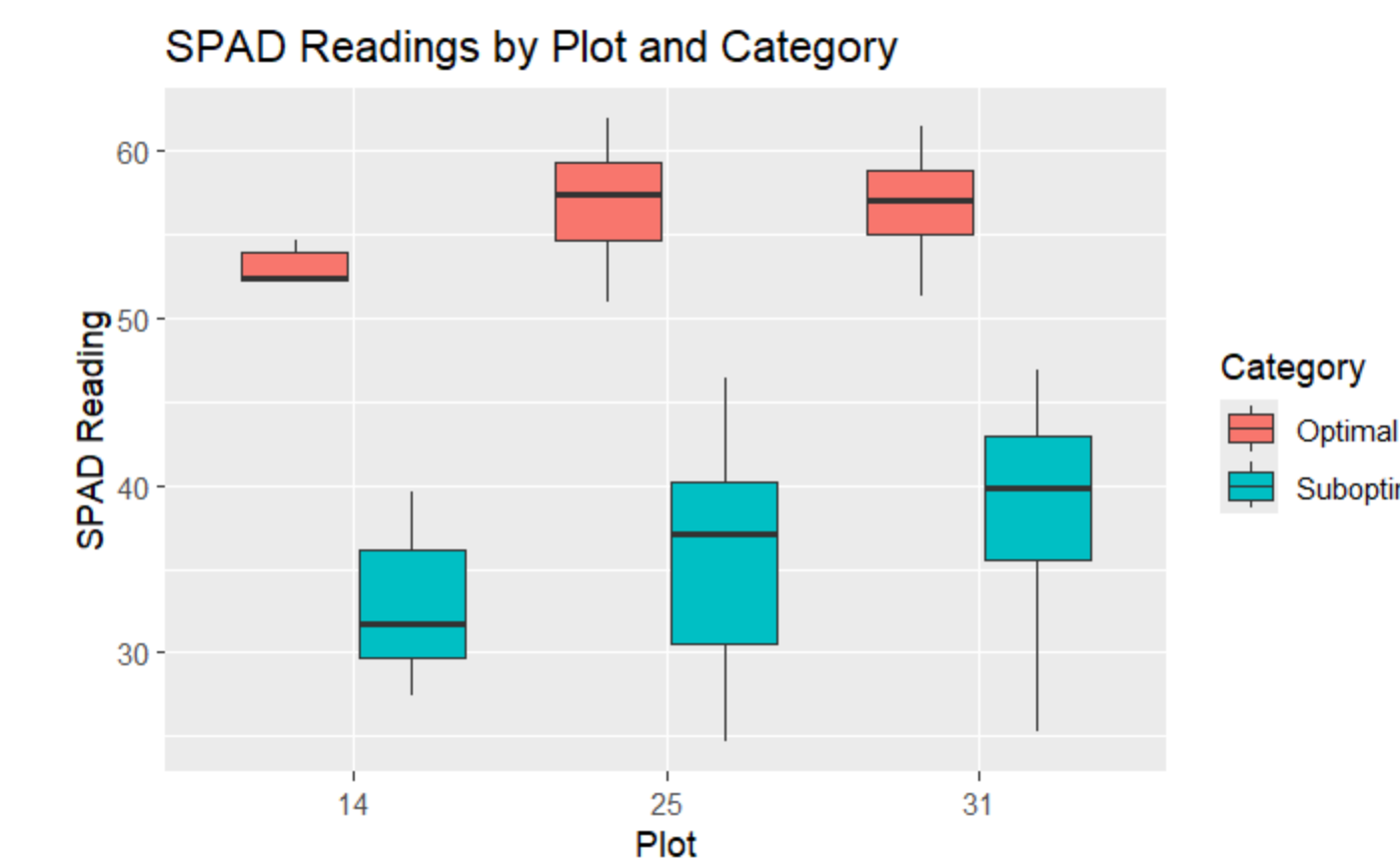
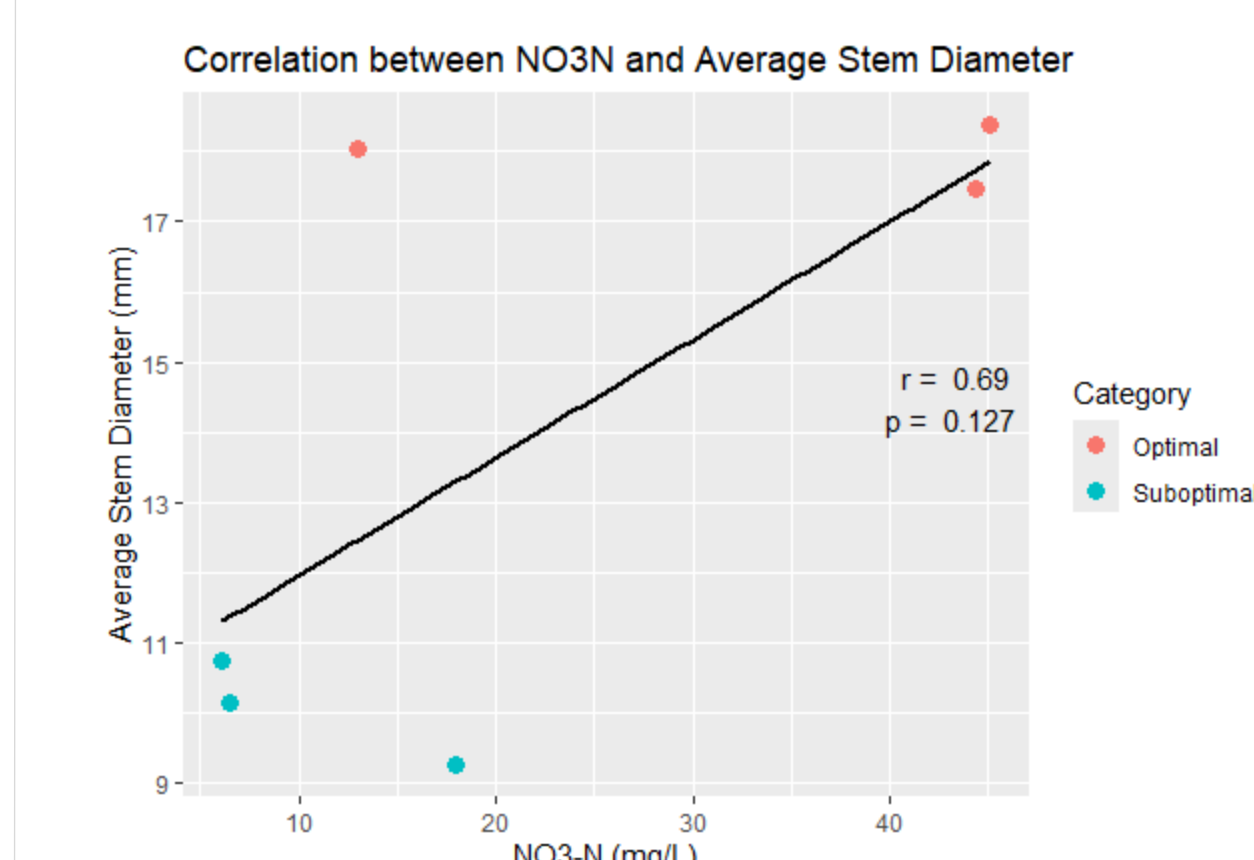
Results & Conclusion

LSNT showed soil NO₃-N of 34 mg/L (optimal) vs. 10 mg/L (suboptimal), but differences were not statistically significant ($p = 0.12$). Suboptimal crops had 2-stage growth delays and reduced chlorophyll.



Differences in **stem diameter** observed

Differences in **corn height** observed



Conclusions: Proper spatial configuration between corn and the PGC is critical for early-season crop performance. Reductions in stem diameter, temporary height suppression, developmental delays, and reduced chlorophyll will be observed which may negatively impact final grain yield

Future Collaborations

This summer taught me a lot about research. It taught me that things may not always go your way, and that's ok, it matters how you take your next steps. I will definitely be contacting Iowa State, and people like Dan Andersen and Maya Hayslett to get students interested what our farming state has to offer.



Objectives

Kurtz *et al.* (2021) found that maize seedling emergence was reduced when planted too close to living PGC, highlighting the importance of spatial configuration between crops and groundcover. Building on this work, our study investigates how the spatial arrangement of RHb affects early corn growth in a corn-soybean rotation system

Objectives:

- To evaluate the physiological effects of optimal versus suboptimal corn-PGC spacing on early-season maize growth, and subsequently influencing yield

Acknowledgements

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