# Performance of Short and Tall Stature Maize in Perennial Groundcover

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## Background

Conventional production practices can lead to soil erosion, nutrient loss, and reduced soil health, when fields are left bare. Perennial groundcover (PGC) maintains soil coverage through intercropping a cool-season grass between maize rows with the goal of protecting soil and improving sustainability. One challenge of using PGC is that it may compete with maize for light, water, and nutrients, potentially leading to altered crop growth and reduced grain yield. Selecting a maize hybrid that is shade-tolerant and able to adjust performance in a competitive environment will promote soil protection while maintaining yield. This research evaluates four maize hybrids with differences in stature to determine their growth and yield responses in PGC systems.

## Abstract

This field experiment evaluates the response of four maize hybrids grown in the presence of PGC. Maize hybrids representing short stature maize (SSM) and conventional tall maize (CTM) types were grown in PGC conditions to determine whether hybrid stature impacts performance in a PGC system. Throughout the growing season, plant height, stem diameter, chlorophyll content (SPAD), and grain yield were measured. The study will aim to provide insight into hybrid performance in PGC systems and enable the selection of maize hybrids for sustainable production.

## Objectives

- Assess pre-planting seed quality by performing germination and seed vigor tests among the four hybrids
- Evaluate maize hybrid growth and development response in a PGC system
- Compare the final yield performance of each hybrid in the PGC system and determine which growth traits correlate with grain yield
- Determine if maize stature influences performance when grown with PGC

## Methods

- Split-plot randomized complete block design (RCBD)
- Main plot treatment - PGC vs no PGC
- Subplot treatment consisting of four maize hybrids
- Maize planted at 15cm from Kentucky bluegrass PGC

**Germination test**

- Standard Germination
- Vigor

**Field data**

- Plant height and stage
- Stalk length
- SPAD
- Stem diameter


**Fig. 1:** Measuring leaf chlorophyll content (SPAD) in maize

**Fig. 2:** Setting up seed germination test

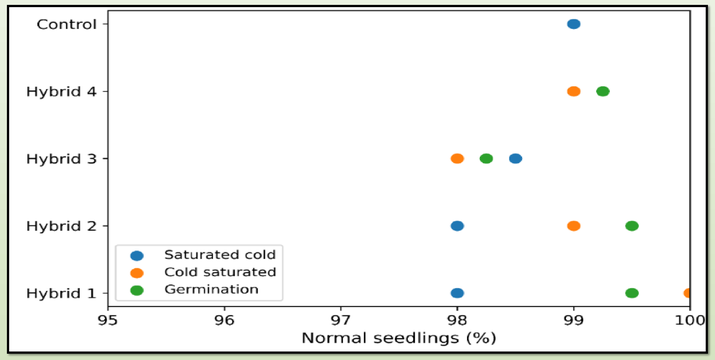


**Fig. 3:** Seed germination results for four maize hybrids under saturated cold, cold saturated, and standard germination tests.

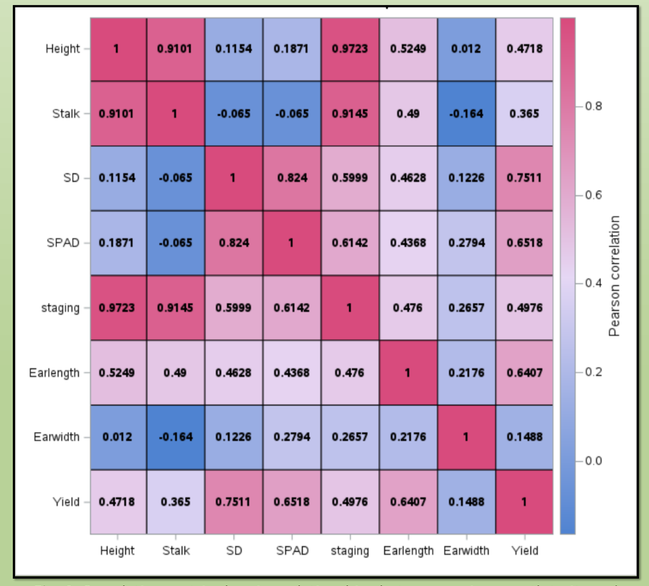


**Fig. 4:** Correlation matrix showing relationships between maize growth traits and grain yield.

## Results

- All four maize hybrids demonstrated excellent seed quality health
- PGC negatively influenced plant growth and grain yield
- No differences were associated in response to PGC by hybrid or stature
- Stem diameter, SPAD, and ear length were positively correlated with grain yield suggesting these traits may be better indicators of productivity in this system than maize hybrid selection

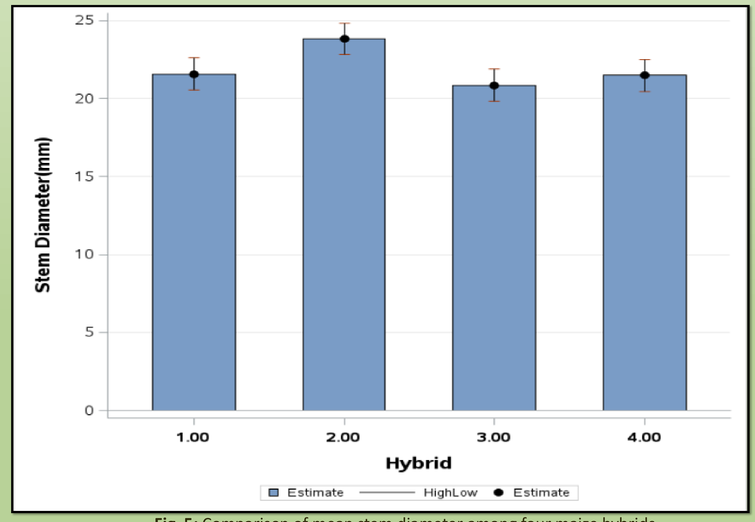


**Fig. 5:** Comparison of mean stem diameter among four maize hybrids.

## Future Collaborations

Some ways I can incorporate my research into my classroom:

- Working in groups makes research more enjoyable and encourages collaboration toward a common goal
- Every member of a research team contributes to answering a larger scientific question
- Productive struggle is part of the research process, and it's okay not to know all the answers

## 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.

**Application -** Students will develop models to predict how different cover crops affect the growth of a cash crop, then design and conduct a small-scale investigation using fast-growing plants such as pumpkins, soybeans, beans, or radishes to test their predictions. After collecting and analyzing data, students will compare their results with their original models and revise their explanations based on evidence.

## Acknowledgements

I would like to extend a thank you to everyone who helped make this research experience enjoyable. Thanks to Amina Moro, Cameron Krumm and Kenneth Moore.

RegenPGC is supported by Agriculture and Food Research Initiative Competitive Grant No. 2021-68012-35923 from the USDA National Institute of Food and Agriculture