Investigating the Effects of Gibberellin Treatments on Different Dwarf Millet Genotypes and Identifying the Mechanism Responsible for Genetic Dwarfism

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Introduction

Gibberellins are plant hormones that play a crucial role in regulating growth and development, particularly in stem elongation, seed germination, and flowering. In many cereal crops, including millet, dwarf genotypes are of significant agricultural interest, due to their potential for increased structural stability and improved yield efficiency. However, the underlying genetic mechanism responsible for dwarfism in different millet genotypes remain unclear. This study aims to investigate the response of various dwarf millet genotypes to gibberellin treatments and to determine the genetic basis of their dwarfism.

Previous research has established that certain dwarf traits in plants result from mutations affecting GA biosynthesis or signal transduction pathways. By understanding how different dwarf millet genotypes respond to GA application, we can identify whether their dwarfism results from deficiencies in gibberellin production, or if they lack the receptors for the gibberellin hormone. Such knowledge has potential applications in crop improvement and agriculture

Objectives

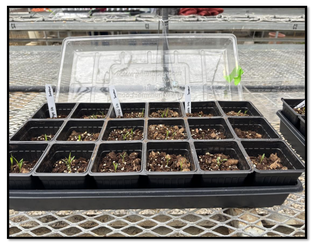
- To determine the effect of gibberellin treatments on the growth of different dwarf millet genotypes
- To identify the genetic basis of dwarfism in each genotype, by evaluating their response to gibberellin treatment.
- To contribute to the broader understanding of plant hormone regulation in cereal crops, aiding in the future of agriculture and crops with improved yield and stress resistance.

Procedure/Methodology

This study will use a controlled greenhouse experiment to assess the impact of gibberellin treatment on multiple dwarf millet genotypes. Our research question of this experiment is, how do different dwarf millet genotypes response to gibberellin treatment, and what does this indicate about the genetic mechanism of their dwarfism? We hypothesize that dwarf millet genotypes with gibberellin biosynthesis deficiency will exhibit increased stem elongation when treated with gibberellin and that dwarf millet genotypes with gibberellin signal transduction defects will not show significant growth changes after gibberellin application. In this experiment, the independent variable is the dwarf millet genotype, and we are measuring (dependent variable) stem elongation. Our experiment also includes controlled variables of light exposure, water availability, soil conditions, and temperature.

Gibberellin Treated | **Normally Treated**

Week 1

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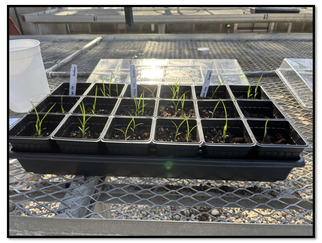
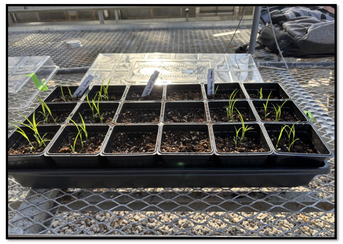

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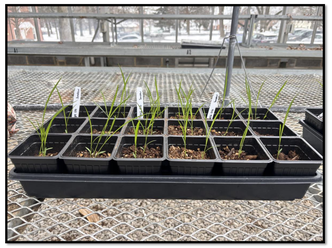
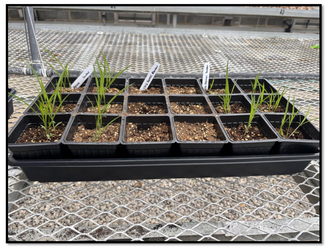
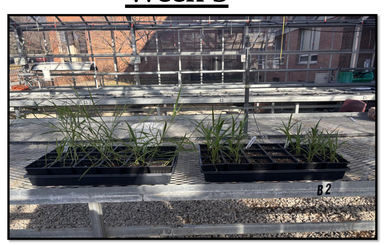
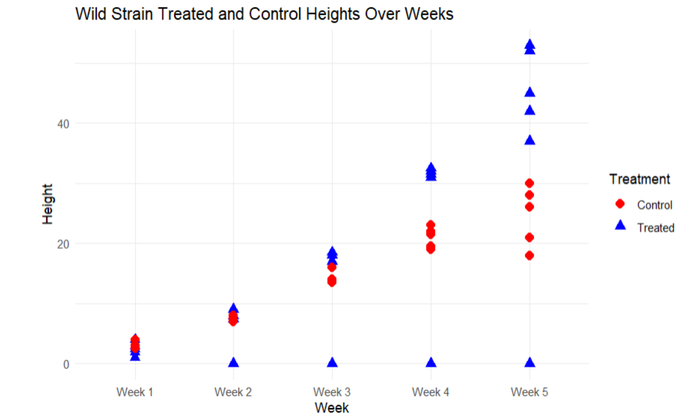
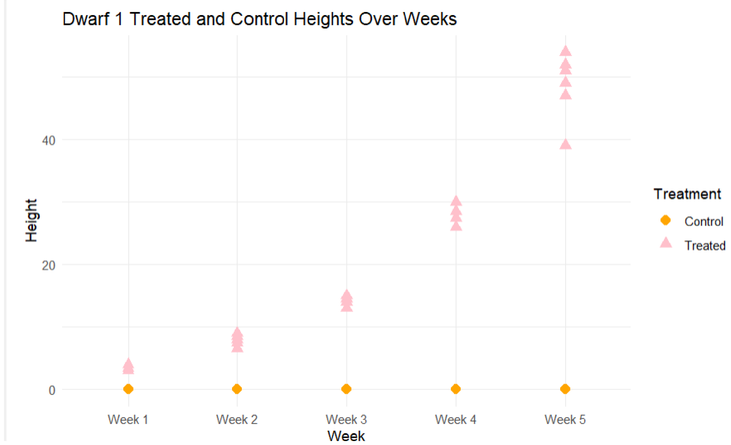



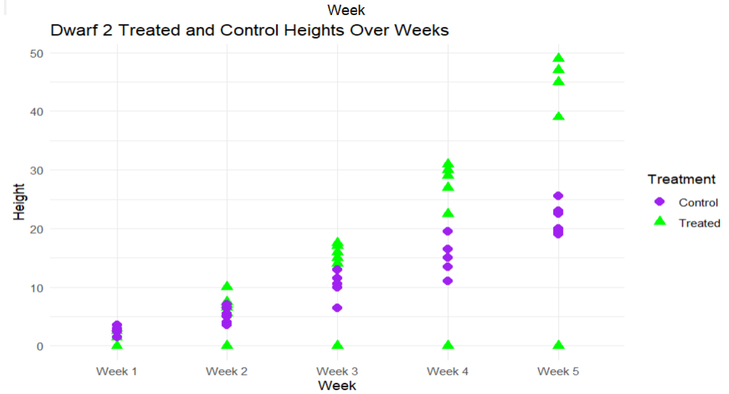
Week 4

Week 5









Data Analysis

- The wild strain offered a very good range of data. That also depicted a very fast exponential growth for the treated plants over the 5 weeks. We also had one pot die\not grow for all 5 weeks
- The dwarf 1 seeds reacted very well for the pots that were treated. But for some reason the pots that were controlled all died\did not grow at all.
- Lastly the dwarf 2 seeds performed similar to the wild strain plants. But the groupings of the growths were much closer together. It also had one pot die\not grow