Exploring the Influence of Gibberellic Acid on Green Fox Tail Millets (*Setaria Viridis*): Investigating Its Effects and Implications

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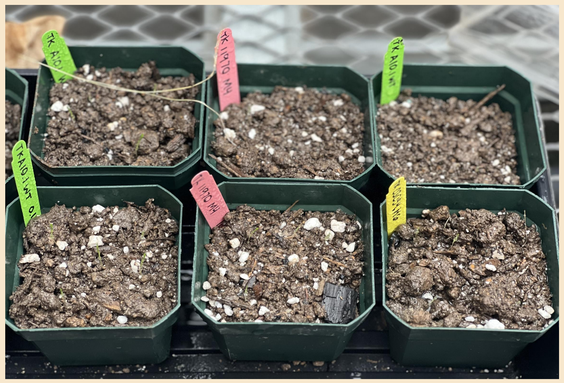
I- Introduction

In recent decades, extensive scientific research had focused on uncovering the mechanisms governing growth enhancement in both typical and dwarf plants. Back in the 1950s, Japanese scientists delved into cultivating *Gibberella fukuroi*, a pathogenic fungus causing diseases in rice plants, and analyzed its composition, eventually identifying impure crystals of two fungal compounds, one of which was "Gibberellin A." Building upon these findings, subsequent researchers like Curtis and Cross identified gibberellic acid, a chemically distinct crystalline compound, which acts as a growth hormone in plants, stimulating processes such as seed germination, stem, and leaf elongation. This discovery significantly contributed to understanding plant growth intricacies. Despite progress, inquiries persisted regarding gibberellic acid's effects on chemically mutated plants like *Setaria viridis* and its role in influencing normal and mutant millets' growth. Studies on maize mutants revealed varied responses to gibberellic acid, highlighting the complexity of interactions between this hormone and different plant species or mutants.

II- Purpose

Our research aimed to investigate the response of Setaria viridis, or green foxtail millets, to gibberellic acid, a hormone crucial for stem elongation in plants. By examining both normal and mutant millet plants under controlled conditions, we sought to understand how gibberellic acid influences growth patterns, particularly in instances of dwarfism. We hypothesized that exposure to gibberellic acid would lead to a significant increase in plant height over the course of the 7-week study, potentially offering insights into genetic modifications for expressing a normal phenotype in dwarf mutant millets.

Figure I: Different Groups of Millets - *Setaria Viridis* 11970 Mutant 4, *Setaria viridis* 03054 Mutant 6, and *Setaria Viridis* A10.1 Wild Type Pre-Gibberellic Acid Application



III- Materials and Methods

- Seeds encompassing mutant and normal millets, including *Setaria Viridis* 11970 Mutant 4, *Setaria viridis* 03054 Mutant 6, and *Setaria Viridis* A10.1 wild type, were provided for the research.
- Soil composition for pots was meticulously determined, using a combination of organic potting soil and perlite.
- Twelve pots were utilized, allocating four for each millet type, with six seeds strategically planted in each pot.
- Gibberellic acid was applied to six pots (two per millet group) at a concentration of 0.5g/L, with 1000µl droplets near roots and leaves, thrice weekly.
- Growth conditions were carefully controlled in a greenhouse at 25±5° C, with 12-hour sunlight exposure, and weekly plant height measurements were taken from hypocotyl to epicotyl using a ruler for subsequent analysis.

Figure II: Different Groups of Millets - *Setaria Viridis* 11970 Mutant 4, *Setaria viridis* 03054 Mutant 6, and *Setaria Viridis* A10.1 Wild Type Post-Gibberellic Acid Application

IV- Results

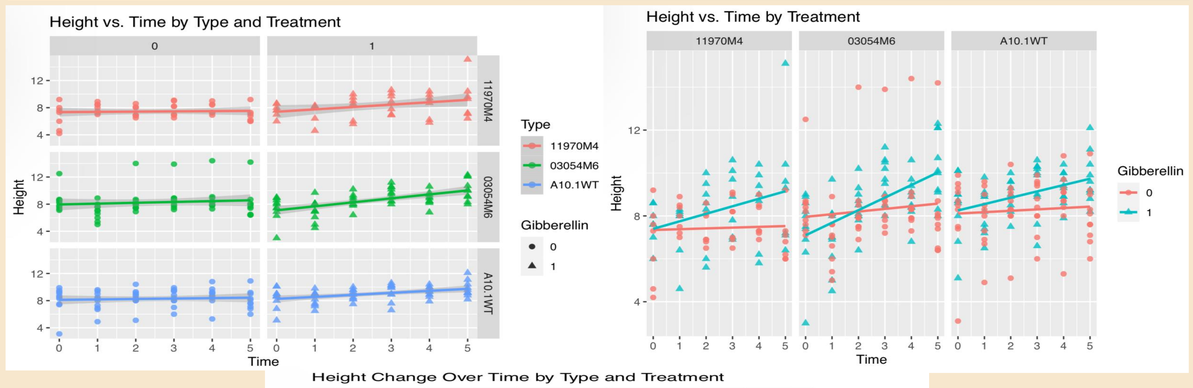


Figure III: Height Variation in Treated and Non-treated Millet Groups over time

V- Discussion

- Significant growth was seen in *Setaria Viridis* mutants and wild type treated with 0.5g/L gibberellic acid three times a week: Mutant 4 increased from 7.8 cm to 9.2 cm, Mutant 6 from 7.6 cm to 10.1 cm, and Wild Type from 8.1 cm to 9.9 cm.
- Our results indicate that Gibberellic acid does have a discernible impact on the growth of mutant millets, particularly in stem elongation. This finding aligns with our hypothesis, which posited a significant height increase in millets exposed to the growth hormone.
- While there were slight variations in sizes among untreated millet groups, it's worth noting that genetically dwarf plants exhibited a normal phenotype following treatment with gibberellic acid.
- Our results also suggest the presence of a mutation in Dwarf millets plants resulting in a lack of natural production of gibberellic acid.
- They also suggest the presence of receptors favorable to this growth hormone, although further research is warranted to confirm this hypothesis.
- Investigating the influence of gibberellic acid on mutant millet growth holds significance not only for advancing scientific understanding of plant development but also for its potential applications in agriculture. Millets, as essential cereal crops, stand to benefit from enhanced growth, leading to improved crop yield and quality.
- A deeper comprehension of growth mechanisms in these plants offers the prospect of cultivating more resilient and diverse millets, thereby fostering sustainable agricultural practices in environmentally friendly conditions.

VI- References

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