

# The Application of Gibberellin on Dwarf Mutant Millet Plant (*Setaria viridis*)

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## Introduction

Gibberellin is a hormone in plants<sup>3</sup> that acts to increase growth of the leaves<sup>3</sup>, and stems<sup>2</sup>. Whether a dwarf plant's growth is increased by gibberellin application depends on the dwarf mutant's sensitivity to gibberellin<sup>1</sup>. Sensitive dwarf mutants do not produce gibberellin but have receptors to create a response if gibberellin is applied<sup>1</sup>. Insensitive dwarf mutants produce gibberellin but do not have receptors to cause a response to it<sup>1</sup>. If there is no response to gibberellin, there is no increased growth.

## Materials and Methods

- 5 types of millet plants were used: 1 wild type and 4 different mutant millet plants. Each type of plant was treated in separate planting pots with differing concentrations of gibberellic acid.
- Gibberellin solutions: high (0.15 grams/liter of water), medium (0.05 grams/liter), and low (0.02 grams/liter) concentration solutions were applied to wild type and mutants 1, 2, 3, and 4.
- One pot for each millet type was a control group and was not treated with gibberellin. Each millet type had 2 pots for each of the concentrations of gibberellin treatment.
- Gibberellin solutions were applied to the leaves and stems once a week using a paintbrush.
- The water level was kept constant for each plant. Each plant was watered 3 times a week.
- Data collected for each plant height was recorded twice a week.

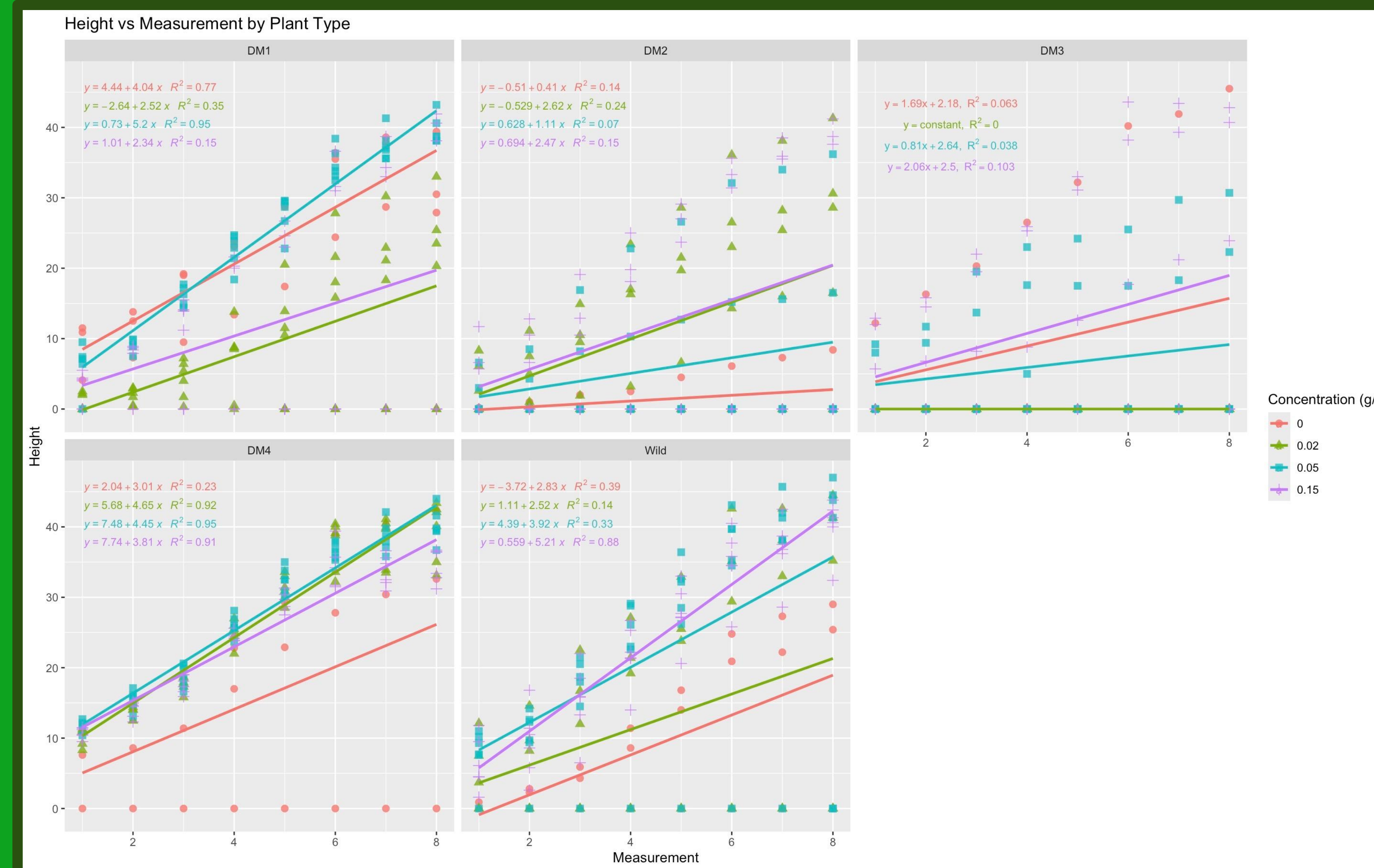
## Experimental Design

Purpose: Observe the response of gibberellic acid to mutant millet plants.

Research question: How will dwarf mutant millet plants respond to the application of differing gibberellin concentrations?

H<sub>0</sub>: The mutant millet dwarf plants will show no significant difference in growth with increasing concentrations of gibberellin.

H<sub>1</sub>: The mutant millet dwarf plants will show a significant difference in growth with increasing concentrations of gibberellin.



## Notes on Data

- Heights were measured in centimeters.
- Eight height measurements were taken, which is reflected on the x-axis.
- R<sup>2</sup> refers to how well a line of best fit matches the data points. A value close to 1 is ideal.
- Some seeds never sprouted, which is likely the cause of many of the lines that have a low R<sup>2</sup> value. If seeds did not sprout, gibberellin could not be applied because the method of application was on the leaves and stems.



## Results

DM1: The no gibberellin and medium concentration lines of fit had R<sup>2</sup> values closer to 1 than the high and low concentrations. The medium concentration had an R<sup>2</sup> value of 0.95, and the slope was the steepest, so the medium concentration of gibberellin produced the tallest DM1 plants.

DM2 and DM3: All R<sup>2</sup> values are close to 0. Lines of fit for these plants do not indicate the tallest growth. No relationship between gibberellin concentration and growth can be seen.

DM4: All three concentrations of gibberellin have an R<sup>2</sup> value close to 1. Both the lowest and medium concentrations produced the tallest of the DM4 plants.

Wild: The R<sup>2</sup> value for the highest concentration was the closest to 1. The highest concentration had the steepest slope and therefore the tallest plants at the end of the experiment.

## Conclusion

Depending on the type of millet plant, response to gibberellin varied. DM2 and DM3 did not show a significant increase in growth based on gibberellin application. These two dwarf mutant types can be considered insensitive. DM1, DM4, and the wild-type millet plants did show significant increases in growth with the application of gibberellin. For the DM1 plants, the medium concentration caused the greatest growth response. For DM4, all three concentrations of gibberellin showed about equal increases in growth response. The largest increase in growth for the wild-type millet was caused by the strongest concentration of gibberellin. It appears that DM1 and DM4 are gibberellin sensitive. We reject our hypothesis for all dwarf mutant plants and accept our hypothesis for the wild-type millet.

## References

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