Fertilizer Application and Water Amount in Red Winter Wheat

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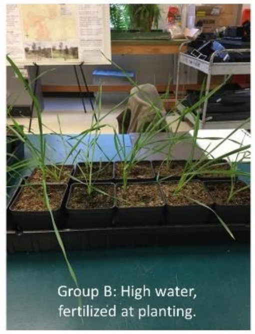
Introduction

- It is necessary to improve wheat production in Oklahoma and to determine the greatest methods possible to do so. Previous research has shown that "application of nitrogen (N) fertilizer is one of the most important measures that increase grain yield and improve grain quality of winter wheat" (Zhao, J.Y., Yu, Z. W., 2006).
- This research can be helpful in a state such as Oklahoma, where agriculture represents a significant portion of the local economy.
- We hypothesized that fertilizer and amount of available water play a role in the fast-growing plant Red Winter Wheat during a 5 week process.
- Wheat farmers commonly apply fertilizer at planting and again in the spring (about 6 months after planting). We set out to determine if we could see results in a shorter time frame, applying fertilizer 3 weeks after planting and conducting this experiment with well-water and under-watered groups.

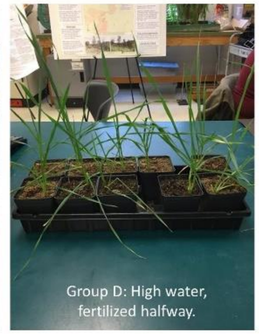
Materials and Methods

- Each treatment represented a unique combination of fertilizer timing and water amount: Fertilizer at planting + high water, at planting + low water, three weeks after planting+ high water, three weeks after planting +low water.
- High water treatments received 100mL, while low-water groups received 15-50mL at watering.
- 10 ml of nitrogen deficient added to each pot.
- All non-nitrogen required macro and micronutrients were supplied weekly, leaving only the nitrogen received through experiment which was applied before, or after germination depending on treatment.
- Physical traits analyzed each week-plant height, number of leaves, top joint measurement; root biomass and stem biomass were measured at the end of the experiment.


Group A: Low water, fertilized at planting.


Group B: High water, fertilized at planting.


Group C: Low water, fertilized halfway .


Group D: High water, fertilized halfway.

Results

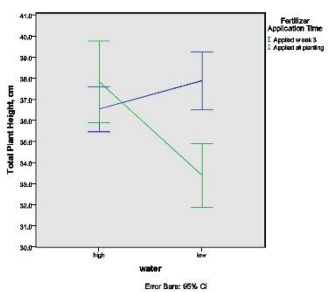


Figure 1: Plants that received fertilizer at planting had a higher average of plant height when water amount was higher. Plants that received fertilizer Three weeks in had an opposite effect: higher mean correlated with low water.

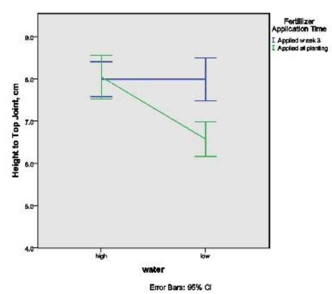


Figure 2: Mean of plants with fertilizer at planting directly correlated to high level of water. Three weeks showed almost no correlation with water.

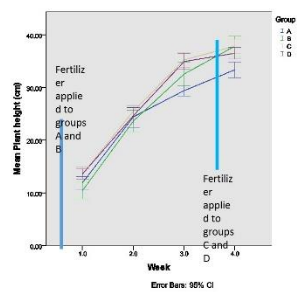


Figure 3: Mean plant height for all four treatments through time.

Plant Height	Mean Square	P(same)
Water:	24.025	0.02585
Fertilizer:	25.6	0.02171
Interaction:	84.1	0.0001075

Table 1: Results of Two-way ANOVA for Plant Height Measurement

Top Joint	Mean Square	P(same)
Water:	.40225	0.001015
Fertilizer:	4.69225	0.001995
Interaction:	5.40225	.001015

Table 2: Results of Two-way ANOVA for Top Joint Measurement

Discussion

Along the duration of our research, we stumbled across a few circumstances which could have made a significant difference within our research design. We found that, because of the close proximity of our plants with another group's, the water runoff from their project came over into our plants, oversaturating them. This depleted the accuracy of our water levels because they were not consistent. We determined that if this experiment was done again, the plants would have to be elevated, out of reach of runoff.

Another flaw in our experimental design was we did not have the time or resources to dry out the roots and weigh them dry. This could decrease the significance of the data that we found because the water likely added a lot of weight to the data.

Time also flawed the experimental design. Because wheat farmers separate fertilizing on about a 6-month scale, separating the fertilizers by 3 weeks is significantly different from a real life model. It was shown in previous research that "delayed fertilizer N application generally increased grain protein" (Zebarth, B.J., Botha, E. J., Rees. H., 2007)If this experiment was to be done again, it would be done along a larger time frame that could be calculated to contribute to real world planting .

These findings contribute to the raising of wheat crops in Oklahoma because by applying fertilizer at planting and increasing the amount of water given to the plant, plant height and top joint were shown to increase. Root biomass did not show a significant change that can be applied to planting.

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Acknowledgments

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