

Determining Nitrogen Fertilizer Timing Effect on Protein and Grain Yield of Two Spring Wheat Varieties

Tyler Searle
Chris Humphreys
Jared Williams
Dept. of Applied Plant Science
Brigham Young University-Idaho

Introduction

Southeast Idaho is a diverse and economically important location for wheat production. The geographic make-up, climatic conditions, and access to water make it one of the few locations where multiple classes of wheat can thrive. The Dayn variety being tested in this study has historically been the highest yielding variety of spring wheat in South Eastern Idaho from 2012 to the present. However, Dayn wheat has lower than average protein averages. Klasic Spring wheat has been a variety established in the area and under proper management yields very well. The purpose of this study is to see how the timing of Nitrogen (N) application on these two well yielding varieties differs. It will be important to see if the timing of N applied to each variety cause a difference in N in the flag leaf, in the protein levels and effect yield.

Objectives

Determining the effect of N fertilizer timing on percent flag leaf N, protein grain, and grain yield of two spring wheat varieties (Dayn and Klasic).

Materials and Methods

- Statistical design was a RCBD including six replications with 6 fertilizer timing treatments (Table 1) and two spring wheat varieties, Klasic and Dayn.
- Spring wheat was planted on April 12, 2017, and plot size was 3 x 6 m.
- The N fertilizer rate was 180 kg ha⁻¹ based on pre-plant soil test. Urea was applied based on treatment protocol on May 4 for pre-plants, May 19 for tillering, and June 12 for heading.
- Flag leaf samples were taken as a treatment composite on July 20 for determining percent N.
- Grain yield was determined using a mechanical plot harvester and cutting 1.5 x 6 m samples from each plot.
- Percent grain protein was determined using a NIR spectrophotometer.
- Statistical analysis for determining Differences among treatments was performed using ANOVA in SPSS statistical software (version 24).

Acknowledgments:

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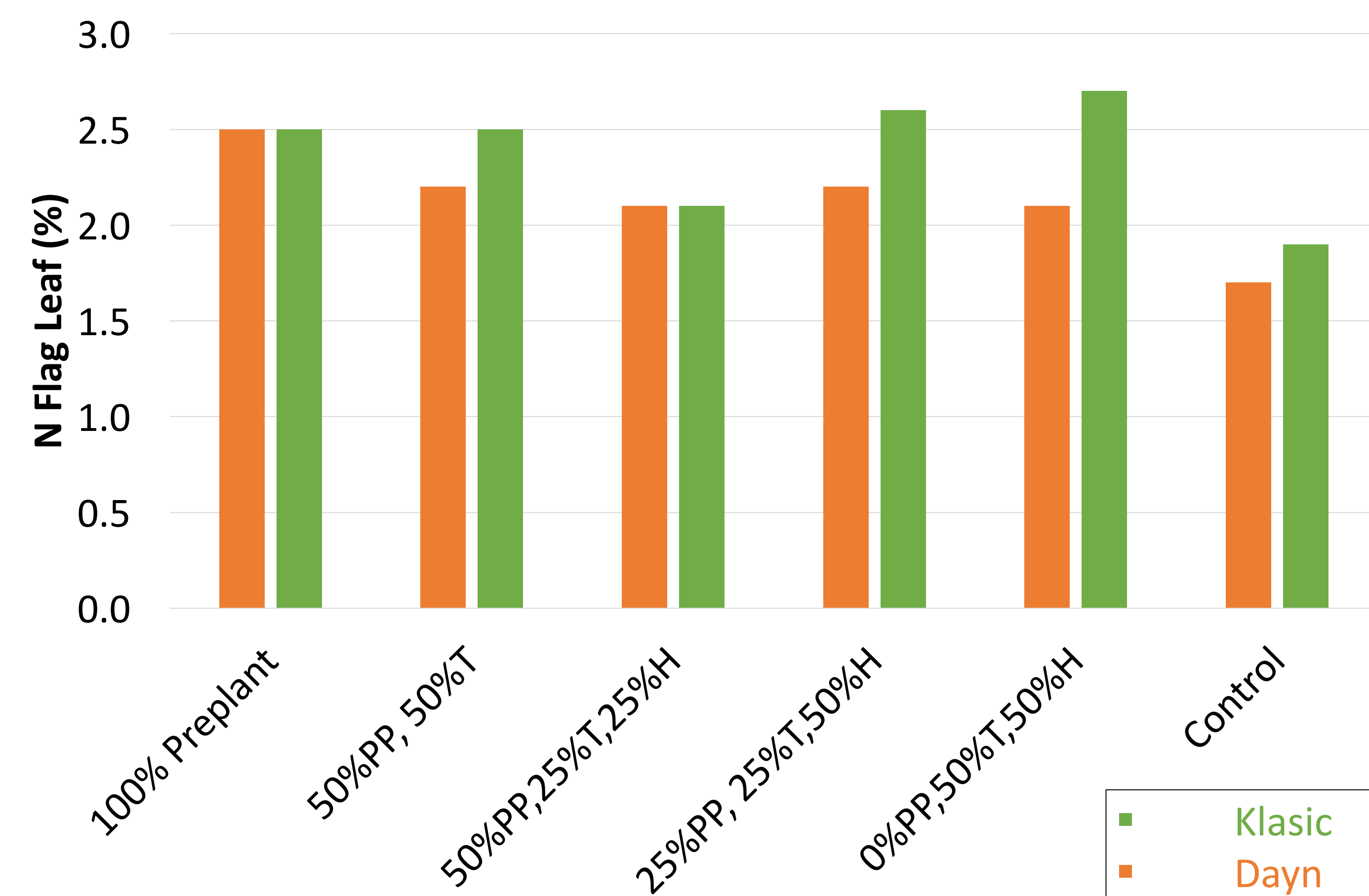


Figure 2. Treatment composite percent flag leaf N for Klasic and Dayn varieties.

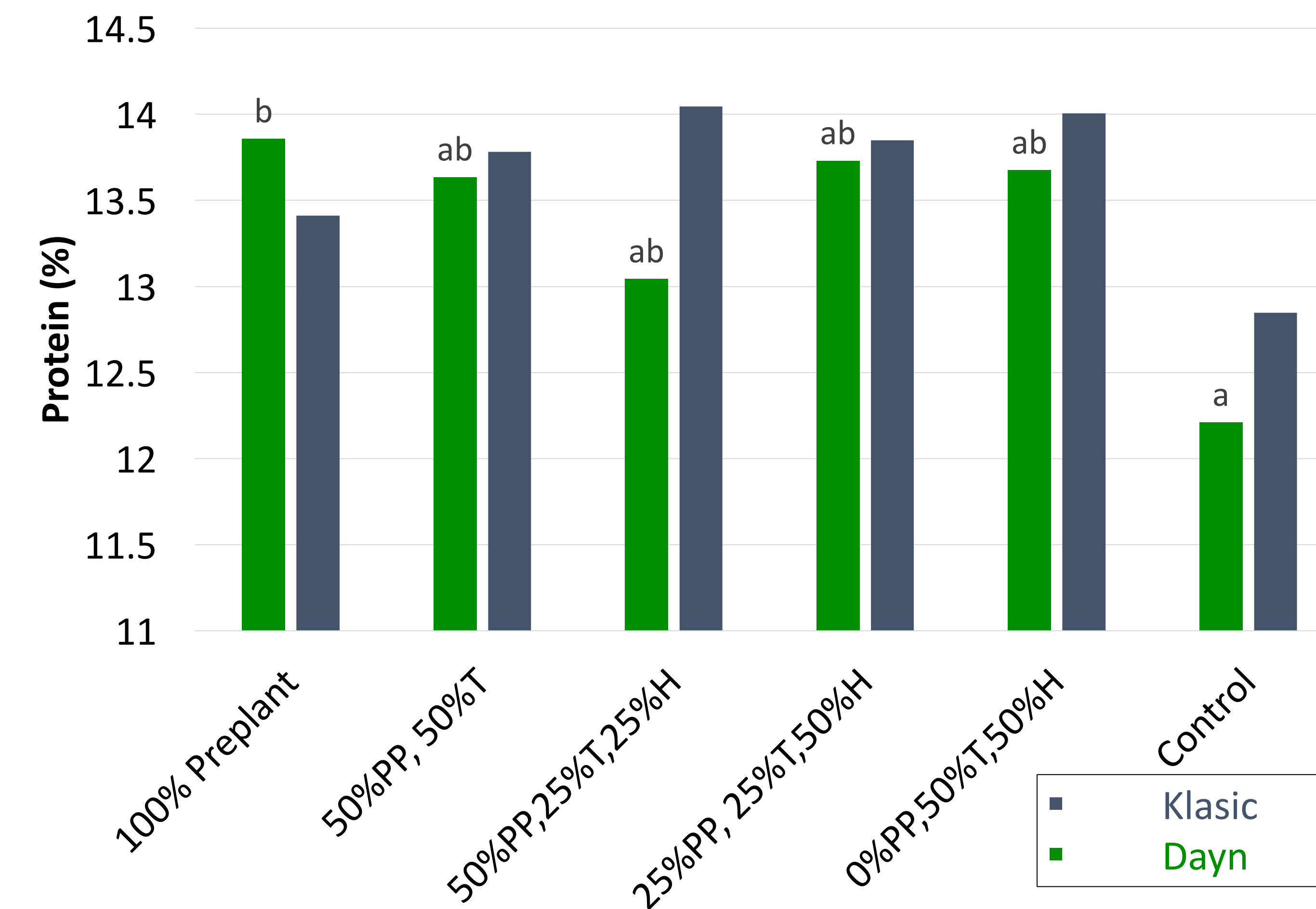


Figure 3. Protein % between fertilizer N timing for Klasic and Dayn wheat varieties.

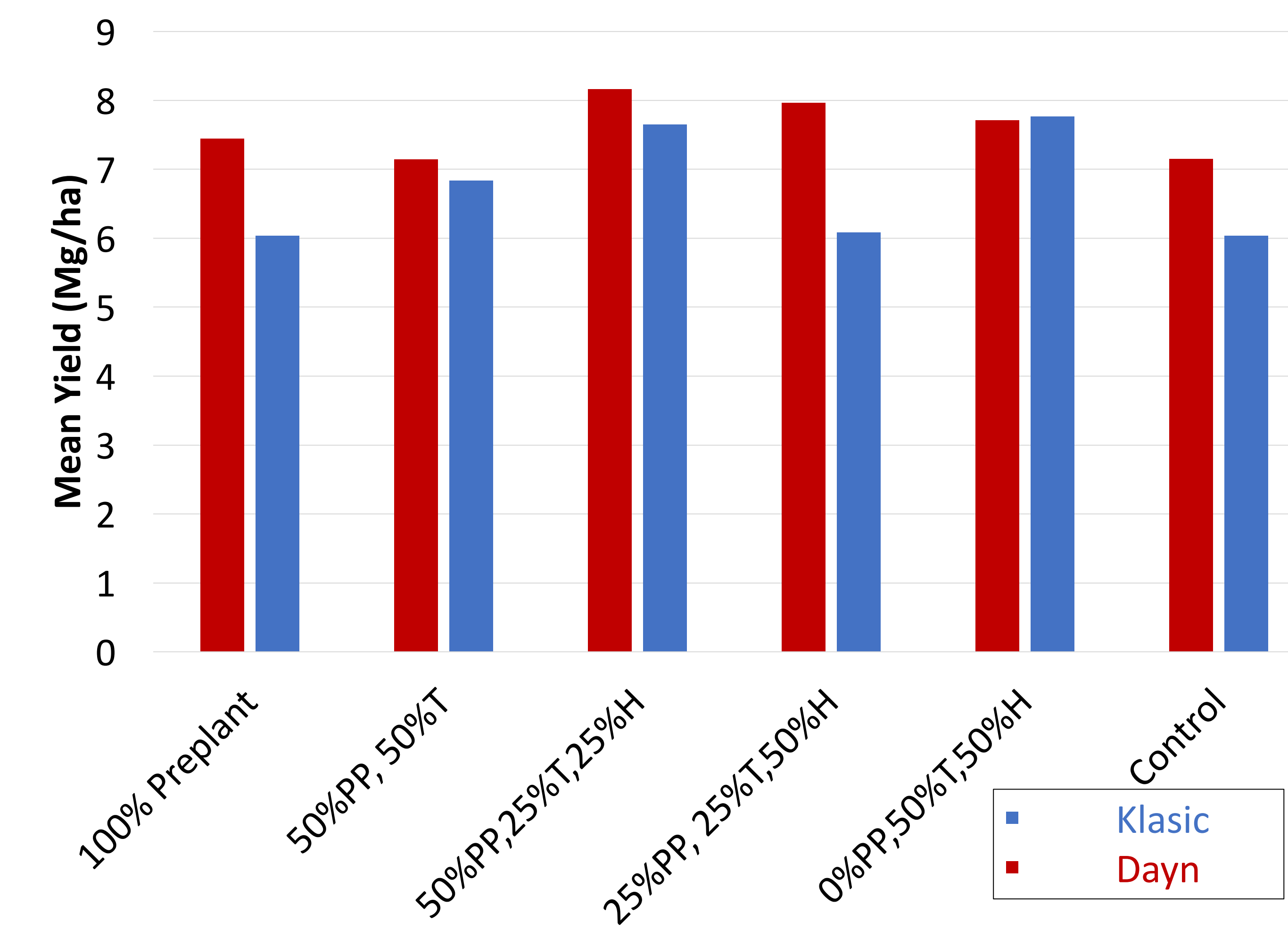


Figure 4. Mean yield data in Mg/ha shown for Klasic and Dayn wheat varieties.

Treatment	Fertilizer	Treatment Timing
1	Urea	100% Pre-plant
2	Urea	50% Pre-plant, 50% tillering
3	Urea	50% Pre-plant, 25% tillering, 25% heading
4	Urea	25% Pre-plant, 25% tillering, 50% heading
5	Urea	0% Pre-plant, 50% tillering, 50% heading
6	Urea	Control

Table 1. Treatments with treatment timings organized

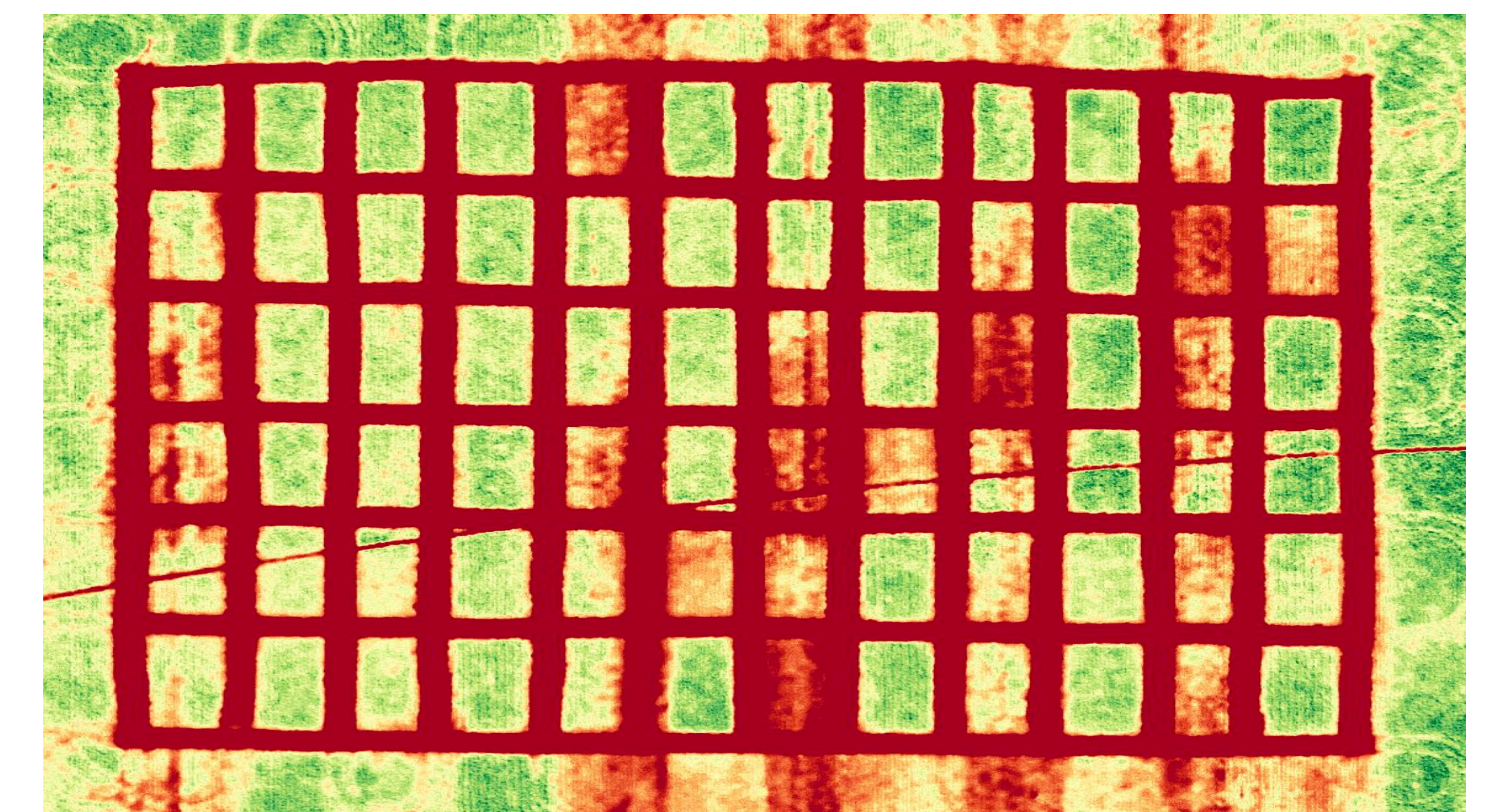


Figure 1a-b. Photos of plant health analysis on wheat. Pictures were taken throughout season with a drone. Top: A raw Image of the wheat before health analysis was ran. Bottom: Green coloring displays the health of the plant.

Results and Discussion

- Visual assessment at Feekes 10.5 on June 28, 2017 of color and false color infrared image showed response to N Fertilizer (Fig. 1a-b).
- Percent Flag leaf N for Klasic variety N treatment ranged between 2.7% for the 0%PP-50%T-50%H treatment to 2.1% for the 50%PP-25%T-25%H treatment and for the control was 1.9% (Fig.2).
- Percent Flag leaf N for Dayn variety N treatment ranged between 2.5% for the 100% pre-plant treatment to 2.1% for the 50%PP-25%T-25%H and 0%PP,50%T,50%H treatment and for the control was 1.7% (Fig.2).
- Percent Protein for 100% pre-plant treatment (13.86%) for the Dayn variety was greater than the control (12.21%). No other differences were observed in protein content among the other treatments (Fig. 3).
- In order for wheat to have better protein, it is required that water stress is put on the plant. In this research, this practice was not performed due to not having the correct watering system to stress the wheat and may be the reason a difference in protein was not seen.
- Fertilizer application or the timing of the application effected grain yields (Fig.4).
- Though soil samples were tested there may have been residual nutrients in the soil that would have caused no difference in wheat yields.

Conclusions

- For this study, Flag Leaf N% in imagery showed visual differences in N timing. However, grain protein and yield were not influenced by N timing.