# Effects of Delayed N Application in Sorghum

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## Introduction:

The majority of grain sorghum production occurs in the central to north west portions of Oklahoma. Generally Oklahoma producers apply their seasonal nitrogen (N) as a pre-plant application that could be subject to loss due to environmental conditions. In these areas of production annual rainfall is at or below 900 mm, precipitation events are less frequent, and temperatures fluctuate throughout the growing season. Areas of low rainfall, and fluctuating temperatures also increase the variability of final grain yield and total nitrogen fertilizer demand

## Objectives:

This study aims to observe the impact of delaying N application after the onset of N deficiencies and the crops ability to recover.

## Materials and Methods:

- This study was conducted over 2019-2020 growing season in dryland conditions. In 2019 two trials were located at the Lake Carl Blackwell research farm near Perry, Ok, and the Cimarron Valley Research Station near Perkins, Ok. In 2020 trials were initiated at at LCB and Perkins and a location was added at the Raymond Sidwell North Central Research Station near Lahoma, Ok.
- Trial consisted of 12 treatments arranged in an RCBD with four replications. All treatments, except 0 N check recieved 100 kg N $ha^{-1}$.
- Treatments were applied 0, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84 days after planting (DAP)
- Visual symptom difference (VSD) between pre-plant treatment and the check (no N application)was confirmed with GreenSeeker™ NDVI sensor readings.
- Weather data collected using Mesonet's past Daily Data Retrieval from stations within 0.5 kilometers from trail locations.

## Discussion:

- The 2019 growing season will not be discussed in this report due to grain storage issues.
- During the 2019 and 2020 growing seasons there was notable differences in maturity date across treatments. Heading date was delayed by two weeks in later applications of N.
- While not statistically different at in-season nitrogen application at Lahoma and Perkins should a trend for increased grain yield. 21 DAP application yielded 0.7 Mg $ha^{-1}$ greater than the pre-plant application at Lahoma and the 42 and 49 DAP applications yielded 0.8 Mg $ha^{-1}$ greater than the pre-plant application at Perkins.
- While only the 84 DAP application was significantly less than the pre-plant due to the high variability across treatments. The data suggests at Lahoma and LCB that applications made after 49 DAP resulted in grain yields below the pre-plant, at Perkins the N was could be delayed to 63 DAP without loss of yield.
- While more work is needed, this study is a proof of concept that N applications can be delayed well into the cropping season with minimum or no negative impacts on yield.

## Results:

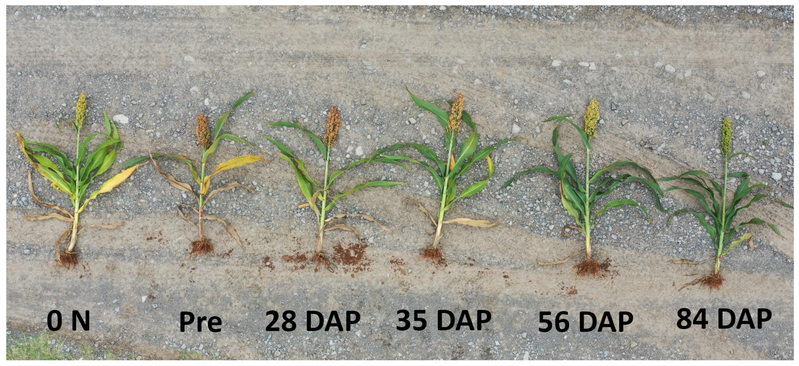



*Figure 1. Aerial image of plants from the Delayed N study at Perkins 2020 . Days after planting (DAP) of treatments labeled*

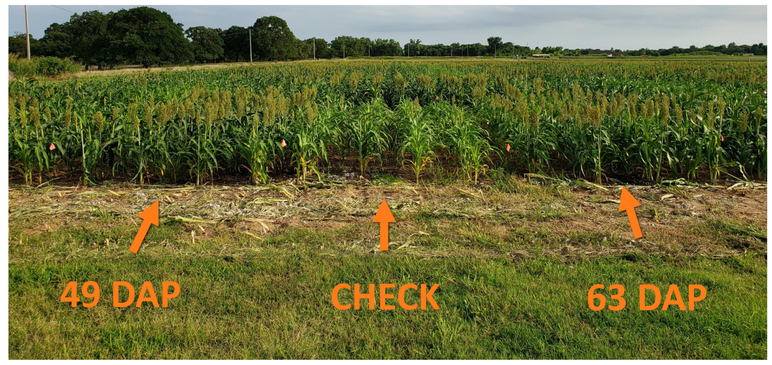



*Figure 2. Delayed N study at Perkins 2020 . Illustrating heading differences among treatments. Days after planting (DAP) of treatments labeled*

| TRT | Date | Heading date | | |
|---|---|---|---|---|
| | | 7/3/2020 | 7/9/2020 | 7/17/2020 |
| 0 N check | | | S | F |
| 0 DAP | 4/17/2020 | S | F | |
| 21 DAP | 5/8/2020 | SF | | |
| 28 DAP | 5/14/2020 | S | F | |
| 35 DAP | 5/21/2020 | | SF | |
| 42 DAP | 5/29/2020 | | SF | |
| 49 DAP | 6/4/2020 | | SF | |
| 56 DAP | 6/12/2020 | | SF | |
| 63 DAP | 6/18/2020 | | SF | |
| 70 DAP | 6/27/2020 | | S | F |
| 77 DAP | 7/3/2020 | | | SF |
| 84 DAP | 7/9/2020 | | | SF |

*Table 1. Perkins heading dates by treatment. S represents the start of heading, and F represents that the treatment finished heading,. The SF combination indicates that a treatment started heading and finished within the same week.*

| TRT | Date | Heading Date | | |
|---|---|---|---|---|
| | | 7/3/2020 | 7/9/2020 | 7/17/2020 |
| 0 N check | | | SF | |
| 0 DAP | 4/17/2020 | SF | | |
| 21 DAP | 5/8/2020 | SF | | |
| 28 DAP | 5/14/2020 | SF | | |
| 35 DAP | 5/21/2020 | S | | F |
| 42 DAP | 5/29/2020 | | SF | |
| 49 DAP | 6/4/2020 | | SF | |
| 56 DAP | 6/12/2020 | | SF | |
| 63 DAP | 6/18/2020 | | SF | |
| 70 DAP | 6/27/2020 | S | | F |
| 77 DAP | 7/3/2020 | | SF | |
| 84 DAP | 7/9/2020 | | SF | |

*Table 2. Lahoma heading dates by treatment. S represents the start of heading, and F represents that the treatment finished heading,. The SF combination indicates that a treatment started heading and finished within the same week*

Figure 3.

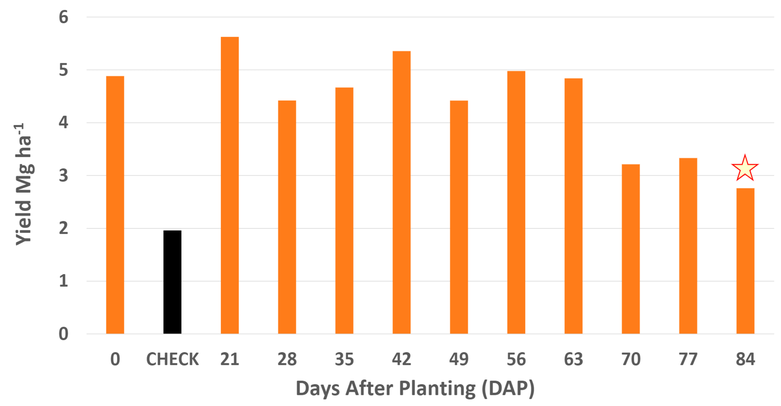



Figure 4

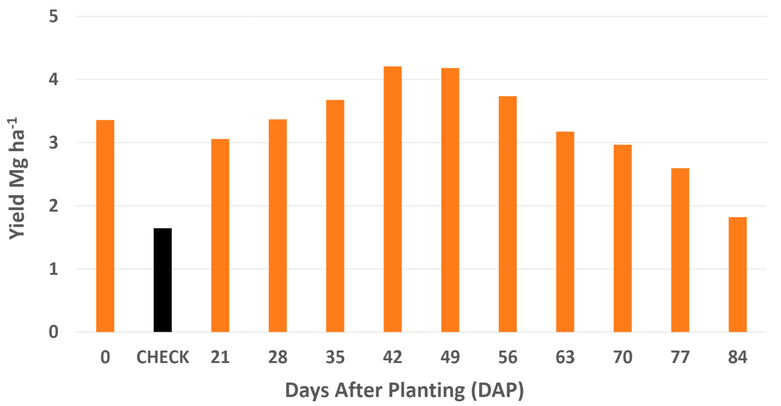
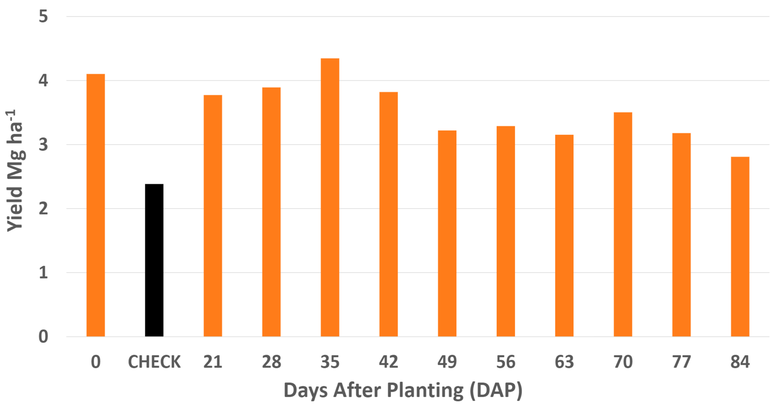



Figure 5




*Figures 3,4,5. Sorghum grain yield response to the application of 100 kg N $ha^{-1}$ as affected by the delayed application at Lahoma, Perkins and LCB respectively. The yield with ☆ indicates treatmetns with grain yields significatnly less than the pre-plant application, at an alpha of 0.05.*