Grain Sorghum Ratoon Cropping System for SEMO

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Project Summary Statements:

- Starter fertilizer did decrease the number of days to 50% bloom in the early season ratoon variety.

- Starter fertilizer did not effect days to 50% bloom in the full season variety or increase grain yield.

- Total grain yield was greater in the grain sorghum ratoon cropping system than in the conventional grain sorghum system.

- Preliminary data suggests that ratoon cropping may prove to be a successful alternative to traditional grain sorghum production systems in SEMO.

Objectives and Goals:

The objectives of this research are:

1) To quantify the affect of starter fertilizer on grain sorghum, growth, development, yield, and quality.
2) To quantify the optimal fertility requirements for a ratoon cropping system.
3) To determine the feasibility of introducing a grain sorghum ratoon cropping system into SE Missouri.

The overall goal of this research is:

1) To develop a best crop management program for grain sorghum production in SE Missouri.

Procedures:

- The experiment was located at two locations in SE Missouri
    - Pemiscot: The University of Missouri Lee Farm at Portageville
    - Dunklin: The University of Missouri Rhodes Farm at Clarkton

- Experimental Design: Randomized complete block design
    - Seeding rate: 110,000 plants per acre
    - Two cultivars:
        - Early season ratoon: KS-310 (55 to 59 days to 50% bloom)
        - Late season check: KS-955 (74 to 78 days to 50% bloom)

- Starter treatment:
  - 45# N and 30# P_2O_5 applied at planting (dribble placement)
- First planting Nitrogen rate (pounds per acre):
  - 120 pounds total
- Ratoon Nitrogen rate (pounds per acre, side-dressed):
  - 0, 30, 60, 90, 120
- Ratoon Phosphorus rate (pounds per acre, side-dressed):
  - 0 or 30
- Four replications:
- Data collected:
  - Days to 50% bloom
  - Maturity and harvest date
  - Grain yield

Results 2003:

The experimental locations were selected based on soil type and yield potential. The soil type at Lee Farm was a Tiptonville silt loam, whereas the soil type at Clarkton was a Malden fine sand. At each location the field experiment was planted on April 14th, 2003. The early season ratoon variety (KS 310) was first harvested on July 28th. The ratoon (second cutting) grain sorghum crop was harvested on November 21st. The full-season single crop variety (KS 955) was harvested on August 14th. Based on environmental conditions in 2003 we estimate that we lost two full weeks of growing conditions for the ratoon grain sorghum crop. However as the results indicate below, ratoon cropping systems may be a viable option for Missouri grain sorghum growers in SEMO.

Lee Farm Results:

Based on first cutting data a variety by starter interaction existed for the 50% bloom date; therefore data was analyzed separately. The average date of 50% bloom did differ in the early season ratoon grain sorghum variety (KS 310). The average 50% bloom date with starter was June 21st; whereas the average date without starter was June 24th. The application of starter fertilizer did not effect the 50% bloom date in the full season grain sorghum variety (KS 955). The average date of 50% bloom was July 5th. Starter did not affect grain yield in 2003, however yield did differ between varieties. The mean yield for KS 310 and KS 955 were 89.8 and 72.9 bu a^{-1}, respectively. The decreased yield of KS 955 may have been due to a later 50% bloom date. The mean air temperature two days prior to 50% bloom for KS 310 was 82° F, whereas the mean air temperature was 92° F for KS 955. Decreased yield may also have been partly caused by increased bird pressure. However, air cannons were used and plots were evaluated at harvest to determine visual bird damage. The results appeared negligible.

The 50% bloom date in the ratoon (second) cutting was not quantified due to extreme variability in bloom date across each plot. Bloom dates began in mid-September and ran through mid-October. Crop yield did not differ between the starter and no starter treatments in the ratoon cutting, therefore crop yield was pooled. In 2003, crop yield increased linearly as nitrogen rate increased (Figure 1). At the high nitrogen rate grain sorghum yield was 66% of

the early season yield. In total, the ratoon cropping system grain yield was 149.4 bu a^{-1} compared to 72.9 9 bu a^{-1} with the full season variety.

Clarkton Results:

Based on first cutting data a variety by starter interaction existed for the 50% bloom date; therefore data was analyzed separately. The average date of 50% bloom did differ in the early season ratoon grain sorghum variety (KS 310). The average 50% bloom date with starter was June 25th; whereas the average date without starter was June 28th. The application of starter fertilizer did not effect the 50% bloom date in the full season grain sorghum variety (KS 955). The average date of 50% bloom was July 3rd. Starter did not affect grain yield in 2003, however yield did differ between varieties. The mean yield for KS 310 and KS 955 were 16.1 and 23.6 bu a^{-1}, respectively. The decreased yield of KS 310 may have been due to water limitations during grain fill. Though Clarkton was an irrigated location, water was a yield limiting factor all season.

The mean 50% bloom date in the ratoon (second) cutting was not quantified due to extreme variability in bloom date across each plot. Bloom dates began in mid-September and ran through mid-October. Crop yield did not differ between the starter and no starter treatments in the ratoon cutting therefore crop yield was pooled. In 2003, crop yield increased non-linearly as nitrogen rate increased (Figure 2). At the high nitrogen rate grain sorghum yield was 124% of the early season yield. In total the ratoon cropping system yielded 40.2 bu a^{-1} compared to 23.6 bu a^{-1} with the full season variety.

2003 Summary and Conclusions

The application of starter fertilizer did decrease the number of days to 50% bloom in the early season variety (KS 310). This may decrease the number of days until harvest and allow growers to capture more growing degree units for the ratoon crop. Starter fertilizer did not affect the 50% bloom date in the full season variety. Starter fertilizer also did not affect crop yield. Crop yield was variable among locations; however at each location the total crop yield of the ratoon system out performed the full season check variety. Preliminary results from 2003 indicate that the application of starter fertilizer may prove beneficial in a ratoon cropping system and that ratoon cropping may prove to be a successful alternative to traditional grain sorghum production systems in SEMO.

Figure 1. Effect of Ratoon Nitrogen Rate on Crop Yield at the University of Missouri Lee Farm in 2003.

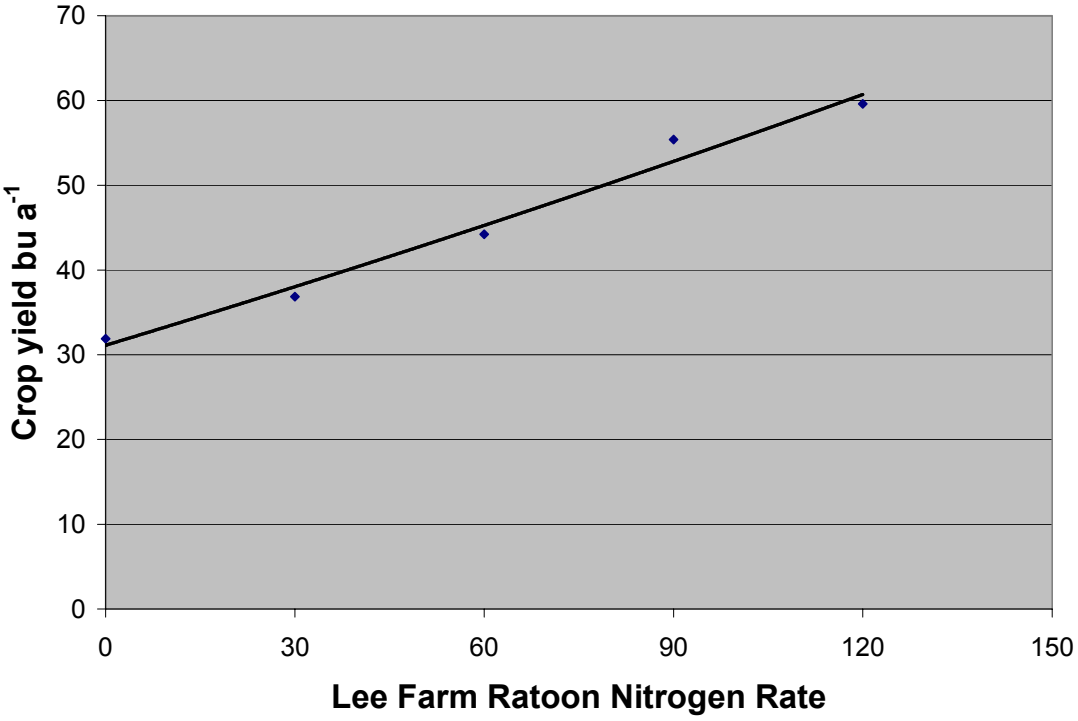

Figure 2. Effect of Ratoon Nitrogen Rate on Crop Yield at the University of Missouri Rhodes Farm in 2003.