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# Impact of Fertility and Mowing on Crabgrass Quantity and Quality for Hay Production in Southeast Kansas


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Farmers Co-op of Columbus and Baxter Springs, KS, provided the fertilizer for the field trial.



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# Impact of Fertility and Mowing on Crabgrass Quantity and Quality for Hay Production in Southeast Kansas

*B. Pedreira, D. Helwig, M. Haywood, J.K. Farney, and G.F. Sassenrath*

## Summary

A crabgrass variety trial comparing Quick-N-Big and Mojo crabgrasses was conducted in 2021 at the K-State Experiment Station outside of Columbus, KS. The trial evaluated forage quantity and quality under different fertilization and harvest management practices.

## Introduction

Forage is a major component of the livestock production system in southeast Kansas. Forage can be grazed, or harvested as hay to supplement cattle feeding during the winter. Crabgrass is a high-yielding summer annual that complements cool-season forages or can be used as a cover crop for summer forage. Mojo crabgrass is a blended seed variety with a large portion of the blend derived from Impact Crabgrass from the Noble Research Institute. Quick-N-Big is a commonly planted variety that has been shown to grow successfully in southeast Kansas and was chosen as a comparison.

In addition to new varieties, fertility management practices can be an alternative to increase forage production and quality. Producers have many different management approaches to forage production. Management choices range from no fertilization to different amounts and frequency of fertilization. However, there is a need to understand the impact of fertilization associated with harvest management. The main difference in production and quality has been reported when producers harvest the forage during the summer, putting the forage back in a vegetative stage. Our objective was to determine how fertilization and harvest management can be used as a tool to improve the production and quality of crabgrass hay. The treatments in the research trial varied fertilizer rates, timing, and harvesting scenarios corresponding with common production choices.

## Experimental Procedures

In 2020, plots were established in a field at the Southeast Research and Extension Center near Columbus, KS. Plots were 60 × 10 ft and replicated 3 times in a Parsons silt loam soil. Before planting, the field was disked and field cultivated. A cultipacker was used to provide a firm seedbed. The seed was planted using a Brillion seeder that dropped the seed in front of packing wheels to a scant ¼ inch depth at a rate of 6 lb/a.

In 2021, plots were fertilized on May 24, sampled on July 7, and additional N was added to treatment 5 on July 9. Nitrogen was broadcast by hand as urea at the rate of 100 lb N/a as defined by the treatment. Treatments are summarized in Table 1.

Plots were sampled for forage production and quality on July 7 and August 12 using a 3-ft Carder Forage Harvester and sampled in a 15-ft length. The entire sample was weighed and a sub-sample was taken to determine moisture, dry weight, and quality. Measurements were converted to an area basis based on total harvested weight. Forage production was determined after drying samples at 120°F for 3 days. Samples were sent to a commercial laboratory for quality analysis of crude protein (CP) and total digestible nutrients (TDN) contents. Crude protein production was calculated by multiplying the forage mass by the CP content. Nutritive value data presented in this report are from August 12.

Treatments 2, 4, and 5 were completely mowed on July 7 after forage sampling. This simulated harvesting of the forage for hay and stimulated regrowth. The remaining treatments were allowed to grow without mowing until the final harvest on August 12.

The weather during the growing season was recorded at the Mesonet station in Columbus, located 6 miles from the field (https://mesonet.k-state.edu/weather/historical/). Temperatures were cool and extremely wet through April and most of May, which may have slowed the initial growth of the crabgrass (Helwig et al., 2022). Weeds such as foxtail and barnyard grass were prevalent in the plots, largely due to wet and cool conditions late in the spring. No herbicide or weed control was used. Moisture was sporadic the rest of the summer, but overall growing conditions were favorable in the summer of 2021.

## Results and Discussion

The fertilization of crabgrass has a direct effect on total forage accumulation (TFA) and CP levels in the forage (Table 2). However, harvest management of the forage also plays a key role. When 100 pounds of N were added to Mojo and Quick-N-Big after the first sampling, TFA increased by 350 and 675% compared to control, respectively, demonstrating that crabgrass responds well to nitrogen application.

A key component of this trial was to show how management affects the quality of the grasses. Ideally, CP levels in hay should be from 9% (for dry cows) to 12% (for lactating cows). At first cutting, there was not a large difference in CP among treatments, but when considering FA, the application of nitrogen greatly increased the protein availability for the animal. In the Quick-N-Big treatments, the application of N increased CP from 8.5% in the control to between 9.5 and 11% in the other treatments.

Harvest management of the forage played a small role in the TFA. However, harvesting the forage and resetting the plant to a vegetative stage played a large role in the total CP produced throughout the growing season.

Different harvest management practices increased the total pounds of protein produced when similar fertilizer treatments were used. Comparing treatments 1 and 2, where no nitrogen was applied, there was a 75% increase (Mojo) and a 30% increase (Quick-N-

Big) in total protein accumulation by harvesting the plant and returning it to a vegetative stage.

Between treatments 3 and 4, there was an increase of 77% (Mojo) and 17% (Quick-N-Big) in pounds of protein produced by harvesting and returning it to a vegetative phase. Applying additional N after the first harvest even further increased crude protein accumulation. Treatment 5 had an increase of 49% (Mojo) and 97% (Quick-N-Big) in CP production over treatment 4 which only had 100 pounds of nitrogen applied.

If the forage was not harvested during the season, crude protein levels of the plant dropped below 6% regardless of nitrogen application. This level of protein will not support a dry cow's protein requirement and the animals will lose weight and decrease performance.

The TDN values were similar among treatments, especially with Quick-N-Big. However, comparing Mojo treatments 4 and 5, the greatest value was observed in treatment 5, which was fertilized again in July. It highlighted Mojo's potential to maintain high CP and TDN values when a second nitrogen application was performed along with the harvest.

## Recommendations

Crabgrass responds very well to nitrogen. However, management is key to achieving greater performance. The increased CP production correlates to increased animal gains and performance. If crabgrass is used for summer grazing, when it matures it needs to return to a vegetative stage to maintain the forage quality.

Nitrogen application improved TFA but also increased CP production. Combining nitrogen application with timely harvest of the forage will increase the total pounds of crude protein harvested from the field. After crabgrass reaches maturity, it will continue to increase in TFA, but CP values will decrease unless it is harvested and returned to a vegetative stage.

Recommendations are to apply nitrogen early in the growing season to stimulate forage growth. Then an additional nitrogen application and harvest can be conducted to return the grass to a vegetative state to increase TFA and the total amount of CP produced, whether the grass is intended for haying or grazing throughout the growing season.

## Acknowledgments

Farmers Co-op of Columbus and Baxter Springs, KS, provided the fertilizer for the field trial.

## References

Helwig, D., Haywood, H., Farney, J., Sassenrath, G.F., Pedreira, B. 2022. Bermudagrass Under Different Fertility and Harvest Management Practices. *Kansas Agricultural Experiment Station Research Reports*: Vol. 8, Issue 3. https://newprairiepress.org/kaesrr/vol8/iss3/.

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**Table 1. Fertility and mowing treatments for Mojo and Quick-N-Big crabgrass, Columbus, KS**

| Treatment | Mowing | | Fertilizer (May 24) | Fertilizer (July 7) |
|---|---|---|---|---|
| 1 | None | August 12 | None | None |
| 2 | July 7 | August 12 | None | None |
| 3 | None | August 12 | 100 lb N | None |
| 4 | July 7 | August 12 | 100 lb N | None |
| 5 | July 7 | August 12 | 100 lb N | 100 lb N |

**Table 2. Total forage accumulation (FA, lb DM/a) during the growing season, and crude protein (CP, %), total digestible nutrients (TDN, %), and CP production (lb/a) from the August 12 harvest in Mojo and Quick-N-Big crabgrass, Columbus, KS**

| Treatment* | TFA, lb DM/a | CP, % | TDN, % | CP production, lb/a |
|---|---|---|---|---|
| | | Mojo | | |
| 1 | 1797 | 5.05 | 58.01 | 91 |
| 2 | 1746 | 6.74 | 57.64 | 159 |
| 3 | 5086 | 4.98 | 57.74 | 253 |
| 4 | 6092 | 7.28 | 55.62 | 449 |
| 5 | 7037 | 9.37 | 60.84 | 667 |
| | | Quick-N-Big | | |
| 1 | 1746 | 4.75 | 58.72 | 83 |
| 2 | 1406 | 7.24 | 58.90 | 108 |
| 3 | 7539 | 4.70 | 58.04 | 354 |
| 4 | 4662 | 7.91 | 56.87 | 413 |
| 5 | 7634 | 10.41 | 57.56 | 815 |

*See Table 1 for treatment details.