

# **Final Technical Report**

## **FCEB Project #26**

# Florida Cattle Enhancement Board Final Technical Report – August 15, 2024

**Project #:** P0324585

**Title:** Next-Stage Screening of Bahiagrass Breeding Lines to Identify New Varieties for the Florida Cattle Industry

**Investigators:** Lynn Sollenberger, Marcelo Wallau, Kevin Kenworthy, and Esteban Rios

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## Project Overview:

The Florida beef cattle industry relies on bahiagrass as a major source of nutrients for livestock. Bahiagrass is grown on approximately 2.5 million acres in Florida and is valued for tolerance of grazing, low fertility soils, and a wide range of soil drainage characteristics. Ability to thrive with low-input management makes it a perfect fit for the Florida beef cattle industry. The overall goal of our research is to develop, screen, and release new bahiagrass varieties for the Florida cattle industry. We are specifically targeting bahiagrass types that have the desirable characteristics of current variety Argentine (wide leaf blades, persistence under grazing, good nutritive value, and tolerance of low soil fertility), but in addition have greater early- and late-season growth. In a previously funded Florida Cattle Enhancement Board (FCEB) project (2020 and 2021 growing seasons), we screened under grazing nine bahiagrass breeding lines developed by UF-IFAS Agronomy Department forage breeders and compared them with Argentine. Four of the nine lines showed either superior early-season growth, greater total forage production, or better persistence under grazing than Argentine. The specific goal of this proposed project is to continue screening these four promising lines in order to determine the one or two lines that are best suited for release to the Florida cattle industry. Our objectives address several FCA Research Priorities including “New annual and perennial options for North and South Florida” and “Warm-season varieties that thrive under low soil fertility” under the category of “Pasture and Forage Management”, and the FCA Research Priority “Economic efficiency of fertilizer use” under the “Fertilization” category. These priorities are addressed by 1) evaluating new bahiagrasses that have potential to extend the growing season to earlier in spring and later in fall, resulting in a reduction in need for supplements and conserved forage, and 2) screening bahiagrass lines under low soil fertility to ensure adaptation to these conditions.

## Overall Goal and Specific Objectives:

The **overall goal** of our research program is to develop, screen, and release new bahiagrass varieties for the Florida cattle industry.

The **specific objectives** of this project are to:

1. Determine which of the four elite bahiagrass lines produce sufficient seed to support variety release and planting of large acreages in Florida.

2. Compare grazing tolerance, competitiveness with weeds, seasonality of production, and nutritional value of four superior breeding lines with the existing variety Argentine under conditions of minimal or no fertilizer input.
3. Evaluate the tolerance of new bahiagrass entries to metsulfuron herbicide, as a potential tool for weed control in Argentine-type bahiagrasses.

### **Summary of Activities, Important Findings, and Next Steps:**

Funding from the project was used to support three experiments based on Objectives 1-3 above. Two graduate students, Renan Becker and Nicolas Caram, were partially funded by the project to carry out this work.

For the seed production component of the research, we capitalized on existing bahiagrass plots used in a previous FCEB-funded project. Each of five bahiagrass lines (M98Alt, FPN 1901, Hybrid 3, Hybrid 93, and Argentine) included in this study were clipped to two and four inches in May 2022, 2023, and 2024 at the start of the seed production phase. Plots were monitored for seed set and seed was harvested two to three weeks after anthesis (i.e., pollen shedding). All seedheads were dried and threshed and seed yield determined. Germination tests were conducted on filled seed using standard procedures.

To support the grazing portion of the project, bahiagrass plots were planted in the field in July 2023. Four lines identified as superior in a previous FCEB project were planted, and Argentine bahiagrass served as the check treatment. Plots were fertilized and kept weed free and plants grew undisturbed through the remainder of the 2023 growing season. The fertilizer treatments were imposed in April of 2024 and grazing treatments were imposed in May 2024. We will continue grazing evaluation of these plots through the remainder of the 2024 grazing season.

A metsulfuron herbicide tolerance study was conducted in the greenhouse during spring and summer of 2024. This work has been completed, with damage assessments made. Data analysis is underway.

*The main findings of our study are:*

1. Two of the four elite breeding lines (Hybrids 3 and 93) continue to demonstrate outstanding seedling vigor, better early and late-season growth than Argentine, and similar or slightly lower nutritive value than Argentine.
2. Seed production of Hybrid 3 was greater than Hybrid 93 and several elite hybrids had superior seed production to Argentine. One challenge in this regard is that lines like Hybrid 93, with superior forage potential, have lower seed yield. This must be a continuing focus of the cultivar development process

*Next steps:*

We will continue evaluating the performance and tolerance of these four elite lines and Argentine to grazing stress and to low soil nitrogen conditions. This work will be carried out during the remainder of the 2024 grazing season and also in 2025. The results will confirm whether Hybrids 3 and 93, the best performing lines in studies conducted up to this point, are indeed our primary targets for cultivar release. The seed production work shows that there are some remaining barriers to seed multiplication of these lines. Work in 2025 will also focus on management practices to increase seed production of Hybrids 3 and 93. When seed multiplication is successful, it is anticipated that Hybrids 3 and 93 will be candidates for cultivar release.

### **Products from the Project:**

The link below is a video giving background into the overall bahiagrass selection project that was first funded by FCEB in 2020, describing its importance and the methods we used. This experimental setup is very similar to that being used in the current project to evaluate the four best lines selected from the original nine, and specifically their tolerance and productivity under low N fertilizer and heavy grazing conditions.

It can be viewed by cutting and pasting the link below into a browser.

[https://www.facebook.com/UFForageTeam/videos/604794916833932/?\\_tn=KCH-R&eid=ARAZ03wr7dHXb7MuM-W1QeEVVn5QCspLIMDFiS7pJvIMzbYz5ALvdxkWWibmGVfawqyLkPOgkghRqgXe&hc\\_ref=ARSF-tr8U0hBh0jVY89RgQel4LHkyyoJ8oYhTuSQbrjaR0GjSIjFBK8v-nQ7jgVnI&fref=nf&xts\\_\\_\[0\]=68.ARC3IMucgZ6IHP7s-ejWNJTQFg0n9N6Z7lxuufF7eGO0rI39\\_7aRAonCOEoDGnQ7vJkRuIPrteBfZPRYnMkeJHWhUj3W\\_Fir0BN6jX1tt2NiP9yu6UDkLBAenNln6vSJBcGTISMz8xA6113fAi8ujaw5R2CI0Nrkp8ApCmOe5j4WLpohFeQSVo0Lbyqs69lHA01Rex32ZAu4WJkgzf1hHEgxxr0vp5GXYFgCAlcnjZW5oaXBd0paRKDCBpoUKZVu0tRtZ0\\_CQHcAKmZGRcapYili9b\\_1NHwqY5liq0D32TkBV8OdwfS686R9GNLxmetqffkyJFKf0vXQFYJpSalhr72rBF1e\\_g](https://www.facebook.com/UFForageTeam/videos/604794916833932/?_tn=KCH-R&eid=ARAZ03wr7dHXb7MuM-W1QeEVVn5QCspLIMDFiS7pJvIMzbYz5ALvdxkWWibmGVfawqyLkPOgkghRqgXe&hc_ref=ARSF-tr8U0hBh0jVY89RgQel4LHkyyoJ8oYhTuSQbrjaR0GjSIjFBK8v-nQ7jgVnI&fref=nf&xts__[0]=68.ARC3IMucgZ6IHP7s-ejWNJTQFg0n9N6Z7lxuufF7eGO0rI39_7aRAonCOEoDGnQ7vJkRuIPrteBfZPRYnMkeJHWhUj3W_Fir0BN6jX1tt2NiP9yu6UDkLBAenNln6vSJBcGTISMz8xA6113fAi8ujaw5R2CI0Nrkp8ApCmOe5j4WLpohFeQSVo0Lbyqs69lHA01Rex32ZAu4WJkgzf1hHEgxxr0vp5GXYFgCAlcnjZW5oaXBd0paRKDCBpoUKZVu0tRtZ0_CQHcAKmZGRcapYili9b_1NHwqY5liq0D32TkBV8OdwfS686R9GNLxmetqffkyJFKf0vXQFYJpSalhr72rBF1e_g)

On the following two pages, we show:

- 1) the abstract of a presentation given at the American Forage and Grassland Council national meeting by project-funded M.S. student Renan Becker, describing the first two years of the seed production data from the current project, and
- 2) a poster summarizing current project results that was presented at the 2024 Florida Cattlemen's Annual Meeting at Marco.

# SEED PRODUCTION COMPONENTS OF NEW TETRAPLOID BAHIAGRASS LINES FROM THE UNIVERSITY OF FLORIDA FORAGE BREEDING PROGRAM

R.P. Becker<sup>1</sup>, E. F. Rios<sup>1</sup>, Kenworthy, K. E. <sup>1</sup>, L. E. Sollenberger<sup>1</sup>, M. Wallau<sup>1</sup>, N. Caram<sup>1</sup>

## Abstract

Bahiagrass (*Paspalum notatum* Flüggé) is a C4 perennial warm-season grass largely used in the southern USA by beef cattle producers. Challenges to the establishment of new areas are still present because of low seed production and quality characteristics. This study aimed to evaluate the seed production of 9 new tetraploid bahiagrass lines compared with Argentine under two cutting heights (5 and 10 cm). The experiment was carried out at the Beef Research Unit of the University of Florida, Gainesville, FL, using a four replicates of a randomized complete block design with a 10 x 2 factorial treatment arrangement (10 entries x two cutting heights) during summer and fall 2022 and 2023. Data were collected in each subplot, and the variables measured were seed yield, filled seed production, number of seed heads/m<sup>2</sup>, seed set and thousand seed weight. Entries were significantly different for all the variables measured ( $\alpha < 0.05$ ). 3Fpen8 had the highest yield in both years followed by Hybrid 3 in 2022 and by M34, FPN1901 and M27 in 2023 (Table 1). The filled seed production in 2022 was greater for 3Fpen8 and Hybrid 3 and in 2023 only for 3Fpen8 (Table 1). Seed heads was affected by entries, years and cutting heights. 3Fpen8 and Hybrid 3 had the highest number of seed heads/m<sup>2</sup> for both cutting heights (Table 2). The lower cutting height (5 cm) increased seed heads/m<sup>2</sup> for Hybrid 3, M27, M34, and M98Alt entries. 3Fpen8 and Hybrid 3 reduced seed heads/m<sup>2</sup> and Argentine and M6Alt increased seed heads/m<sup>2</sup> in 2023 vs. 2022. This reduction matches with the reduction in seed yield for 3Fpen8 and Hybrid 3 in 2023, while Argentine and M6Alt increased both seed heads/m<sup>2</sup> and seed yield in 2023. Seed set was affected by entry and year ( $P < 0.031$  and  $< 0.0001$ , respectively). There was also an entry\*year interaction with M27 having the highest seed set in 2022 (15.5%). In 2023, 3Fpen8 had the highest seed set (15.4%). In the second, M98Alt, Argentine, A4EMS, M27 and Hybrid 3 decreased and 3Fpen8 increased seed set (Table 3). Thousand seed weight was also affected by entry and year with 3Fpen8 having the highest value in 2022 (3.64 g) and 3Fpen8, M34, FPN1901 and Hybrid 93 having the highest values in 2023. There was an interaction year\*entry ( $P = 0.035$ ), with M27, 3Fpen8, M34, FPN1901, A4EMS and Hybrid 3 having lesser thousand seed weight in the second year (Table 4). Lower rainfall and probable metsulfuron herbicide damage may explain some of the differences between years and entries related to the variables. 3Fpen8 is the entry with the best performance in seed yield and production of filled seeds, outyielding Argentine in both years of assessment.

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<sup>1</sup>University of Florida-IFAS Agronomy Department, Gainesville, FL 32611.



# Seed Production Components of New Tetraploid Bahiagrass Lines from the University of Florida Forage Breeding Program

R. P. Becker; E. F. Rios; K. E. Kenworthy; L. E. Sollenberger; M. Wallau; N. Caram

## Introduction

- Warm-season perennial grass
- Rhizomes as storage organs
- Low seed head density
- Low filled seed production
- Mowing and intermediate levels of nitrogen fertilization are the main managements to increase seed yield



## Hypothesis and objectives

- Lower cutting heights
- More light reaching basal growing points
- Greater tiller and seed head production
- Greater seed production

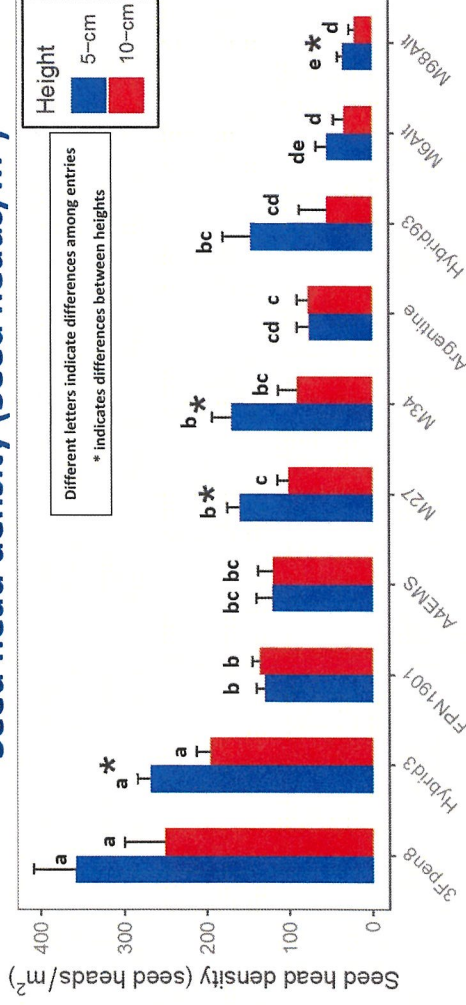
## Material and methods

- 2022-2023
- UF Beef Research Unit, Gainesville/FL
- 9 entries + Argentine cultivar x 2 cutting heights (2 and 4 inches)
- Plots were mowed in mid to late Spring and fertilized with 54 lb N/acre

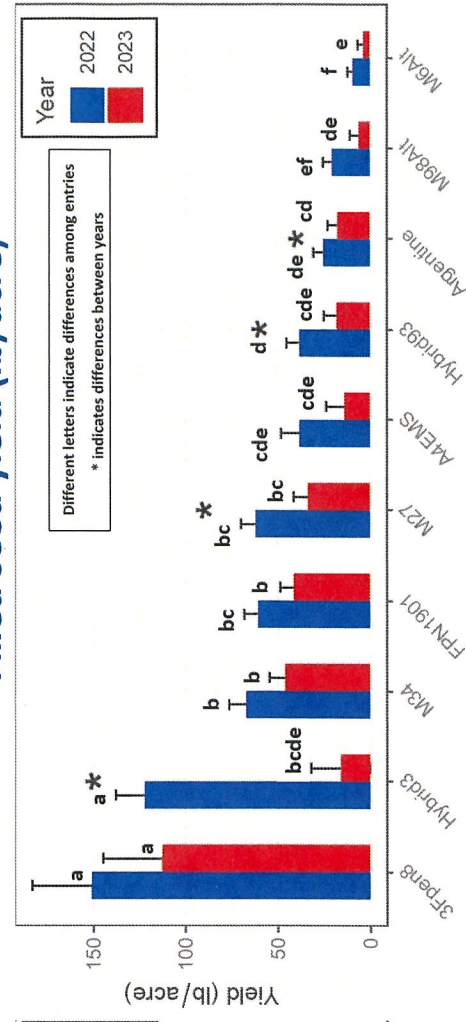
## Conclusions

- The effect of cutting height on seed head density appears to be entry specific
- 2-inch cutting height increased seed head density for some entries
- 2-inch cutting height did not increase filled seed yield
- Relatively low seed production of entries showing greatest forage potential

## Seed head density (Seed heads/m<sup>2</sup>)



## Filled seed yield (lb/acre)



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Invoice Date: 08/14/2024  
Invoice Period: 03/01/2024 - 07/31/2024  
Principal Investigator: Sollenberger, Lynn E  
Award Begin Date: 10/30/2023  
Award End Date: 07/31/2024

**SPONSOR:**

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Sponsor Award ID: 26  
Award Title: Next-Stage Screening of Bahiagrass Breeding  
Lines to Identify New Varieties for the Florida  
Cattle Industry  
Award Amount: \$50,040.00

<b>Invoice #</b>	I000130473
<b>UF Award #</b>	AWD15794
<b>Primary Project #</b>	P0324585
<b>Primary Department:</b>	60080000
<b>Current Invoice Amount:</b>	\$28,033.11

Description	Current	Cumulative
Personnel - Salary	\$20,964.72	\$37,540.47
Personnel - Fringe Benefits	\$2,464.90	\$4,420.79
Contractual Services	\$1,600.00	\$1,600.00
Direct Cost	\$25,029.62	\$43,561.26
Facilities and Administrative Costs	\$3,003.49	\$5,227.27
<b>Total</b>	<b>\$28,033.11</b>	<b>\$48,788.53</b>

For billing questions, please call 352.392.1235  
Crawford, Ashleigh [crawford.a@ufl.edu](mailto:crawford.a@ufl.edu)  
Please reference the UF Award Number and Invoice  
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By signing this report, I certify to the best of my knowledge and belief that the report is true, complete, and accurate, and the expenditures, disbursements and cash receipts are for the purposes and objectives set forth in the terms and conditions of the federal award. I am aware that any false, fictitious, or fraudulent information, or the omission of any material fact, may subject me to criminal, civil, or administrative penalties for fraud, false statements, false claims or otherwise. (U.S Code Title 18, Section 1001 and Title 31, Sections 3729-3730 and 3801-3812).

*Ashleigh Crawford*

Certifying Official

Payment History	
Cumulative Invoices:	\$48,788.53
Payments Received:	\$20,755.42
Outstanding Balance:	\$28,033.11
Note: Outstanding balance includes current invoice amount	

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Additional Projects: N

Project ID	Deptid	Department Name	Current	Cumulative
P0324585	60080000	AG-AGRONOMY	\$28,033.11	\$48,788.53