Final Technical Report

FCEB Project #23

Breeding Legumes Adapted to Beef Cattle Systems in Florida

Principal Investigator (PI):
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Aim 1 - Breeding forage legumes for Florida – Percent completion 90%

1 – Breeder seed increases in critical cool- and warm-season legumes species for Florida.

- Warm-season legumes: we have threshed and clean seed for 15 breeding lines for the following species: Aeschynomene, alyce clover, hairy indigo, and carpon desmodium. The cleaned seed was planted at the Plant Science Research and Education Unit on August 1st 2024 to multiply seed for field trials that will be conducted in Citra and Marianna, FL, in 2025.
- Cool-season legumes: seed for 3 advanced alfalfa breeding lines were sent to USDA for seed increases. Seed will be produced in summer 2024 in Prosser, Washington, and returned to our lab for planting new trials in Fall 2024. Dr. Rios visited the station in Prosser, WA and inspected the crops in June 2024. Seed is expected to be harvested in early September 2024 and will be shipped to Florida in October 2024.

2 – Development of advanced warm-season legumes (Aeschynomene, alyce clover, and carpon desmodium) with improved forage and seed yield, for overseeding systems in North and South Florida.

- Due to the lack of seed volume required for replicated trials in both locations, we focused our efforts into planting a large seed increase block in 2024, and replicated trials will be conducted in summer 2025 in Citra and Marianna, FL. Results from these variety trials will provide evidence for the release of new varieties. Remnant seed will be used to propagate the selected lines commercially.

3 – Train an *in-state undergraduate student* on advanced forage breeding methods.

- Chase Johnson is a Senior undergraduate student in the Agricultural Operations Management program in the department of Agricultural and Biological Engineering. Chase was trained on seed production and processing.

Aim 2 – Leveraging genomic and phenomic selection to breed better forage mixtures faster – Percent completion 100%

1 – Prediction models for legume/grass intercropped mixtures.

- Three trials were established in November 2023 to evaluate crimson clover and oats under intercropping systems.

- Trial 1: 380 crimson clover lines and 30 oat cultivars were planted in mixtures for a total of 600 plots to measure establishment, vigor, canopy cover, forage yield and quality during the Spring 2024. Given the limited seed available for the 380 crimson clover lines, we planted this trial as a single-row plot. Data collection was completed in May 2024 and we are now analyzing data to select the best combination of crimson clover/oat.
- Trial 2: 5 crimson clover cultivars and 2 oat cultivars were planted under monocropping and intercropping to measure forage yield and quality during the Spring 2024. This trial was planted as a sward with 5 rows per plot to approximate the production system to real farming operations. The cultivars used in this study were selected based on seed availability and good performance in Florida. Data collection was completed in May 2024 and we are now analyzing data to select the best combination of crimson clover/oat.

2 – Development of advanced crimson clover breeding lines with improved traits for intercropping.

- A nursery of 200 crimson clover families using 10 spaced-plants/family were established in November 2023 and were subjected to selection based on vigor and flowering time. Seed was harvested from individual plants to use in trials for the 2024-2025 season (Trials 1, 2 and 3 will be planted again this coming season). Seed threshing and cleaning is underway. We are now planting 10 seeds/family in trays to develop a new spaced-plant nursery for the 2024-2025 season, and them remnant seed will be used to plant Trials 1 and 2 described above for a second year of data collection.

3 – Establishment of protocols to improve the efficiency breeding for mixtures.

- New software and tools are being tested to improve the efficiency of data collection in large plots. The app Canopeo estimates canopy cover with images, and the app Field Book app is being implemented to collect and process data. We also flew drones prior to field data collection and we are now processing those images to estimate canopy cover and botanical composition of the mixtures.

4 – Train an *in-state undergraduate student* on advanced forage breeding methods.

- Chase Johnson was trained on data collection and analysis.

Aim 3 – New annual ryegrass cultivars for Florida – Percent completion 100%

1 – Prediction models to select annual ryegrass for yield and disease resistance by leveraging phenotypic and genomic data.

- PhD student Pablo Sipowicz is developing genomic (DNA markers) and phenomic (wavelengths from NIRS) models to improve annual ryegrass for yield and disease resistance. Pablo presented these results in the National Association of Plant Breeder's Meeting in St. Louis, MO, in July 2024. I also presented results from this project in the

North American Alfalfa Improvement Conference (NAAIC), Trifolium Conference, and Grass Breeders conference in Pasco, WA in June 2024.

2 – Development of advanced annual ryegrass breeding lines with improved yield, nutritive value and disease resistance.

- Six breeding populations were planted at the Agronomy Forage Research and Education Unit in Hague, FL in November 2023. We have performed selections for phenology, vigor, and disease resistance. The selected plants were harvested for seed in May and June 2024, and we are now cleaning seed for each of the 6 breeding populations. The selected seed will be planted again in Fall 2024 for more breeding, and these lines will also enter the variety trials in FL, GA, and AL to collect data for future releases.

3 – Train an *in-state undergraduate student* on advanced forage breeding methods.

- Chase was trained on single-seed NIRS analysis, desktop NIRS data acquisition and analysis, and phenomic prediction.

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Invoice Date:	08/14/2024
Invoice Period:	03/01/2024 - 07/31/2024
Principal Investigator:	Rios,Esteban Fernando
Award Begin Date:	10/30/2023
Award End Date:	07/31/2024

SPONSOR:
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UF FEIN: 59-6002052

Sponsor Award ID: 23
Award Title: Breeding Legumes Adapted to Beef Cattle Systems in Florida
Award Amount: $25,306.00

Invoice #	I000130476
UF Award #	AWD15784
Primary Project #	P0324552
Primary Department:	60080000
Current Invoice Amount:	$19,527.76

Description	Current	Cumulative
Personnel - Salary	$12,552.76	$14,621.72
Personnel - Fringe Benefits	$2,281.86	$2,525.98
Domestic Travel	$2,600.91	$2,600.91
Direct Cost	$17,435.53	$19,748.61
Facilities and Administrative Costs	$2,092.23	$2,369.81
Total	$19,527.76	$22,118.42

For billing questions, please call 352.392.1235
Crawford,Ashleigh crawford.a@ufl.edu
Please reference the UF Award Number and Invoice
Number in all correspondence

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:	$22,118.42
Payments Received:	$2,590.66
Outstanding Balance:	$19,527.76
Note: Outstanding balance includes current invoice amount	

FOR UF USE ONLY   Additional Projects: N

Project ID	Deptid	Department Name	Current	Cumulative
P0324552	60080000	AG-AGRONOMY	$19,527.76	$22,118.42