

Florida Cattle Enhancement Grant Application

Title: Identification of superior limpograss cultivars under low-input systems

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Project Overview

Fertilization is one of the most costly inputs in cow-calf production systems in Florida. In 2014, IFAS released two new cultivars, Gibtuck and Kenhy, and there has been a rapid increase in acreage of these new cultivars in South and Central Florida. However, there is no information regarding specific fertilization requirements of the new limpograss cultivars and whether there is any difference in fertilizer use efficiency among cultivars. The objective of these studies will be to identify limpograss cultivars with greater production, nutritive value, and persistence under low-input systems. A plot study has been conducted in three locations, Ona, Gainesville, and Marianna and the treatments are the factorial combination of two fertilization levels, 80 lb N, 20 lb P₂O₅, 80 lb K₂O/acre, or 40 lb N, 10 lb P₂O₅, and 40 lb K₂O/acre, four limpograss cultivars, Floralta, Kenhy, Gibtuck, and 1, and two harvest frequencies, 6 and 12 weeks.

Deliverables/Report

- 1. Establishment of three experimental areas with four limpograss cultivars, which can be used for further investigations**

Plots were established in Ona and Gainesville in 2015 and fertilization treatments applied in April 2016. In Marianna, plots were established in May 2016 and it was expected that fertilizer treatments would be applied in July 2016. However, the plots had a greater than expected incidence of weeds (primarily crabgrass, *Digitaria* sp.) and are undergoing an intensive weed control program. We expect to apply the treatments and start the evaluations in Marianna on September 2016.

- 2. Identification of fertilizer use efficiency by different cultivars of limpograss**

In Ona, there was a significant ($P < 0.05$) effect of cultivar, regrowth interval, and fertilization level on herbage accumulation of limpograss (Table 1). Gibtuck had the greatest herbage accumulation, followed by Kenhy and Floralta. Entry 1 had the least herbage accumulation

among the cultivars. Plots harvested at 12 week interval had greater herbage accumulation than 6 weeks (Table 2) and plots receiving greater fertilization levels had greater herbage accumulation (Table 3).

There was no difference in crude protein (CP) concentration among cultivars; however, Gibtuck, Kenhy, and Entry 1 had greater TDN than Floralta. Forage harvested at 6 weeks had greater CP and TDN than 12 weeks and greater fertilization levels resulted in greater CP and TND at 6 weeks; however, there was no effect of fertilization level on nutritive value when the forage was harvested at 12 weeks (Table 4).

In Gainesville, the overall herbage accumulation was greater than Ona, primarily due to the longer establishment period of the plots. Similarly to the trial at Ona, there was a significant ($P < 0.05$) effect of cultivar, regrowth interval, and fertilization on limpograss herbage accumulation. Gibtuck and Kenhy had the greatest herbage accumulation, followed by Entry 1 and Floralta (Table 1). Plots harvested at 12 weeks had 50% greater herbage accumulation than 6 wk regrowth interval. In addition, plots receiving greater fertilizer levels had greater herbage accumulation. The nutritive value of the forage samples from Gainesville and the remaining samples from Ona will be analyzed at the end of the 2016 growing season.

Table 1. Herbage accumulation of Gibtuck, Kenhy, Entry 1, and Floralta limpograss in Ona and Gainesville, FL.

	Limpograss Cultivar				SE
	Gibtuck	Kenhy	Entry 1	Floralta	
	-----Herbage accumulation (lb DM/acre)-----				
Ona	5400a*	3800b	4300b	3200c	300
Gainesville	13900a	13900a	12300b	12400b	400
	-----Crude Protein (%)-----				
Ona	8.7a	9.3a	7.9a	7.4a	0.7
	-----TDN (%)-----				
Ona	55a	57a	55a	51b	1.0

*Means followed by the same letter within rows are not different ($P > 0.05$)

Table 2. Regrowth interval effects on herbage accumulation of limpograss cultivars in Ona and Gainesville, FL

	Regrowth interval		SE
	6 weeks	12 weeks	
	---Herbage accumulation (lb DM/acre)---		
Ona	4000b*	4700a	200
Gainesville	10400b	15800a	300

*Means followed by the same letter within rows are not different ($P > 0.05$)

Table 3. Fertilization levels effects on herbage accumulation of limpograss cultivars in Ona and Gainesville, FL

	Fertilization level		SE
	80-20-80	40-10-40	
	---Herbage accumulation (lb DM/acre)---		
Ona	5000a*	3800b	300
Gainesville	14000a	12200b	300

*Means followed by the same letter within rows are not different ($P > 0.05$)

Table 4. Regrowth interval x fertilization levels effects on CP and TDN of different cultivars of limpograss in Ona, FL.

	Fertilization levels		SE
	80-20-80	40-10-40	
Ona	-----CP (%)-----		
6 weeks	10.7a*	7.5b	0.5
12 weeks	6.5a	5.9a	0.5
	-----TDN (%)-----		
6 weeks	57a	53b	1.0
12 weeks	50a	49b	1.0

*Means followed by the same letter within rows are not different ($P > 0.05$)

3. Preliminary information to adjust limpograss fertilization recommendations in South Florida

Based on the preliminary data, the average N extracted from the soil by the forage in Gainesville and Ona would be approximately 75 lb N/acre. Therefore, the current fertilization recommendation of 80 lb N/acre is appropriate for limpograss hay and silage production. We are

planning to conduct this project for 2 more years and have a more robust nutrient extraction information, including N, P, and K.

4. Identification and expression of genes associated with ribulose 1-5 biphosphate (Rubisco) in different limpograss cultivars pre- and post-fertilization and harvest.

The DNA was extracted from the pre-treatments in Ona and Marianna and post-treatments in Ona and Gainesville. A primer from rice (*Oryza sativa*) was used to estimate the Rubisco gene (*rbcS*) expression. There are no specific warm-season perennial primer available for limpograss and we tried to test primers from comparable crops. There was no difference in the expression of the *rbcS* pre- or post-treatment (12 weeks harvest); however, this initial analyzes provided evidence and preliminary knowledge to advance the original hypothesis. The next step will be to try a maize primer (*Zea mays*) and try to estimate the expression of different factors linked to the Rubisco activity in the plant. Recent research has shown that there is a significant effects of Rubisco Accumulation Factor (RAF1) and Rubisco activase (RCA) in the photosynthesis rate of maize, therefore, these two genes will be of interest for further analysis. In addition, the expression of Glutamine synthetase (GS), a gene related to nitrogen use efficiency in corn, bean, and rice will also be estimated using the maize primer.

5. Preliminary information to support the potential release of a new limpograss cultivar

Based on the preliminary herbage accumulation information generated in this report, there is no evidence that Entry 1 should be released as a new cultivar. However, it has been observed that Entry 1 has a prostate growth habit and it can be more persistent under frequent defoliation than the other cultivars. After 2 cycles of evaluation (2 – 12 weeks periods), there is no difference ($P > 0.05$) in ground cover and plant frequency among cultivars. However, the treatments will be imposed for 2 additional years and it is expected that cultivars with greater persistence will have greater ground cover, mainly in the 6 weeks regrowth interval treatments.