2021 NFREC Beef/Forage Day

Thursday, September 30, 2021

UF/IFAS NFREC Beef Research Unit

(One mile west of Greenwood, FL on Hwy 162)

Schedule of events (CDT):

8:00 AM **Registration (Registration fee - $10) and interact with exhibitors**

9:00 AM **Start morning program**

- **Mycotoxins and toxic plants in grazing systems**- Ann Blount, UF Forage Breeder, and Joao Bittar, UF Beef Cattle Extension Veterinarian, and Mark Tancig, UF/IFAS Leon Co. Horticultural Specialist
- **Getting ready for breeding season–** Angela Gonella-Diaza, UF Beef Reproduction Specialist , and Kalyn Waters, Holmes Co Extension Director
- **Managing weed encroachment to maximize livestock performance–** Jose Dubeux, UF Forage Specialist, and Mark Mauldin, UF/IFAS Washington Co Extension Agent
- **Lessons learned: perennial peanut x bahiagrass variety mixes–** Cheryl Mackowiak, UF Soils Specialist
- **Limpograss: an alternative for extending grazing in North Florida**– Marcelo Wallau, UF Forage Specialist, and Doug Mayo, Jackson Co Extension Director
- **The potential of silages in backgrounding diets** – Nicolas DiLorenzo, UF Beef Specialist, and Nick Simmons, Escambia Co Extension Director

12:00 PM **Lunch (Lunch and refreshments will be provided)**

1:00 PM **Optional Tour: Cover-crop Trial and Grass-Legume Grazing Trial**–Jose Dubeux, UF Forage Specialist, and Cheryl Mackowiak, UF Soils Specialist

2:00 PM **Adjourn**

UF | IFAS Extension
UNIVERSITY of FLORIDA

For further information call 850-526-1613 or visit the NFREC website (http://nfrec.ifas.ufl.edu/).

BEEF FORAGE FIELD DAY COMMITTEE

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Dr. Jose Dubeux
Dr. Angela Gonella-Diaza
Ms. Kalyn Waters
Mr. Nick Simmons
Ms. Tina Gwin

Dr. Ann Blount
Dr. Cheryl Mackowiak
Mr. Doug Mayo
Mr. Mark Mauldin
Mr. Mike Goodchild
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Mr. David Thomas, Beef Unit Manager

Appreciation is expressed to the following NFREC staff members that are involved or assist with the NFREC Beef Cattle and Forage programs.

NFREC Marianna Beef Unit
Mark Foran
Olivia Hill
Chad Stephens
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Troy Windham
Cole Wood

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NFREC Marianna Farm Crew
Jim Bob Baxter
Bill Conrad
Alan Toole

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BEWARE-POISONOUS PLANTS IN YOUR OPEN AND WOODED PASTURES

Ann Blount-UF Forage Extension Specialist, NFREC-Marianna/Quincy, Brent Sellers-UF Weed Specialist and Director, Range Cattle Research Station-Ona, João Bittar-UF/CVM Extension Beef Veterinarian, Gainesville, Adam Stern-UF/CVM Veterinary Forensic Pathologist, Gainesville, and Mark Tancig-UF Leon County Extension Horticulture Agent, Tallahassee

"Coral ardisia" or *Ardisia crenata* (left) and "Heavenly bamboo" or *Nandina domestica* found in a wooded pasture in Gadsden County, FL on January 24, 2021, and are suspected in cattle poisoning and subsequent death from grazing.

Livestock producers beware! Especially during the winter months, hungry livestock may be tempted to graze on plants that are toxic. While we recognize many of these plants, like deadly nightshade, lantana, crotalaria and coffee weed or coffee senna, not all plants are listed in our publications as potential sources for livestock poisoning. Some plants, often ornamental landscape plants, have escaped into the wild and are proliferating and naturalizing in open pastures and shaded, wooded areas where livestock may graze.

In a recent rash of cattle deaths, it was the consumption of Coral Ardisia (*Ardisia crenata*)and Heavenly bamboo (*Nandina domestica*), that may have been at fault. Cattle, recently turned out into a wooded pasture in north Florida. Both ornamental plants are invasive and are spreading through the Florida Panhandle.

Clinical signs observed in these cattle included abdominal distention (due to acute bloat), impaction (due to slowed gut motility), and death. While Nandina species have been identified as highly toxic to livestock in veterinary journals, poisoning from Coral Ardisia consumption has not been confirmed.

Although these plants have been implicated as toxic to livestock in Florida in two similar situations, no actual proof of causation was determined. Often there are reports about healthy livestock of various species and ages dying from an unexplainable circumstance. The cause of the livestock illness or deaths are not typically investigated due to the high cost associated with veterinary expertise, timely necropsies, sample collections and submissions to diagnostic laboratories.

In this situation, the local University of Florida (UF-IFAS) county agent was contacted. Then, University Specialists were asked to investigate the actual cause of the illness and death of these cattle. Joao Bittar, Adam Stern, Mark Tancig and Ann Blount worked with the owner of the livestock to identify the potential cause of the illness and deaths. Plant specimens, including fresh leaves and berries of both plants, and various animal organs, rumen contents and blood samples were sent to Iowa State University's Veterinary Diagnostics Laboratory in Ames Iowa, and ultimately to the USDA-ARS Poisonous Plant Laboratory located in Logan, Utah. We recently received this report from the USDA-ARS Lab that they prepared for the Florida Cattlemen, and we share it with you below:

USDA/ARS Poisonous Plant Research Laboratory Report: Coral Ardisia Update (9/1/2021)

Bryan Stegelmeier, Ed Knoppel and Daniel Cook

Ardisia crenata has historically been associated with livestock poisoning though its toxicity has not been experimentally documented or reproduced. It has been used as an herbal medicine with various seemingly unrelated reported activities and recent cytotoxicity studies document its toxic potential (Food Science 122 (2010) 546-552 and Nat Prod Res 35 (2021) 157-161).

Nandina domestica has also been identified as a toxic plant. Several cyanogenic glycosides have been identified in the plant and these certainly have the potential to poison both livestock and humans (Knight (2001) Guide to plant poisoning of animals of North America. Teton New Media, Jackson WY). As cyanide poisoning does not seem to be a factor in the clinical poisoning reported in this project, this plant is less likely to be the cause of poisoning. Collected plants will be analyzed for cyanogenic potential, but only will be included in these studies if *A. crenata* is determined not to be the cause.

The objectives of this work will be to confirm *A. crenata* toxicity in ruminants and develop a small animal model of disease that may be used to confirm the toxicity of chemical fractions and individual toxins.

Clinical case: Nearly all cattle (bulls and cows) of a relatively small herd of registered shorthorn animals were placed on a pasture infested with both *A. crenata* and *N. domestica*. Nearly all the

cattle were observed eating and during field studies many of both plants were nearly grazed to the ground. Both plants had numerous berries that were also eaten. Poisoned animals developed bloat with acidosis, diarrhea, anorexia and dehydration. The disease often extended for days and even weeks and animals became dehydrated with fetid halitosis, snotty nose and ulcers on the muzzle. Several animals were necropsied, and berries were identified in the rumen. Microscopic evaluation of small numbers of tissues that were collected had a necrotizing gastroenteritis with hepatic microabscesses suggestive of septicemia from breakdown of the mucosal barrier. Surviving animals had severe rumen atony with acidosis that required extensive therapy using fluids, electrolytes, sodium bicarbonate, rumen stimulants, and transfaunations resulting in prolonged and costly slow recovery.

Figure 1: Muzzle of cow poisoned with *A. crenata.* Notice the crusting and mucosal ulcers.

Plant: A team in Florida made collections of both plants including frozen plant and air-dried plant. These were brought to the laboratory, stripped from the branches, sorted, the frozen plant was freeze-dried/the other was air dried, finely ground and dosed to goats and mice. The leaves and small stems were fibrous and difficult to dose. Initial dosing of ground plant material in mice produced no observable or microscopic lesions or disease. However, when dosed to goats the berries produced severe diarrhea with mucoid gastroenteritis and occasional small ulcers.

Figure 2: Photographs of dosed goat with diarrhea (left). The jejunum is distended with mucoid exudate. Notice the congested mesenteric vessels (center). Mucosa of the abomasum that is edematous with mucoid exudate on the surface (right).

USDA-ARS Poisonous Plant Laboratory plans: PPRL chemists are preparing extracts of both the *Ardisia* berries and plant. These will be dosed to both mice and goats. This model will be used to identify the *Ardisia* toxins. This will be useful in identify the toxic component so that we can find what plants, plant parts and plant phenotypes are toxic and likely to cause poisoning. After the toxin is identified we'll confirm its toxicity in cattle.

Take Home Message:

When an event like this occurs with livestock:

- Immediately remove animals to a secure and safe area
- Supply livestock with fresh water, a mineral source and clean hay
- Contact your local veterinarian and/or your State Animal Health inspectors and local county agent

By asking for assistance, you may be able to determine and prevent more unnecessary livestock losses. Also, it can help educate others about potential pitfalls, especially from poisonous plants or from unknown causes.

UPDATE ON GRASS ENDOPHYTES AND MYCOTOXINS OCCURRENCE IN FLORIDA FORAGES

UF-IFAS-Faculty: *Ann Blount, Sunny Liao, Cheryl Mackowiak, Joao Bittar, Angela Gonella-Diaza, Carissa Wickens, and Marcelo Wallau* ***UF-Extension*** *Brittany Justesen, Osceola County Extension and Joe Walter, Brevard County Extension****UF Graduate Students:*** *Valerie Mendez, Soil and Water Sciences Department*

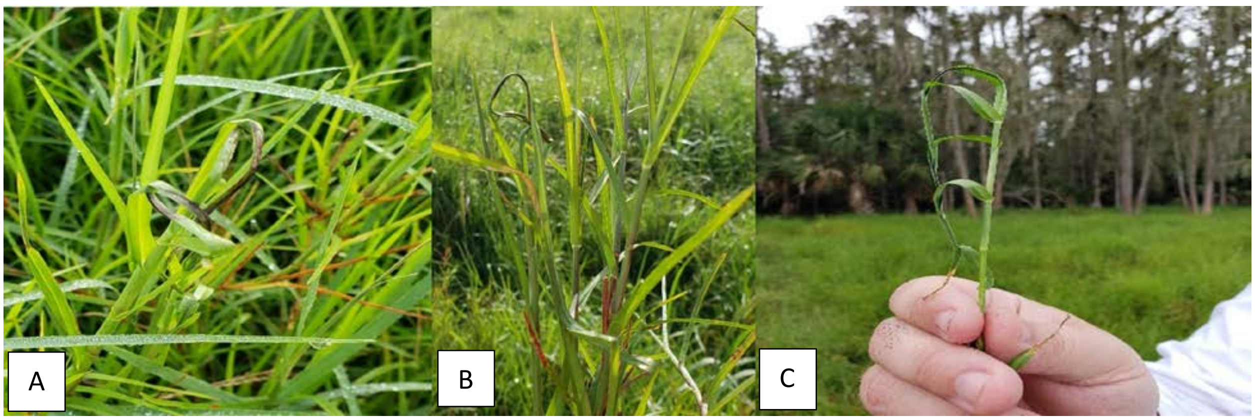

FIGURE 1
Limpograss (*Hemarthria altissima*) Floralta associated with *Myriogenospora atramentosa* in the field. A, Tangletop condition caused by *M. atramentosa* stromata. B, *M. atramentosa* stroma on the tip of a leaf. C, *M. atramentosa* causing a "black line braid" condition by merging multiple leaves along the stem. (exerpted from Chen K. H, Blount, A., Justesen, B., Walter, J., M., Wallau, M. & Liao H. L. (2019). First report of *Myriogenospora atramentosa* within the plant genus *Hemarthria*. *Plant Health Progress* (Brief) DOI: 10.1094/PHP-07-19-0043-BR).

We have been collecting and evaluating Florida forages for the presence of fungal inhabitants and mycotoxins. Our team of researchers, graduate students, and extension faculty collaborated in a state-wide sampling of bahiagrass, bermudagrass, smutgrass and limpograss since 2018. To date, we have collected over 500 forage samples from Florida ranches.

From February 2018, we began sampling pastures on approximately 14 ranch sites strategically located across the state. Some Florida ranch sites were selected where historically high mycotoxin levels had been found at this time of the year. The goal of our multi-year survey was to identify the occurrence and prevalence of mycotoxin activity in these four forage species. Additionally, the fungal community of the forages was identified through DNA analysis. Our 2021 sampling season will try to determine if older shoots (less frequently grazed or cut off) often referred to as "standing hay", "deferred grazing" or "stockpiled forage", might increase the incidence of fungi or mycotoxins.

Several research groups in the U.S. and South America have joined our efforts to better understand fungal-plant relationships and what triggers mycotoxin production. Dr. Jennifer Duringer, our Co-PI at Oregon State University, is pursuing this line of research and has been assisting us with our additional workload of sampling.

This project is on-going with the inclusion of two new graduate students, Valerie Mendez and Brittany Justesen, who will focus on seasonal changes of fungal inhabitants and mycotoxin levels in suspect pastures. Jennifer Duringer at the Oregon State University's Department of Environmental and Molecular Toxicology will help to identify mycotoxins and their levels in Florida forages.

To date, we have confirmed the identification of relevant mycotoxin-producing fungal genera, including Fusarium, Alternaria, and Aspergillus. In several forages multiple mycotoxins occur simultaneously. We have so far identified and quantified the presence of mycotoxins Zearalenone, ZEAR-4-sulfate Q1, Fumonisin, Beauvericin Enniatin, Ergonovine, Elymoclavine, Lysergol, Dihydrolysergol, Agroclavine, Alternariol and Alternariol methyl ether, as well as other mycotoxins that are potentially deleterious to animal health. Of concern are levels of zearalenone, an estrogenic metabolite produced by multiple Fusarium species. Data collected for the 2018-2019 season showed significant levels of this mycotoxin and its derivatives in Bermudagrass and Limpograss forage samples from several different ranch pastures.

This project does not determine if there is a cause and effect of the fungi with levels and types of mycotoxins found with the observations expressed from our livestock producers. Animal tolerance levels to our identified mycotoxins have not been widely studied. However, rare publications are available to confirm that staggers, tremors, respiratory and reproductive issues, including animal death, are related to the animals' exposure to mycotoxins. With inclusion of UF Extension Veterinarian -Dr. Joao Bittar (UF College of Veterinary Medicine, Gainesville), and UF Veterinarian and Reproductive Specialist -Dr. Angela Gonella-Diaza (NFREC-Marianna Beef Unit), we plan to continue our research to better understand mycotoxin impacts on livestock health. This preliminary research, we hope, will provide incentive to further the study of these "emerging" mycotoxins regarding effects on animal health and animal tolerance levels.

This research should further our understanding of fungal and mycotoxin presence in Florida forages, DNA profiling of these fungal inhabitants, and mycotoxin type and quantification. We will continue to provide evidence-based information about fungal and mycotoxin presence in Florida forages and its potential relation to animal health and performance.

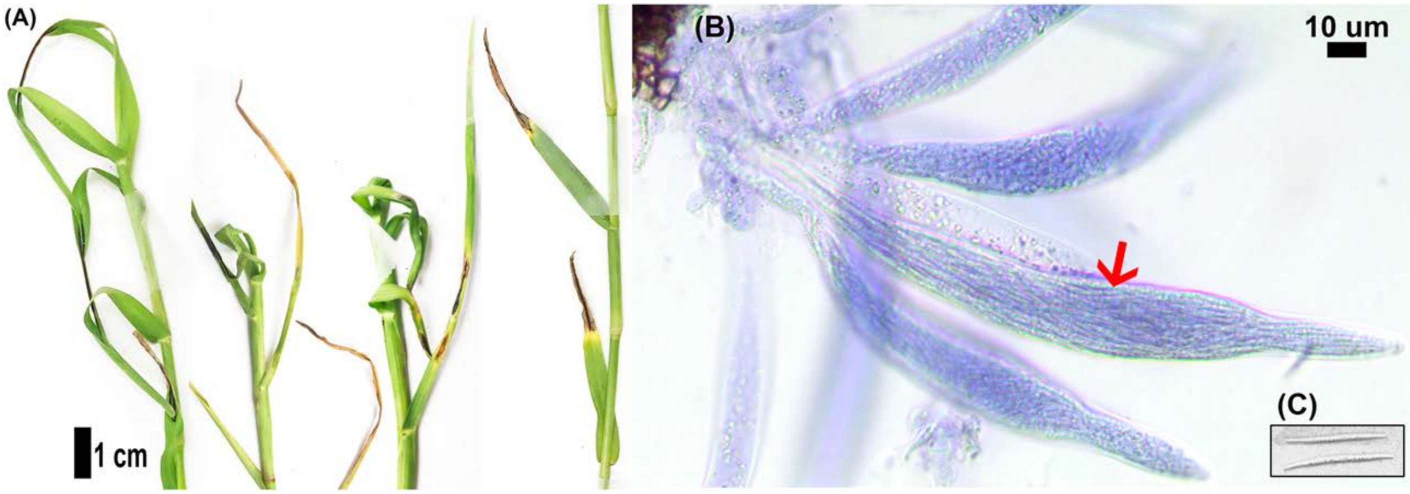

FIGURE 2

A, Limpograss (*Hemarthria altissima*) leaves infected by *Myriogenospora atramentosa*. B, Asci and ascospores of *M. atramentosa* stained with trypan blue. Red arrow pointing to fusiform asci containing many cylindrical ascospores. C, Fusoid part-spores (exerpted from Chen K. H, et. al. 2019).

For additional information, please contact Dr. Ann Blount at paspalum@ufl.edu or Valerie Mendez valeriemendez@ufl.edu

GETTING READY FOR BREEDING SEASON

Angela Gonella-Diaza[1], DVM, MSc. Ph.D., Daniella Heredia[1], MSc. Kalyn Waters[2], MSc.

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[2] County Extension Director and Extension Agent III, UF/IFAS Extension Holmes County

Introduction

An established breeding season consists of introducing bulls to a group of females for a limited amount of time each year. The beginning of the breeding season and its duration will determine the beginning and duration of the subsequent calving season and the age of calves at weaning. Having a set date to start the breeding season will facilitate the use of other managing practices, for example: Breeding Soundness Evaluation of bulls, vaccination, reproductive tract scoring of heifers, artificial insemination, among others. Also, having an established breeding season will consequently provide a compact calving season. You can dictate calving at an ideal time of year by limiting bull exposure with your cows—for example, the time of the year that you have better quality and more abundant forages. Also, many producers take advantage of the breeding season to plan their calving season and weaning to target the best cycle of prices in the market. By shortening the breeding season, you create more uniform groups of calves for marketing.

Finally, having a controlled breeding season will help you fit all your herd into a yearly cycle. This is very important to increase the efficiency of your cow-calf operation. If you do not have a controlled breeding season, this annual cycle is difficult to manage. It makes reproductive management of the herd challenging. While, having a breeding season will help you ensure all your cows fit their annual cycle because they will be bred, calve, and be wean around the same time every year. Finally, it will be easier to identify and cull the cows that are not efficient and remain open at the end of the breeding season.

This article will cover how estrous synchronization technologies (alone or in combination with artificial insemination (AI)) could help you increase your efficiency, how you could adopt these technologies to your operation, and some of the most common estrus synchronization protocols.

What is estrus synchronization?

Estrous synchronization is the technology that, by manipulating the estrous cycle using exogenous hormones, a group of females (cows or heifers) came on heat around the same time. Many options exist for estrus synchronization protocols. Protocols are classified by their use of heat detection, AI, or natural service and the age and genetics of the females (Figure 1).

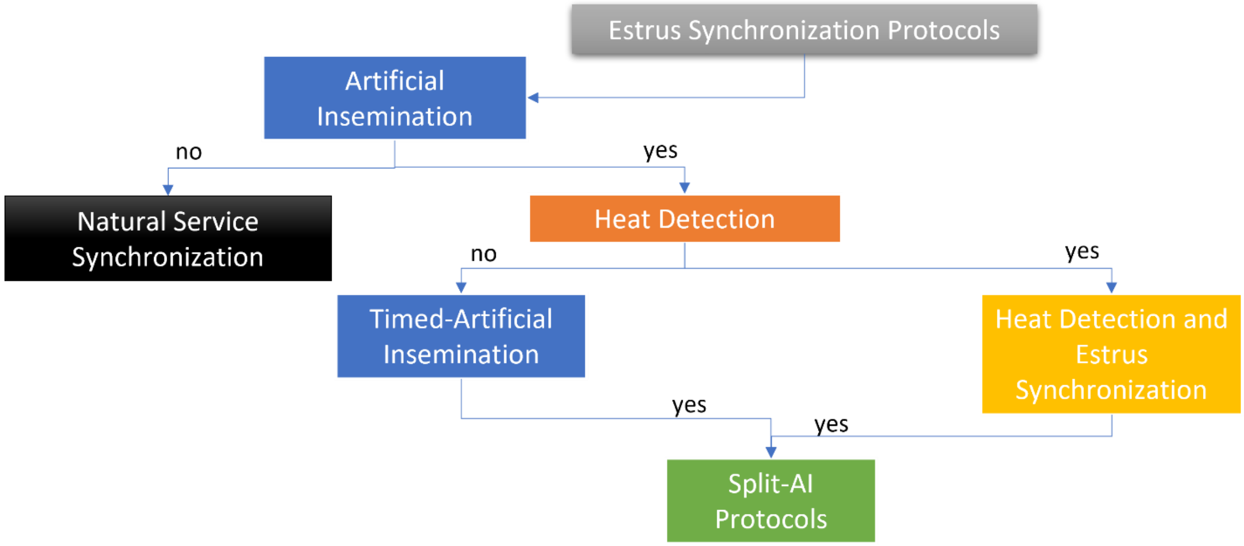

Figure 1: Classification of the Estrus synchronization protocols available for beef cows and heifers.

Artificial insemination is an assisted reproductive technology that allows the deposition of stored semen directly into a cow or heifer's uterus. Timed artificial insemination (TAI) is when AI is carried out at a specific time without detecting estrus (all the synchronized females are bred on the same day at the same time). The use of estrus synchronization protocols along with artificial insemination are alternatives to increase the number of cows pregnant per AI (P/AI). The hormones used for estrus synchronization protocols are gonadotropin-releasing hormone (GnRH), prostaglandin F2α (PGF), and progesterone (P_4). The body naturally produces these hormones. During estrous synchronization, we take advantage of the physiology of the estrus cycle to manipulate it and, in this way, make the cows come on heat and ovulate coordinately. Estrus synchronization allows producers to manipulate the female's estrus cycle to ovulate at a set point of time.

Annually, the beef reproduction task force (BRTF) has released a sheet of recommended estrus synchronization and TAI protocols that have proven effective in beef cows and heifers (Beef reproduction task force, 2021). The protocols recommended are based on research and are proven to work in the field. For a protocol to be recommended, the BRTF considers if the protocol increases fertility, the number of times the animal is handle without affecting fertility, and the costs of the protocol without compromising fertility. It is essential to understand that there is no "perfect" protocol; each producer should find the right program for their operation.

Protocols for Natural Service Synchronization

Natural service synchronization (or timed natural breeding) is used to make a female come on heat earlier during the breeding season to be bred by the bull. Typical, a 60-70% response rate to a natural service synchronization protocol can be expected in a herd with good cycling status. That is why it is highly recommended to increase the bull power during this first week (usually one bull per 10-15 females for seven days). There are several options of timed-Natural breeding protocols:

- One injection of PGF2 alfa (cost varies from $1 to $2 / female): The good thing about this program is that you only bring the cows to the chute once. The bad thing about this protocol is that you need to ensure that most of your females are cycling. Why? Because PGF2a is a luteolytic agent, it only works if there is a corpus luteum in the ovaries of the females. The main problem is that many of our females are not cycling at the beginning of the breeding season. Usually, 40-75% of the cows are not cycling at the start of the Bredin season (Yavas and Walton, 1999; Stevenson et al., 2003; Baruselli et al., 2004). This proportion could be more significant in herds with a strong Brahman influence or a not-ideal nutrition program. This protocol simply calls for administering a single injection of prostaglandin F2a on the day of bull turnout. Females that respond to the prostaglandin F2a injection will be in heat for the next five days. It is expected that around 75% of cyclic females will be in heat within the first seven days of the breeding season.
- Day 4 Prostaglandin: To implement this protocol, females are gathered four days after bull turnout and given an injection of prostaglandin F2a. It is expected that the bulls cover around 20 percent of cyclic females before the PG injection. The remaining cyclic females will be in heat during the next five days. Administering prostaglandin F2a within the first four days of the breeding season will not sacrifice pregnancies from breedings that took place during the four previous days. However, you must be very careful because giving prostaglandin F2a after day 4 of the estrous cycle can abort pregnancies. Using this method, 100 percent of cyclic females theoretically would be in heat within the first 10 days of the breeding season. This means that most breeding activity will happen around day 8 of the breeding season.
- MGA-based protocols: MGA is a synthetic progesterone that can be added to heifers' diet, typically in a pellet. It is easy-to-use and also very effective; the key is constant consumption. Cost is around $1.00/head for a 14-day treatment, not including feed. MGA-based protocols are published on the BRTS protocol sheets. Successful use of an MGA protocol includes having heifers consistently consuming feed (bunk broke) daily before starting the protocol. MGA-based protocols are only approved for heifers.
- 7-day CIDR: This protocol is implemented by inserting a CIDR for the seven days before the start of the breeding season. Once the CIDR is removed, the bulls are turned in (either immediately or one day later). The CIDR will stop cyclic females from showing estrus during the time it is in place. It also has the potential to initiate estrus in some noncyclic females. Within the first five days after a seven-day CIDR protocol, 57 percent of cyclic females would be expected to show heat. The average day to conception in this scenario would be day 6 of the breeding season.
- CIDR-based protocols (cost varies from $20 to $30/HD): A CIDR is an intravaginal device that delivers progesterone. The same hormone that MGA, but with chemical differences. The good thing about the CIDR is that it is the most controlled way to deliver progesterone. Concentrations increase fast after you put the implant and drop-down pretty quickly after you remove it. Because it goes inside the vagina, all females will receive a similar amount of progesterone. There are many options of protocols that use CIDRs. 7-day CIDR protocol is implemented by inserting a CIDR for the seven days before the start of the breeding season. Once the CIDR is removed, the bulls are turned in (either immediately or one day later). The CIDR will stop cyclic females from showing estrus during the time it is in place. It also can initiate estrus in some noncyclic females within the first five days after a seven-

day CIDR protocol. The 7 days co-synch + CIDR protocol commonly used for AI could also be used to synchronize natural service (Figure 2).

Artificial insemination protocols for cows and heifers

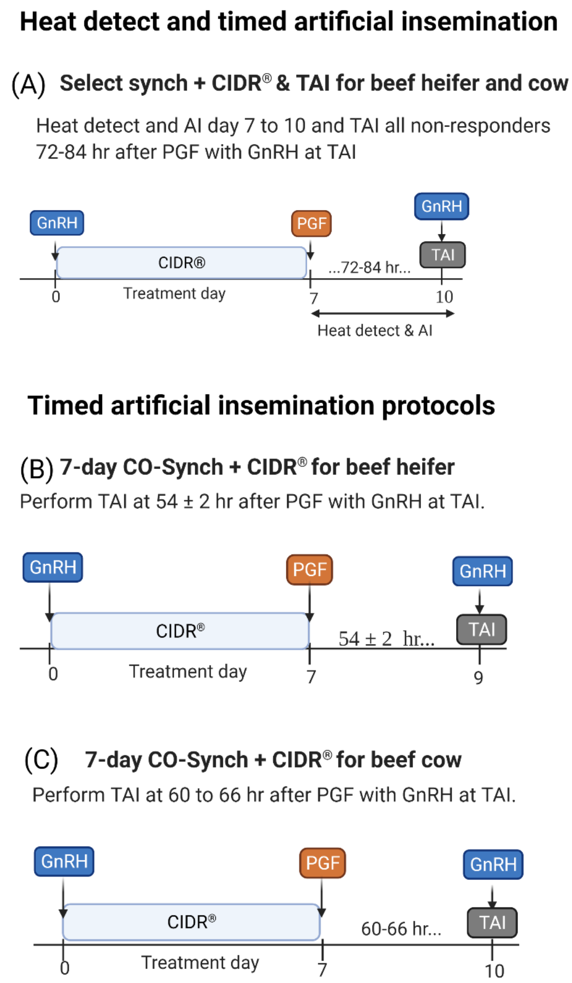

Figure 2. Different estrus synchronization protocols are recommended by the Beef reproduction task force 2021.

In figure 2, you will find three examples of the most common estrus synchronization protocols used for beef cows and heifers. For the heat detection and TAI (Figure 2A), the Select Synch protocol + CIDR is used in either heifers or cows. The protocol consists of administering an injection of GnRH and inserting a CIDR on day 0; on day 7, PGF2α is administered, and the CIDR is removed. Animals that present signs of estrus are inseminated 12 hours after estrus, and those not detected in estrus receive TAI 72-84 hours after the last $PGF_{2\alpha}$ concurrently with a GnRH injection to induce ovulation. For TAI protocols in heifers (Figure 2B), the 7-day CO-Synch + CIDR consist of the application of a GnRH injection on day 0 simultaneous to insertion of a CIDR, at day 77, the CIDR is removed with the administration of one injection of $PGF_{2\alpha}$, TAI is performed 54 hours later with the application of a GnRH dose at TAI time. The main difference for cows is that the TAI is performed between 60 to 66 hours after the $PGF_{2\alpha}$ (Figure 2C; Beef reproduction task force, 2021).

Remember that a successful result in P/AI will depend on factors you should take care of before implementing these reproductive biotechnologies. Factors influencing the P/AI outcome are proper year-round nutrition, good body condition score, good record keeping, effective vaccination, and health program.

Take home message

Estrus synchronization protocols increase calf uniformity and shorten the calving season, thus having heavier calves at weaning, improving the profitability. When estrus synchronization is combined with AI, calves resulted from AI will carry superior genetics. It is vital to select the proper estrus synchronization protocol for your production; make sure you consult a licensed veterinarian for the appropriate application.

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MANAGING WEED ENCROACHMENT TO MAXIMIZE LIVESTOCK PERFORMANCE

Jose Dubeux[1], Luana Dantas[1], Colt Knight[2], Erick Santos[1], Daniele Loures[3], Kenneth Oduor[1], Mark Mauldin[4], Martin Ruiz-Moreno[1]

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3. Universidade Federal do Recôncavo da Bahia
4. UF IFAS Washington County Extension Office

Introduction

Weed encroachment in grasslands might result in large economic losses to livestock enterprises. Weeds compete for water, light, and nutrients, reducing forage productivity. Spiny weeds might hurt the animals and depreciate their value, reduce forage intake, and decrease livestock gains (Figure 1). Furthermore, weed encroachment reduces land value and livestock can rapidly spread weed seeds, increasing the infestation. Controlling weed infestation, therefore, is key to achieve greater livestock performance and maintain/increase the land value. Managing strategies are important to control different weed species, including the product, rate, and timing of application. There are numerous extension articles available for that, with detailed information (Sellers and Devkota, 2020). This article will focus, however, on potential productive losses from livestock due to weed encroachment.

Figure 1. Bermudagrass pastures with control of spiny pigweed infestation (left) or without controlling spiny pigweed infestation (right) at UF IFAS NFREC Marianna. Photo credit: Jose Dubeux

Primary productivity and stocking rate

Weeds compete for water and in conditions of limited water supply there will be a significant reduction in the forage productivity. Plants with different physiology (C3 or C4) have different water use efficiencies. For example, C4 plants such as warm-season perennial grasses (e.g. bahiagrass, bermudagrass) are more efficient using water than C3 plants (e.g. dogfennel, thistle), and C3 weeds will use 2-3 times more water to produce similar amount of biomass. The net result is that for every 1 lb of C3 weed dry matter we are losing 2-3 lb of C4 grass biomass. If water is a limiting factor, this will severely limit pasture productivity. The reason for weeds to thrive under grazing conditions is that livestock avoid them, therefore, they have a great competitive advantage. Besides, many weeds are locally adapted and produce large amounts of seeds, reseeding naturally every year.

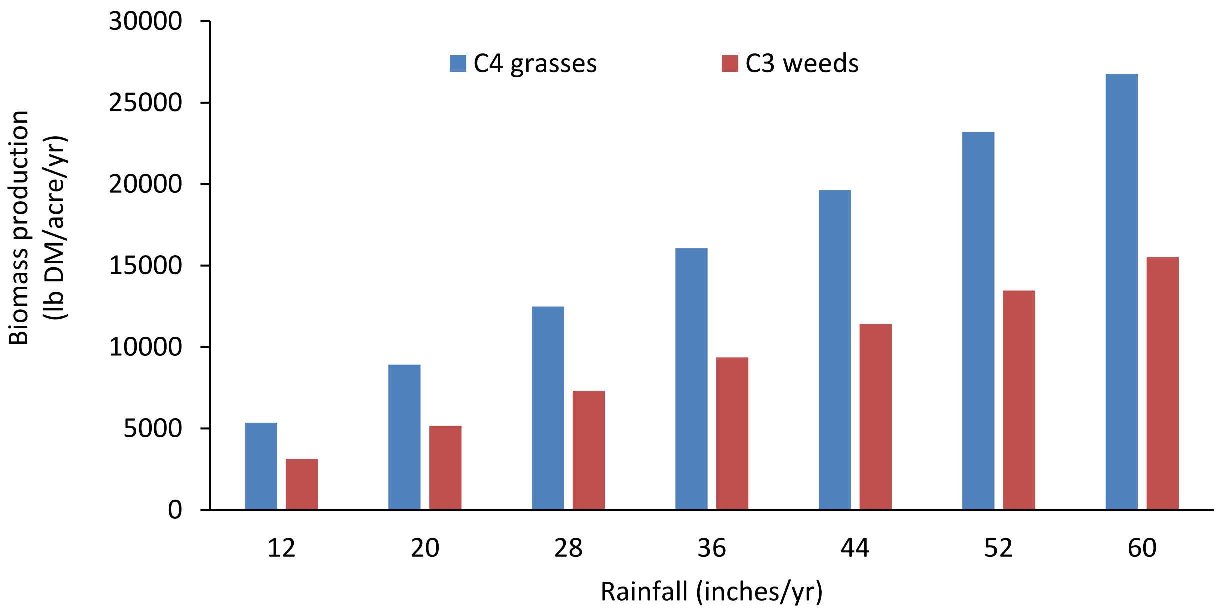

Figure 2. Biomass production potential of C4 grasses and C3 weeds based on rainfall, assuming that: 1. 70% of rainfall is utilized for plant growth; 2. Water use efficiency for C4 grass is 350 lb water/lb DM and for C3 weeds is 600 lb water/lb DM.

Weed encroachment will reduce stocking rate because less forage will be available for grazing. Using the data from Figure 2 and simulating increasing levels of weed encroachment, we developed Figure 3. As weed encroachment increases there is a simultaneous decrease in the stocking rate because of lesser forage mass available for grazing.

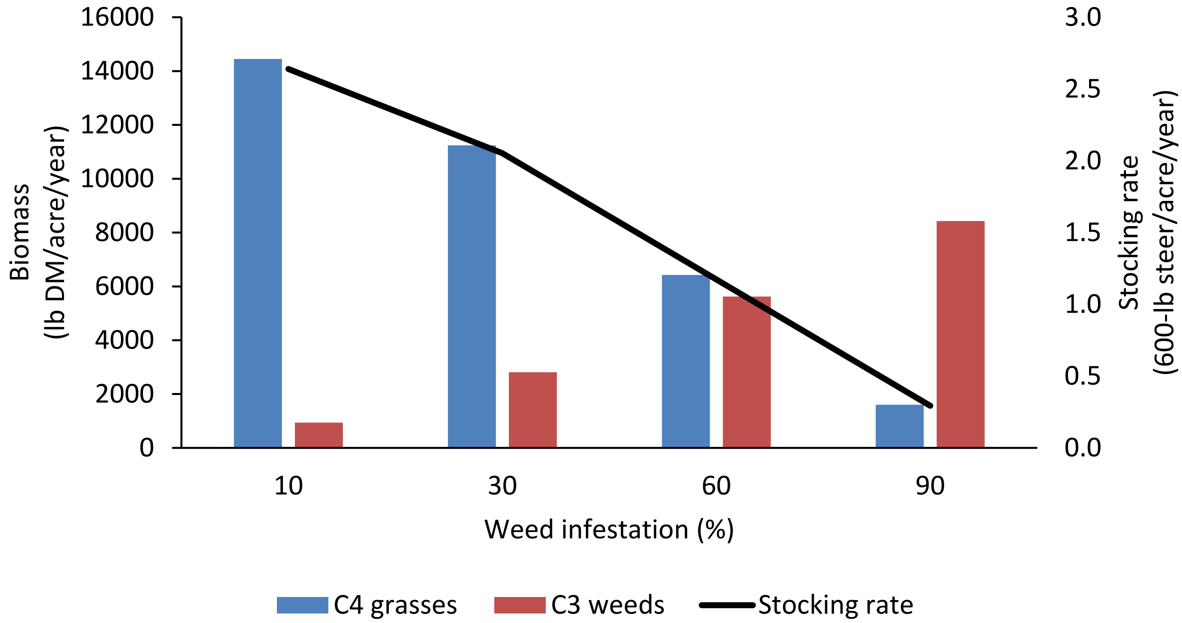

Figure 3. Stocking rate as affected by proportion of weed infestation. Assuming: (1) 36 inches of rainfall per year and that 70% of the rainfall is utilized for plant growth; (2) Water use efficiency (WUE) for C4 grass 350 lb water/lb DM and for C3 weeds 600 lb water/lb DM; (3) Stocking rate is based on 600-lb steer consuming 2.5% BW per day (15 lb DM/d).

How does weed encroachment affect animal production per area?

There are numerous components of the animal production per area (Figure 4) and weed encroachment can affect many of these components. For example, if forage production is reduced because of weed competition, the consumption per unit area will reduce and negatively affect the stocking rate. Likewise, if weed infestation negatively affects voluntary intake and reduces nutritive value, there will be a decrease in the output per animal, which combined with reduced stocking rate will decrease overall pasture productivity (Figure 4). Voluntary intake of livestock on grasslands can be broken down in different components as well (Figure 5). Canopy structure affects several of those components, such as bite depth, bite area and canopy bulk density, ultimately affecting the bite weight (Figure 5). Grazing animals try to compensate the reduced bite weight by increasing their grazing time up to a limit, but at some point, the net result will be reduced intake and decreased animal performance.

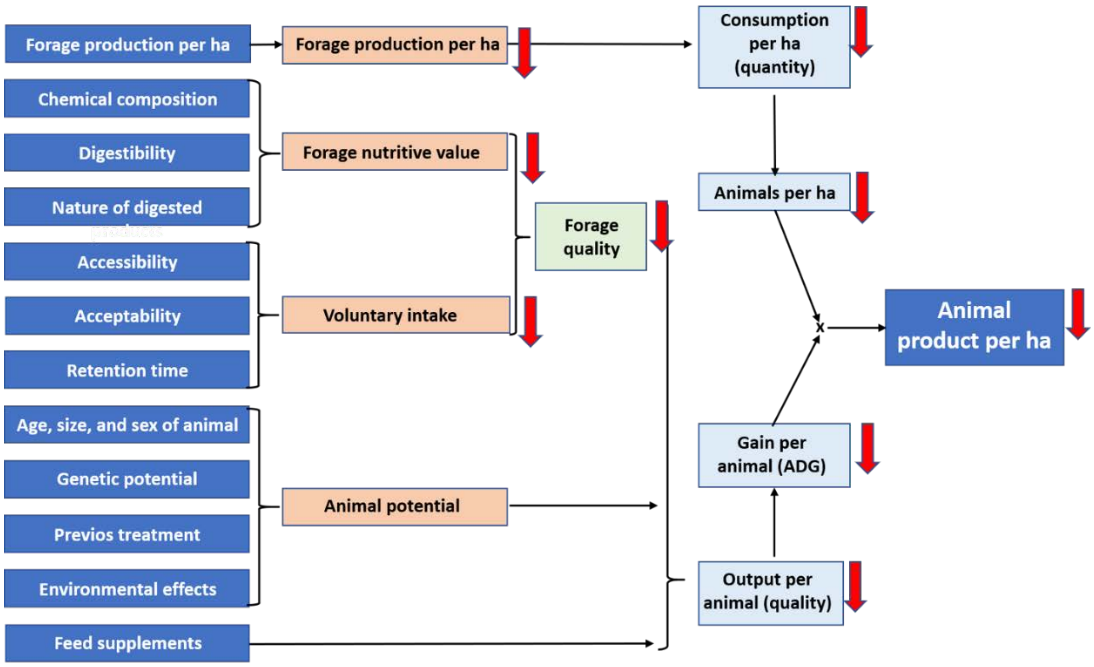

Figure 4. Components of animal production per area. **Red arrows** indicate areas where weed encroachment will have a negative effect on animal production per area. Adapted from Moot and Moore (1985).

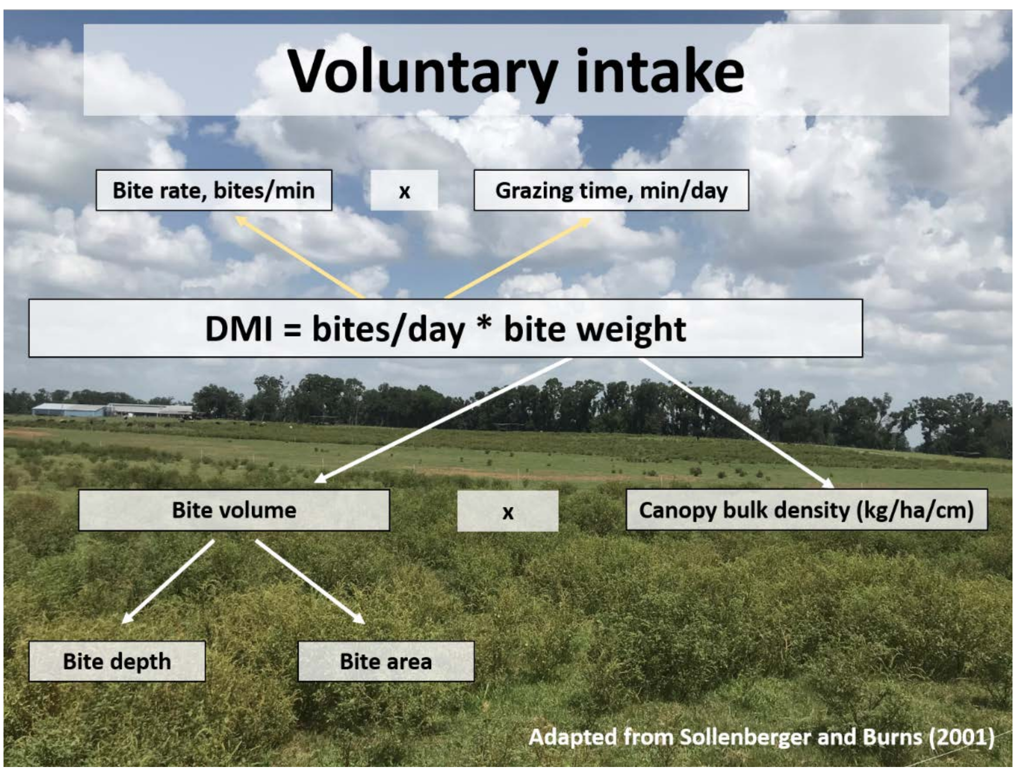

Figure 5. Components of voluntary intake in grazed grasslands.

Grazing management and weed encroachment

Grazing management can help reduce weed infestation before the weed seeds germinate. Providing greater soil cover and having a solid canopy of the preferred forage is key to reduce weed germination. A closed canopy will reduce light reaching the ground and reduce weed germination. Once the weed seeds germinate, however, they must be controlled, since they are not grazed and are locally adapted. Typically, the earlier the weeds are controlled, the less expensive the process is.

Case study at NFREC Marianna

We are assessing how increasing levels of spiny pigweed encroachment affect livestock responses. We established a grazing trial using bermudagrass with a gradient of spiny weed infestation. Three treatments were applied where bermudagrass was established 1) with uncontrolled spiny pigweed; 2) with controlled spiny pigweed, and; 3) with spiny pigweed controlled in alternate strips (Figure 6). Duracor herbicide was used to control the spiny pigweed.

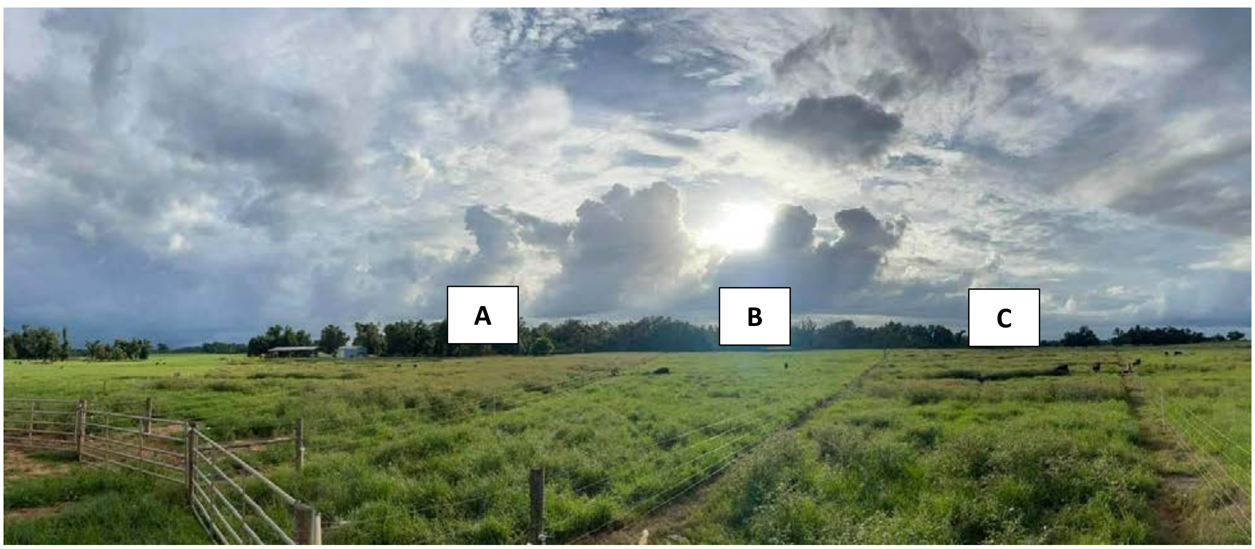

Figure 6. Overview of some paddocks in the grazing trial assessing encroachment of spiny pigweed. A. uncontrolled spiny pigweed; B. controlled spiny pigweed; C. spiny pigweed controlled in alternate strips.

The project started in 2019. Seeds from local spiny pigweed present at NFREC Marianna experimental station were collected, dried at room temperature, and cleaned thereafter. In May 2020, the seeds were drilled (1 lb/acre) in the uncontrolled and alternated-strips paddocks. In 2021, we sprayed Duracor @ 20 oz/acre and used 1 qt/100 gallon of non-ionic surfactant. The herbicide was applied only on the controlled treatment and on strips. Grazing started on 18 June 2021 and ended 10 September 2021. We assessed livestock performance and vegetation parameters. Below is a summary of the preliminary results obtained from 18 June to 20 August 2021 (Table 1). Results are preliminary, but there is a trend to reduce stocking rate and average daily gain, resulting in reduced gains per area in the uncontrolled treatment (Table 1).

Table 1. Livestock performance of steers grazing bermudagrass with contrasting weed encroachment

Treatment	Stocking rate (steers/acre)	Average daily gain (lb/hd/d)	Gain per area (lb/acre)
Controlled	2.1 a	0.93 a	125 a
Strips	2.1 a	1.10 a	149 a
Uncontrolled	1.9 b	0.85 a	104 a
SEM	0.05	0.22	29

In the trial, we are also monitoring grazing behavior of cattle using GPS collars. The GPS units log every second and track the cattle movement along the paddock. The geographical coordinates for strips, shade, and watering points were used to locate the cattle movement from 23-29 June 2021 (Figure 7). The data illustrate the project since we have not analyzed all data yet. For this specific paddock, livestock spent 19% of their time under the shade, 10% near water trough, and 34% in the corner of the paddock congregating likely during the night.

Figure 7. Livestock behavior on paddock with strip-control of spiny pigweeds. A. heatmap showing where cattle stayed longer (green dot indicates shade, blue dot indicates mineral mixture, large red dot indicates the corner of the paddock). B. Red rectangles indicate pigweed strips and small dots indicate cattle movement.

Drones equipped with multispectral cameras are also being used to collect aerial images. The goal is to assess spiny pigweed infestation using aerial images and calibrate with ground measurements taken at the field. This could provide future insights to precision application of herbicide and weed control on pastures (Figure 8).

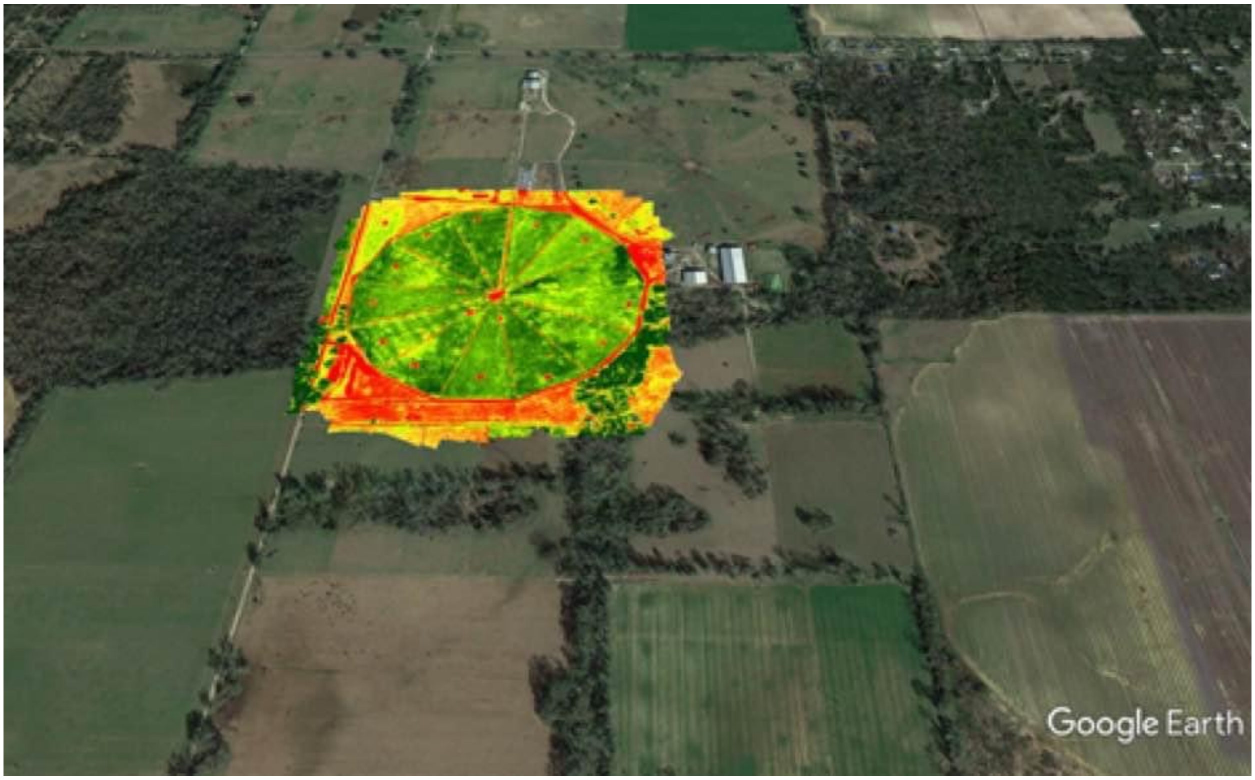

Figure 8. Hyperspectral image of the spiny pigweed trial.

Take Home Messages

- Weed encroachment reduces livestock performance, animal health, and decreases land value.
- Grazing management might reduce weed encroachment as a preventive tactic, but once weeds are established, they must be managed.
- Weeds reduce livestock output per area by affecting forage productivity, forage utilization, forage nutritive value, and voluntary intake.
- New technologies such as GPS collars and drones might be helpful to improve our understanding of livestock behavior to develop future technologies and improve efficiency of our production systems.

Acknowledgments

The authors acknowledge CORTEVA for the support provided to this research.

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LESSONS LEARNED: PERENNIAL PEANUT X BAHIAGRASS VARIETY MIXES

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***Students**: Jung-Chen Liu (MS, graduated), Erick Santos (Post-doc), Victor Guerra (PhD, graduated), Adesuwa Erhunmwunse (PhD candidate)*

Take home messages

- Perennial peanut improves bahiagrass-based forage quality nutritive value under dryland conditions and low nitrogen inputs, without compromising productivity.
- 'Ecoturf' and experimental 'LU-1'perennial peanut germplasm better established into bahiagrass than did 'Florigraze' after nearly three seasons.
- Weed encroachment was a common occurrence when establishing perennial peanut monoculture plantings or as establishment strips planted into bahiagrass.

Background

Arachis glabrata Benth. (perennial or rhizoma peanut) is a warm-season, perennial legume cousin to *Arachis hypogaea* L. (annual peanut). However, this perennial species does not routinely set seed like annual peanut. Perennial peanut becomes dormant and sheds its leaves and stems after the first hard frost. However, by March this legume is ready to re-emerge and accumulate approximately two to six tons of dry forage during the growing season, along with over 200 lbs N/acre, captured through biological dinitrogen (N_2) fixation (BNF). Depending upon variety and management, established plantings will also maintain large root + rhizome biomass. In fact, the belowground root + rhizome mass may represent roughly 1x to 2x the aboveground mass in any given year, and having similarly high N composition (Dubeux et al., 2017; Cooley et al., 2020).

In comparison, *Paspalum notatum* Fluggé (bahiagrass) will frequently produce over five tons dry forage per season, and it also has a massive root + rhizome systems, although the rhizomes are restricted to the upper few inches of soil at the surface. Bahiagrass is considered a workhorse among perennial grasses, as it can tolerate relatively poor growing conditions, such as low soil fertility, soil acidity, and periods of drought. When N fertilizer is applied, bahiagrass forage quality increases, particularly in the spring and fall, but bahiagrass forage quality does not approach the quality found in perennial peanut. Therefore, a mixture of the two forage species is often considered the best of both worlds; a pasture containing a rugged perennial grass with a perennial legume that enhances pasture forage quality, particularly under low N fertilization (Santos et al., 2020).

There is interest in identifying the most successful perennial peanut varieties to incorporate into standing bahiagrass pastures. However, there is little reporting of which bahiagrass varieties provide the best combinations with rhizoma peanut varieties. Perennial peanut mixtures with Argentine bahiagrass (Santos et al., 2018), Tifquik (Santos et al., 2020), and Pensacola bahiagrass (Jaramillo et al., 2018) have been reported but not compared. There are a multitude of combinations to test. At NFREC-Marianna in May 2019, we used long-established, replicated bahiagrass strips as a host site to test incorporating new perennial peanut as mixed plantings for comparison against bahiagrass monocultures and newly established perennial peanut monocultures. Three bahiagrass varieties: 1) Pensacola, 2) Tifton-9, and 3) Argentine were tested, along with three perennial peanut germplasm: 1) Florigraze, 2) Ecoturf, and 3) experimental LU-1 (plant material originated from USDA cattle pasture, Citrus County). Treatment plots were replicated four times, as a strip-plot design.

Establishment Notes

As has been reported by Castillo et al. (2013), one of the most successful methods for establishing perennial peanut into a mature bahiagrass stand is to remove the bahiagrass where you plan to plant the perennial peanut, which is typically as strips as wide as the perennial peanut sprigging equipment. They used a moldboard plow to clear away the living bahiagrass, while we first killed the bahiagrass sod (two applications of glyphosate at approximately 4 quarts per acre per application, at least two weeks prior to planting) then used a rototiller to break up the dead sod, to better accommodate perennial peanut planting material. The perennial peanut was removed from nearby fields as pieces of sod that were broken up into small pieces and planted by hand into their respective treatment plots. Perennial peanut monocultures were planted as small strips of sod, which covered approximately 30% of the plot area, while the mixtures were planted in narrow strips, horizontal to the length of bahiagrass in the plot. Sod planting was chosen over sprigs, since we did not have access to a sprigger and we could treat the sod pieces similar to transplants, where we had a combination of roots, rhizomes, and shoots, thereby aiming for quicker establishment. Unfortunately, we entered a drought for the succeeding several weeks and had little access to water for irrigation. Even so, the perennial peanut established itself over the next two seasons. This was likely helped by keeping competing bahiagrass and weeds from establishing. In 2021, nearly every plot containing perennial peanut appeared to be established or nearly so. Weed competition was observed wherever the soil was exposed or had perennial peanut growing as monoculture, including the planted perennial peanut strips. During the first year or two of establishment, it is beneficial to spray for weeds in original rhizoma peanut sections (Castillo et al., 2013). It is interesting to note that the rhizoma peanut was much more likely to spread in glyphosate treated alleys between plots than bahiagrass. Perennial peanut can be an aggressive spreader, particularly when there is little to weak plant competition.

Herbage Response to Mixture

In well-established plots (> 10 years), perennial peanut mixtures (approximately 50:50 grass to legume) and receiving no N fertilization, herbage production was the same or greater than either bahiagrass or perennial peanut monocultures (Fig. 1). Previous reporting from the same site but the bahiagrass monoculture receiving 240 to 320 lbs N acre^{-1} yr^{-1}, the Argentine bahiagrass monoculture produced over 2x more forage than the mixtures in year 2 of N treatment (Santos et al., 2018). Essentially, took over a year of repeated N applications to reach the relatively greater bahiagrass monoculture production by the end of the second season.

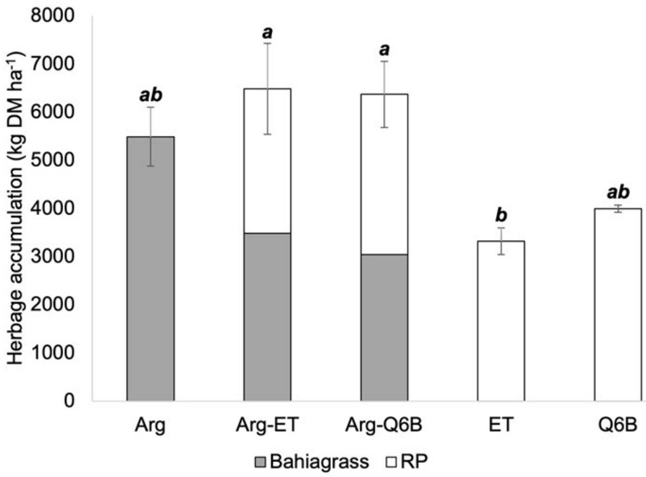

Fig. 1. Herbage accumulation (kg ha^{-1}) of bahiagrass and rhizoma peanut (RP) monocultures and bahiagrass-RP mixtures at NFREC-Quincy, 2020. Bars sharing the same letter are not significantly different. Arg=Argentine bahiagrass; Arg-ET= mixture of Argentine bahiagrass and Ecoturf RP; Arg-Q6B = mixture of Argentine bahiagrass and experimental Q6B RP; ET = Ecoturf RP; Q6B = Q6B RP (Liu, unpublished).

Perennial peanut establishment vigor in the first year is not always a good predictor of performance in succeeding years. At NFREC-Marianna, Florigraze perennial peanut appeared to be the most rapidly establishing of the three candidates during the first season. However, by the end of the second season (2021), Ecoturf and LU-1 spread more vigorously (Fig. 2). Ecoturf was a slow spreader and forage producer during the initial establishment year, but it has much greater growth in 2021. Experimental LU-1 was the slowest to spread during the first year and although its spread is more like Ecoturf in 2021, its limited canopy height in 2021 keeps productivity relatively less in 2021(Fig. 3). Regardless, the perennial peanut monocultures consistently produced the least amount of herbage through the first three years of establishment, while the grass monocultures and mixtures often performed similarly (Figs. 2 and 3).

These treatments received one 20 lb N/acre fertilizer application each year (after first cutting in July), which may be supporting good bahiagrass monoculture growth. Overall, perennial peanut herbage was less than grass monocultures in 2020, but herbage production were more similar across the different treatments in the first half of 2021. The plots will be harvested again in October. The Argentine bahiagrass monoculture and Florigraze monoculture herbage in 2021were trending lower than other treatments in 2021. It will be interesting to observe if this continues over time. At other locations when we stopped supplying mineral N fertilizer to bahiagrass monocultures, we eventually depleted available soil N. This can take from one to 5 years, depending upon initial soil fertility and soil type. Whereas, as a mixture, the bahiagrass portion can increase its tissue N content. Forage quality, represented by crude protein in this case, was greatest in perennial peanut monocultures (12 to 14 % CP), lowest in bahiagrass monocultures (6 to 8% CP), and intermediate in the mixes (8 to 10% CP) in 2020 (Fig. 4).

Incorporating perennial peanut into bahiagrass sod that otherwise receives little to no N fertilizer inputs, is a great way to maintain relatively high yields while elevating overall forage quality. Another option is to apply 200 to 300 lbs N ac^{-1} yr^{-1} to grass, although you will not likely maintain similar forage quality to perennial peanut/bahiagrass mixtures throughout the season. Additionally, excess mineral N in the soil is susceptible to leaching beyond the root zone, which can have negative impacts on water quality, if the nitrate travels from the site and into groundwater or gets washed into surface water (ditches, creeks, etc.). Over the next few years, we expect to learn to what extent grass and legume variety options contribute to successful mixed pasture systems.

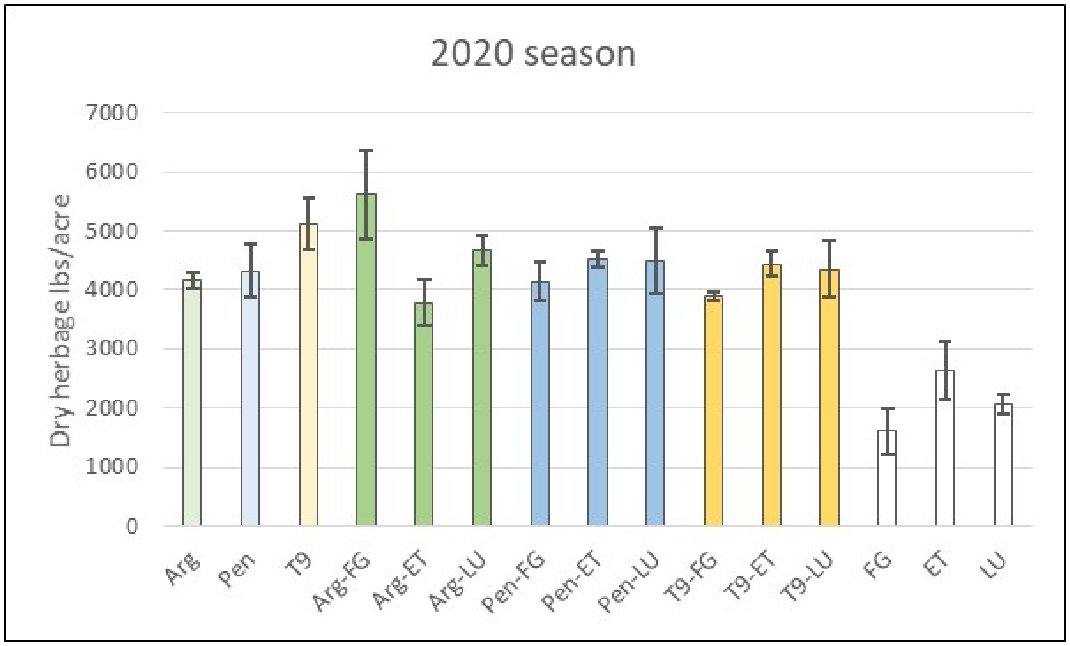

Fig. 2. The impact bahiagrass/perennial peanut mixtures have on annual herbage production, one year after establishment. Bahiagrass: Arg=Argentine Pen= Pensacola, T9=Tifton-9; and perennial peanut: FG=Florigraze, ET=Ecoturf, and LU=experimental LU-1. Each bar equals mean ± standard error (Liu, unpublished)

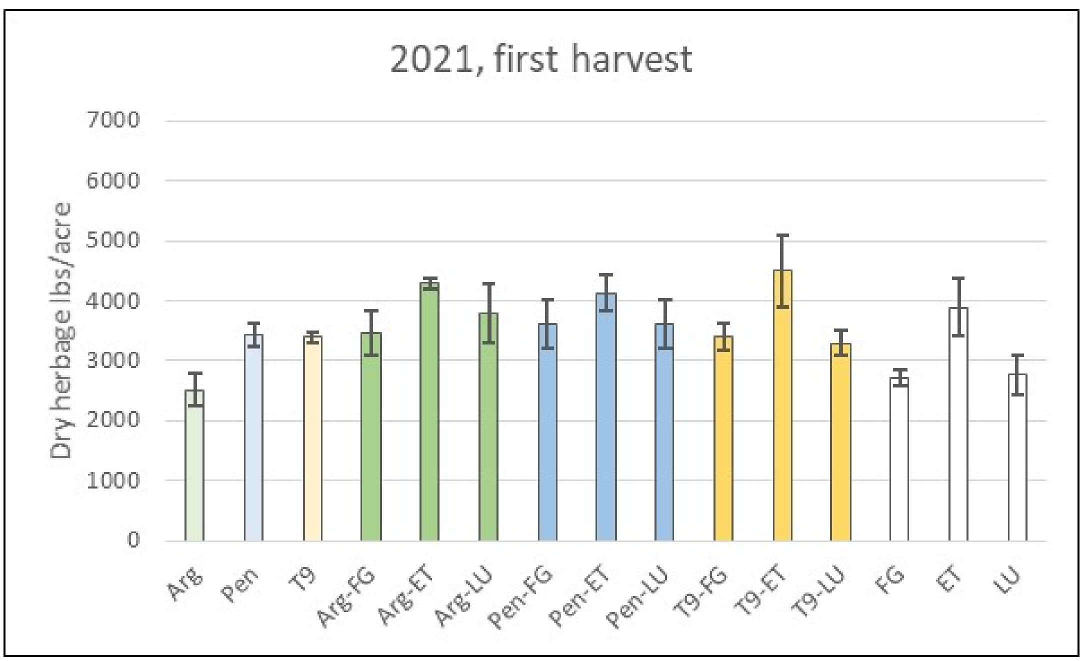

Fig. 3. The impact bahiagrass/perennial peanut mixtures have on annual herbage production, second season, after establishment (first harvest). Bahiagrass: Arg=Argentine Pen= Pensacola, T9=Tifton-9; and perennial peanut: FG=Florigraze, ET=Ecoturf, and LU=experimental LU-1. Each bar equals mean ± standard error (Liu, unpublished)

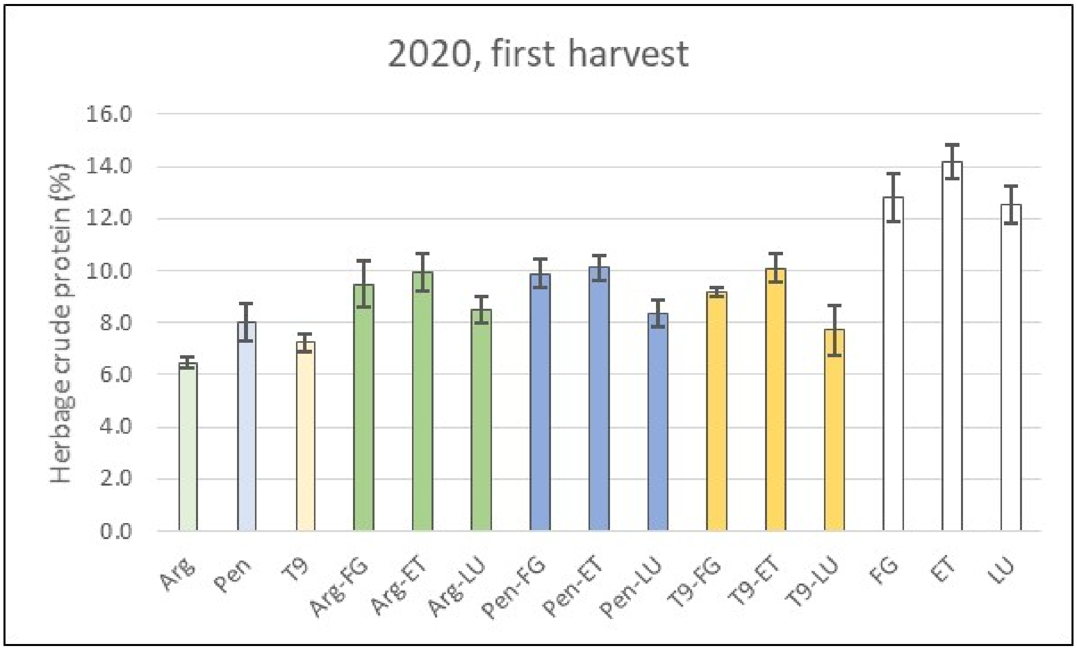

Fig. 4. The impact bahiagrass/perennial peanut mixtures have on herbage crude protein at one year after establishment (first harvest). Bahiagrass: Arg=Argentine Pen= Pensacola, T9=Tifton-9; and perennial peanut: FG=Florigraze, ET=Ecoturf, and LU=experimental LU-1. Each bar equals mean ± standard error (Liu, unpublished)

Under further study

It is somewhat difficult to summarize forage treatment effects before research plots are fully established and mature. In perennial systems, it can take multiple years. We expect to continue studying above- and belowground impacts, as well as continue herbage assessments. For example, we know that legume species tend to accumulate more cations, such as potassium, calcium, magnesium, than do grass species. Combining forages with different nutrient needs may better help balance soil nutrient management to a greater degree than using forage monocultures. We are also finding that bahiagrass rhizome development might be somewhat suppressed when grown in mixture with perennial peanut, while root mass is more equally proportioned between species. In grazed treatments, bahiagrass/perennial peanut mixtures tended to be associated with greater relative abundance of bacteria related to soil N cycling functions (Guerra, data unpublished). Further, soil fungal communities appear to be more responsive to forage species composition than bacterial communities, where *Fusarium* species relative abundance has dominated perennial peanut more so than bahiagrass (Erhunmwunse, data unpublished). Although Fusarium is often considered plant pathogenic, this group is quite phylogenetically diverse, where they may contribute useful pasture soil ecosystem services.

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LIMPOGRASS – AN ALTERNATIVE FORAGE FOR NORTHWEST FLORIDA RANCHERS

Marcelo Wallau, UF/IFAS Forage Extension Specialist, and Doug Mayo, Jackson County Extension Director

Introduction

Limpograss (*Hemarthria Altissima*) was first introduced into Florida in 1964. This grass came from the Limpopo River in Southern Africa. Limpograss had four positive traits that made researchers interested in exporting it to Florida.

1. Limpograss is native to a tropical region of Africa.
2. It thrives in wetter, more poorly drained river floodplain areas, much better than traditional forage grasses, such as bahiagrass and bermudagrass.
3. It has large spongy stems that are more easily digested than other grasses.
4. It is highly productive with a long season of growth in its native region.

From that first introduction of native grass selections, several cultivars were developed including diploid varieties of 'Redalta', and 'Green Alta', as well as the tetraploid cultivars 'Bigalta', and 'Florialta'. Of these early cultivars, Floralta was determined to be the one that was the most persistent with higher grazing tolerance, so it was recommended for ranchers in southern and central Florida. Issues were noted with early cultivars, such as poor stand persistence and low protein levels. In 2014, two new cultivars were released that were hybrids of Floratla and Biglata, called 'Gibtuck', and 'Kenhy'. Both of these new cultivars had excellent persistence and higher annual yields than the two parents.

Since the release of Floralta Limpograss, it has been highly productive in the areas around Lake Okeechobee, the Kissimmee River, and the St. John's River marsh east of Kissimmee and Orlando. This grass grows almost year round in these warm and wet areas. Years of research trials in Gainesville proved this grass could also successfully be grown in the area around Payne's Prairie and along the Santa Fe River floodplain. More recently, these cultivars have been tested at the North Florida Research and Education Center near Marianna and along the Gulf Coast on flatwood soils of Gulf County.

There are four limitations of Limpograss that have hindered widespread adoption.

1. Limpograss is an aggressive grass that rapidly establishes when planted from mature tops, but not from seed. Limpograss is also not like Bermudagrass that can be planted with rhizomes in late winter/early spring. Instead, fertilized mature tops are harvested in mid to late summer for planting as quickly as possible (establishment details outlined later).
2. Limpograss is highly productive providing 8-10 tons of forage annually, but it can be very low in protein when mature, especially in the fall and early winter (as low as 3-5% CP).
3. This is a tropical grass that could be killed by hard freezes. When Limpograss was first released, it was not recommended north of Interstate 4. New genetic selections, however, have increase cold hardiness, and improved varieties are now planted as far north as southern Alabama.
4. Limpograss is more sensitive to herbicides than other tropical grasses, which limits weed control options, especially in the summer.

The Use of Limpograss in North Florida

Limpograss is a very popular forage in South Florida because of its capacity to extend the grazing season through most of the winter. In mild winters, 30 – 35% of annual forage production will occur during the cool season. However, in North Florida, it will go dormant after the first heavy freeze. There are two main uses of limpograss in the northern part of the state: as an improved forage alternative for wet areas, and as stockpiled forage for fall grazing. Eastern Florida and Gulf Coast Flatwoods, for example, cover about 4.5 million acres in Florida, and are currently primarily used for conservation or timber, but are suitable areas for expansion of limpograss pastures. Recent research by Dr. Jose Dubeux's team, in both Jackson and Gulf counties, has shown productivity of more than 6 tons of dry matter per acre, with about 16% of that during the period between September and January. Limpograss can be stockpiled (i.e. deferred grazing) starting between early August and early September, and can accumulate between 1 to 4 tons of dry matter per acre. The most interesting trait, however, is the slow decline on digestibility compared to other grasses, sustaining levels of over 55% *in vitro* organic matter digestibility even after 16 weeks of stockpiling. One concern is the low protein level (~3%), and even lower protein digestibility (about 50%, when stockpiled). This means that when grazing limpograss, protein supplementation is required.

Limpograss does not tolerate continuous heavy grazing. Under continuous stocking, target canopy heigh should be between 12 and 16 inches. Under rotational stocking, pre-grazing height of 18-24 inches and post-grazing between 10 to 12 inches is desirable, with a 3 to 4-week grazing interval during the peak of growing season to avoid overly mature plants. With this management and proper fertilization, crude protein levels of 8 to 10% can be achieved. Most of the nutritional value is on the top half of the canopy, where the proportion of leaves to stem is higher. Leaves can have up to 13% crude protein, compared to ~6% for stems while *in vitro* digestibility for both leaves and stems is comparable and at around 57 to 62%. Those nutritional levels should be adequate for dry, mature cows, but other categories of cattle, especially growing or lactating, will require supplementation when grazing limpograss only pastures. Alternatively, interseeding *Aeschynomene americana* (also known as joint vetch or shyleaf) can improve quality of forage available. This practice is common in south Florida as well, since *Aeschynomene* is one of the few forage legumes which can withstand poorly drained soils and reseed every year, given adequate management.

Establishment of Limpograss Pastures

Limpograss does not produce an abundance of viable seeds, hence establishment is accomplished using vegetative plant material (tops). Even so, limpograss can establish quickly and aggressively cover in a few months. Planting season is during the summer, when rainfall is abundant, unless planted under irrigation when a late spring planting is viable. The recommended planting dates range from May 15 to August 15, when there is adequate soil moisture, and at least 90 days before frost to allow adequate growth before winter dormancy.

Pasture establishment should start with a good, clean seedbed. If possible, start planning at least one season ahead. Planting annual crops can help with herbicide rotations and reduce weed pressure. Planting material needs to be mature (≥8 week old regrowth) and well fertilized. Depending on the type of planting equipment available, the tops can be harvested and handled loose; formed into small, square bales using a conventional hay baler; or formed into large, round bales. Note that baling wet material can exceed the handling capacity of regular hay equipment and cause damage. To avoid equipment failure, growers are advised to use balers adapted to silage/haylage and to reduce the density and size of bales, so they are lighter to handle. The baled material must be planted as quickly as possible (same day), so that it does not overheat. Overheating is a problem, especially for tightly-baled material, and can significantly reduce the vigor of the stems. Planting rate should be around 1,000 to 1,500 pounds of mature tops per acre. Right after planting, the tops should be lightly incorporated (disked in) into the soil, to a 2- to 3-in depth, and rolled. Once plants have emerged, apply 30 lb N/acre, plus all of the soil-test-recommended P_2O_5 and half of the recommended K_2O. Apply the remaining K_2O and 70 lb N/acre 30–50 days later. Utilization (grazing or mowing) should be delayed until pasture is well established, which could be the following spring, depending on when it was planted.

Weed Control in Limpograss Pastures

Although there are many products labeled for pasture in our herbicide arsenal, we need to be cautious on what to apply on limpograss especially during the summer. The commonly-used broadleaf herbicide 2,4-D can cause seriously injury or even kill limpograss at establishment and is especially harmful during the warm season (May-October), even in established pastures. Early recommendations for weed control focused solely on using dicamba products (Banvel, Clarity, Vanquish) for weed control. There are a number of other pasture weed products that also contain 2,4-D as an active ingredient such as GrazonNext, Weedmaster, and Crossbow. The active ingredient triclopyr can also cause severe injury during the warm months, so Remedy, and Pasturegard should also be used with caution.

There are other herbicides that can be used year-round in established pastures in addition to dicamba. Aminopyralid (Milestone), metsulfuron (MSM60, and other generic products), as well as the combination (Chaparral). Also, sulfosulfuron (Outrider) has excellent activity on annual sedges and is safe to uses on Limpograss pastures. Table 1 is a guide to safe herbicide application on Limpograss.

Table 1. Limpograss tolerance to herbicides. Herbicides are safe to apply when a particular month has a mark. If there is no mark, injury from the respective herbicide may occur.

Herbicide	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2,4-D	X	X	X	X							X	X
Chaparral	X	X	X	X	X	X	X	X	X	X	X	X
Banvel	X	X	X	X	X	X	X	X	X	X	X	X
GrazonNext HL	X	X	X	X							X	X
Milestone	X	X	X	X	X	X	X	X	X	X	X	X
Pasturegard HL	X	X	X	X							X	X
Remedy	X	X	X	X							X	X
WeedMaster	X	X	X	X							X	X
Outrider	X	X	X	X	X	X	X	X	X	X	X	X

Source: ***Weed Management in Limpograss***

For more information on limpograss production and weed management, consult the publications listed below under other resources. For further assistance, contact your local extension office.

Other resources available

SS-AGR-320 ***Limpograss (*****Hermartria altissima*****): Overview and Management,*** *Joao Vendramini, Lynn E. Sollenberger, and Ken Quesenberry, Marcelo Wallau, and Jose C.B. Dubeux Jr., published in Ask IFAS: https://edis.ifas.ufl.edu/publication/AG330*

SS-AGR-161 ***Forage Planting and Establishment Methods on Prepared Seedbed,*** *Marcelo Wallau and João Vendramini., published in Ask IFAS: https://edis.ifas.ufl.edu/publication/AG107*

SS-AGR-334 ***Weed Management in Limpograss****, Brent Sellers, Pratap Devkota, and Jay Ferrell, UF/IFAS Weed Specialists, published in Ask IFAS: https://edis.ifas.ufl.edu/publication/AG344*

SS-AGR-08 *Weed Management in Pastures and Rangeland—2020, Brent Sellers, Pratap Devkota, and Jay Ferrell, UF/IFAS Weed Specialists, published in Ask IFAS: https://edis.ifas.ufl.edu/publication/WG006*

THE POTENTIAL OF SILAGES IN BACKGROUNDING DIETS

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Introduction

With 929,000 head of beef cattle and an annual sales revenue of $522 million, the Florida cow/calf industry is on the main economic engines of the state (USDA NASS, 2019). Averaged across the U.S., the cow/calf segment of the beef industry shows a revenue of $30 and $60/head for 2020 and 2021 (projected), respectively (CattleFax, 2021). During the same timeframe, the stocker segment of the industry showed profits averaging $40 and $90/head for 2020 and 2021 (projected), respectively (CattleFax, 2021). In particular, the projections for 2021 show the potential for stocking/backgrounding systems to create profit in beef cattle operations, as long as the input costs, largely feed, can be minimized. The development of cost-effective alternatives for adding value to cattle beyond weaning has been one of the objectives of the NFREC Beef and Forage Program.

Opportunities exist to add value to Florida calves, particularly in northern Florida, where the combination of soils and climate allow for certain row crops and winter forages to provide cost-effective feeding option for backgrounding cattle. The opportunities that exist to add weight to weaned cattle by grazing winter forages, have been extensively discussed in the past and it has been showcased in previous field days conducted at NFREC. With optimal grazing management, there is no question that it is possible to produce growth rates of more than 2 lb/animal/d in growing beef cattle for at least 100 days, by grazing winter annual forages in North Florida.

One of the venues that has been recently explored at NFREC is the opportunity that ensiled feeds offer to minimize the feed cost of gain (FCOG). The FCOG is typically expressed in $/lb and it should be the main variable to watch when considering adding value to calves via stocking/backgrounding. As long as the FCOG remains below the market price of backgrounded calves, this could be a viable alternative to turn a profit. However, before making a final decision, the cost/convenience of delivering the feed needs to be considered. This is often one of the challenges with ensiled feeds, but as it will be discussed below, there are some practical alternatives that can help manage this issue. While corn prices are forecasted to increase in the near future, thereby increasing the cost of most of the commodities available in the region, some alternatives exist that may be attractive to beef and forage producers in the region. Whole-plant corn and sorghum silage produced in North Florida can be some of the least costly feeds in terms of $ per lb of dry matter (DM) offered. In these proceedings we will share some of the early experiences at NFREC with the use of ensiled corn and sorghum, as well as some comments about the most recent experiments with ensiled ryegrass and limpograss.

First things first… what is the cost of producing corn and sorghum silage, and what type of performance may be expected in growing calves?

A series of experiments were conducted at NFREC in which corn silage was compared to sorghum silage. An experiment conducted from January to March of 2021 at NFREC, compared the performance and cost of feeding a corn silage-based vs. a sorghum silage-based diet in the backgrounding period. The diets tested two sources of protein (cottonseed meal or carinata meal) and a treatment was included to test the effects of feeding a corn silage-based diet without any supplemental protein. The results are showed in Table 1 including an economic analysis of the FCOG.


Figure 1. Corn harvesting for silage at NFREC.

Figure 2. Harvesting of corn for silage and feeding sorghum silage to cattle at NFREC.

Table 1. Backgrounding study conducted at NFREC with 105 weaned steers averaging 742 lb of BW at the beginning of the study. The study lasted 56 days after a 14-day adaptation period.

	Sorghum silage + 10% cottonseed meal	**Sorghum silage + 10% carinata meal**	**Corn silage + 10% cottonseed meal**	**Corn silage + 10% carinata meal**	**Corn silage only**
ADG, lb/d	2.07	2.13	2.97	3.02	1.57
FTG, lb of DM /lb of BW	10.2	8.6	7.2	6.8	11.3
DMI, % of BW	2.58%	2.27%	2.50%	2.44%	2.24%
Total diet cost[1], $/ton of DM	$141	$139	$152	$150	$120
FCOG[2], $/lb	$0.72	$0.60	$0.55	$0.51	$0.68
Diet[3] NEm, Mcal/lb of DM	0.68	0.75	0.81	0.83	0.67
Diet[3] NEg, Mcal/lb of DM	0.40	0.47	0.53	0.54	0.40

[1] Calculated using the following prices (all in $/ton as fed, using 35% DM for silages): corn silage = $42/ton, sorghum silage = $38/ton, cottonseed meal = $320/ton, carinata meal = $300/ton
[2] FCOG = Feed cost of gain. Represents the feed cost for every lb of body weight gained.
[3] Calculated from performance.

The issue of feeding silages daily

One of the first limitations when considering feeding silages is the need to have the proper feeding equipment and facilities (i.e., mixer, tractor, bunks). Some options that are being explored at NFREC include the used of "self-fed" silage bags such as the one in Figure 3. Under this very low-cost approach, a silage bag can be opened in one end, with two hot wires running across the face of the silage bag while fencing off the sides of the bag to prevent ruptures by cattle trampling. This can largely simplify the daily feeding of silage, minimizing feed waste. However, two considerations are essential for this to work: 1) the number of cattle per bag needs to be large enough to ensure that the bag advances at least 1 foot per day; and 2) protein needs to be supplemented on the side when feeding growing cattle. For item 1), the need to advance 1 foot is to ensure that fresh material is feed daily. In a 10- or 12-foot bag the air may penetrate as much as 1 foot/day. Thus, if not enough cattle are assigned per bag face, the animals may end up consuming silage that has been exposed to air and thus lost nutrients. In general, between 80 to 100 head of 500 to 600 lb calves may be needed to ensure that the intake of the silage bag advances at least 1 linear foot per day in a 12-foot bag. Regarding condition 2), the protein in either corn or sorghum silage alone is not sufficient to sustain growing cattle. Table 1 shows a good example of how performance is affected when o protein is supplemented.

Figure 3. Use of a self-fed corn silage bag with growing cattle at NFREC.

How about ensiled winter and summer forages?

At NFREC we have been experimenting with ensiled ryegrass and, most recently, limpograss, in an effort to become independent from buying commodities when growing replacement heifers or stocking cattle over the winter. Our preliminary results are very promising and show the potential of some of these technologies to harvest forages quickly and effectively. Ensiling forages allows taking advantage of the excess forage growth, while minimizing the reliance on the production of hay reserves at a time of the year that in which excessive rains complicate the process. If nothing else, this year has been a prime example of how difficult can be to produce quality hay in the Florida summer.

Take Home Message

Market signals show the potential profitability of beef cattle backgrounding/stocking systems when feed costs can be managed. The used of ensiled feeds such as whole-plant corn or sorghum can be an attractive alternative, generating backgrounding diets in the range of $140 to $150/ton of DM. Options are being explored to reduce the labor involved in silage feeding, including the possibility of self-feeding silage bags. Protein supplementation needs to be considered when using corn or sorghum silage to feed growing cattle.

References

CattleFax. 2021. Market Outlook. Presentation by Randy Blach on 9/9/21 in the 2021 Liquid Feed Symposium held in Chicago, IL.

USDA National Agricultural Statistics Service. 2019 State Agricultural Overview, Florida, https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=FLORIDA