Effects of K and N Fertilization on Bahiagrass Forage Accumulation, Root-Rhizome Mass, and Tissue K Concentration.

James K. Yarborough, Joao M.B. Vendramini, Maria Lucia A. Silveira, Lynn E. Sollenberger, Ramon G. Leon, Frank Kuwahara, Joao M.D. Dalmazo Sanchez, Ulysses Cecato and Cecilio Vegas Filho

Introduction

- Bahiagrass (*Paspalum notatum* Flügge) is the most planted warm-season grass in Florida.
- Fertilization is a management practice with potential to decrease variations in bahiagrass forage quantity and quality; however, commercial fertilizers are the most costly input in warm-season grass forage production.
- Nitrogen is routinely the first nutrient fertilized to warm-season grass pastures due to the greater response on forage production and nutritive value. However, repeated fertilization with N only may cause an insufficiency of other nutrients in the soil, which may impact forage production, nutritive value, and persistence negatively.
- Potassium is an important macronutrient for production and persistence of warm-season grasses. Due to the limited cation exchange capacity of Florida's sandy soils and limited potassium fertilization, warm-season grasses may likely face potassium deficiency and it may became the most limiting nutrient in bahiagrass pastures in Florida.

Objectives

- To evaluate the effects of N and K fertilization on herbage accumulation, nutritive value, and persistence of bahiagrass
- To determine the critical K levels on bahiagrass plant tissue

Methods and Materials

- A field and a green house experiment were conducted in 2014 and 2015.
- The greenhouse experiment was conducted at the UF/IFAS Range Cattle Research and Education Center, Ona, FL.
- Treatments were the factorial arrangement of N fertilization levels (0, 50 and 100 kg N ha^{-1}) and K fertilization levels (0, 16, 33, and 66 kg K ha^{-1}) distributed in a randomized complete block design with four replicates.
- The "E" horizon of a Pomona Sand soil was collected and used as a growing media in pots designed to grow tree seedlings (10 cm diameter x 41 cm height) with approximately 10 kg of soil per pot.
- All pots received the equivalent of 12 kg ha^{-1} P and 2 kg ha^{-1} of micronutrients (F503G micromix). The sources of fertilizer applied were ammonium nitrate, sodium phosphate, and potassium chloride. Fertilizer levels were calculated on a weight basis.
- Pots were harvested at 5-cm stubble height every 6 wk and herbage accumulation determined. Subsamples were dried at 60ºC for 48 h and ground to pass a 1-mm screen in a Wiley mill (Udy Corporation, Fort Collins, CO). and analyzed for N and K concentrations.
- The field experiment was conducted at two locations at Deseret Ranches.
- Treatments were the split plot arrangement of 3 N levels (0, 50 kg N ha^{-1} applied in May, or two applications of 50 kg ha^{-1} in May and August) and 2 K fertilization levels (0, and 42 kg K ha^{-1}).
- Samples where harvested every 6 weeks to measure herbage mass, and tissue K concentration. Root-rhizome samples were collected at the termination of the experimental period.

Results

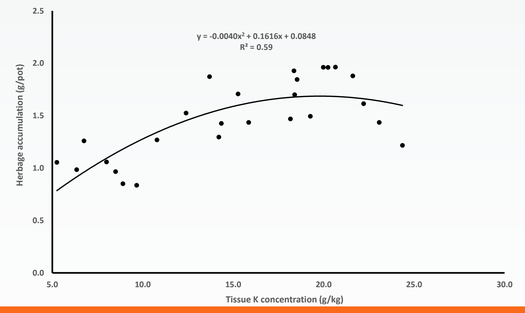
- Potassium fertilization did not affect average pre-grazing herbage mass, crude protein, and in vitro digestible organic matter concentrations; however, pre-grazing bahiagrass tissue K concentration increased from 10 to 12 g/kg with increasing K fertilization levels from 0 to 42 kg K ha^{-1}

Response variable/Location	Month					
	June	August	September	November	December	SE
Herbage mass		----------	Mg ha^{-1}	----------		
Location 1	2.8c†	4.1b	4.8a	3.3c	2.8c	0.3
Location 2	1.3b	2.8a	2.5a	1.8b	1.2b	
SE			0.3			
P value‡	<0.001	<0.001	<0.001	<0.001	<0.001	
IVDOM		----------	g kg^{-1}	----------		
Location 1	520a	467b	438b	453b	395c	4.5
Location 2	520a	483b	469b	467b	424c	
SE			4.7			
P value	0.97	0.03	<0.01	0.04	<0.01	
CP		----------	g kg^{-1}	----------		
Location 1	80a	82a	70b	72b	75b	2.1
Location 2	89a	86a	89a	93a	75b	
SE			2.1			
P value	0.04	0.12	<0.01	<0.01	0.89	
K		----------	mg kg^{-1}	----------		
Location 1	13.6a	12.2a	11.3a	11.8a	6.7b	0.6
Location 2	13.3a	12.1a	12.8a	10.6b	4.9c	
SE			0.5			
P value	0.61	0.83	<0.01	<0.01	<0.01	

- There was a N x K fertilization interaction effect on bahiagrass root-rhizome mass. Potassium fertilization increased root-rhizome mass only with no N fertilization.

N fertilization	Potassium fertilization level (kg K ha^{-1})		*P* value	SE
	0	42		
	--Root-rhizome mass (kg ha^{-1})--			
0	787a†	988a	0.043	112
1N‡	923a	1036a	0.064	
2N	900a	1034a	0.091	
SE	80			

- The greatest herbage accumulation occurred with tissue K concentration of 17 g/kg



Conclusions

- Potassium fertilization may not increase pasture herbage mass, but due to increased root/rhizome mass, it may increase pasture persistence.
- A split application of N in the late summer months may not increase pasture herbage mass, especially in areas with high rainfall.
- Tissue K concentration is variable and may not be a consistent parameter for K fertilization decisions.

James K. Yarborough
jyarborough@ufl.edu