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

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Introduction

- Bermudagrass (*Cynodon dactylon* L.) is the most planted warm-season grass in the southeastern USA.
- Fertilization is a management practice with potential to decrease variations in bermudagrass 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 bermudagrass pastures in Florida.

Objectives

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

Methods and Materials

- The experiment was conducted in a green house at the UF/IFAS Range Cattle Research and Education Center, Ona, FL from August to December 2014.
- Treatments were the factorial arrangement of N fertilization levels (0, 50 and 100 kg N ha^{-1}) and K fertilization levels (0, 20, 40, and 80 kg K_2O ha^{-1}) distributed in a completely randomized 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 plots 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 7-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.

Results

- There were no effects of K fertilization levels on herbage accumulation (HA) and root and rhizome mass with 0 N fertilization level; however, both response variables increased linearly with increasing levels of K fertilization at 50 and 100 kg N ha^{-1}. (Table 1.)

Table 1. Herbage accumulation of Jiggs bermudagrass plants fertilized with different levels of N and K

N levels (kg ha^{-1})	K levels (kg K_2O ha^{-1})				SE	Polynomial Contrast
	0	20	40	80		
	g DM pot^{-1}					
0	2.7	3.5	2.6	3.3	0.7	NS
50	3.0	16.1	21.5	21.0	1.6	L
100	6.7	16.0	18.7	21.4	2.7	L
SE	2.0	1.7	1.5	2.1		
Polynomial contrast†	NS	L, Q	L,Q	L,Q		

† NS = not significant, L = linear, Q = quadratic

- There was a quadratic correlation of HA and K tissue concentration with HA increasing when K tissue levels increased from 0 up to 17 g K kg^{-1} DM (critical level) (Figure 1).

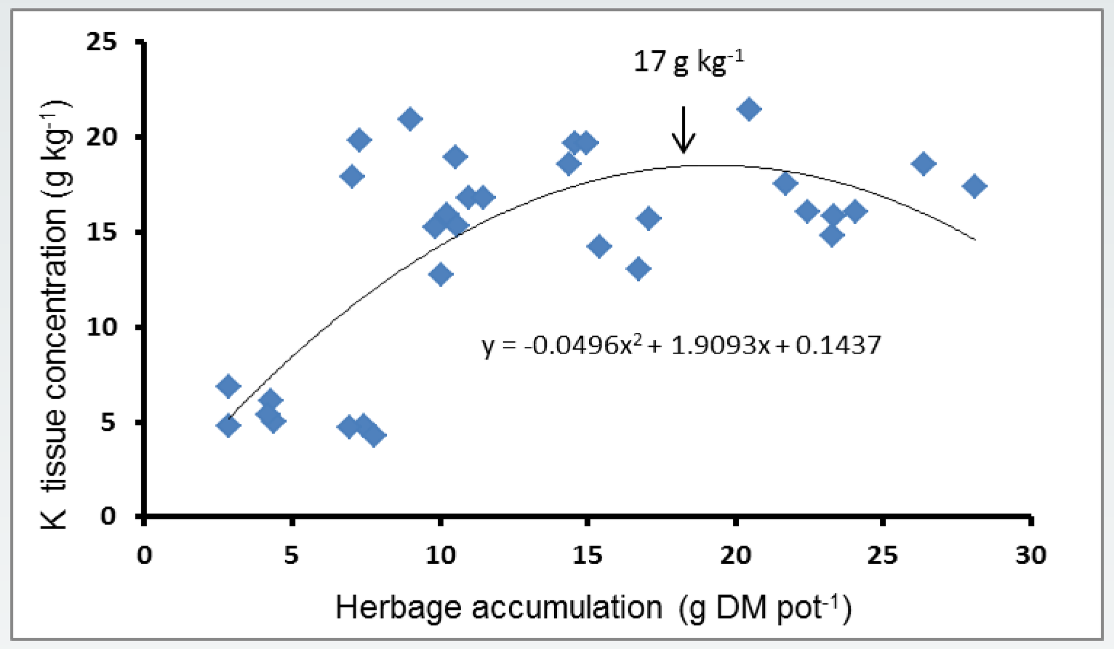

Figure 1. Critical level of K tissue concentration on Jiggs bermudagrass

- Potassium content in roots and rhizomes decreased linearly with increasing levels of N fertilization at 0 and 20 kg K_2O ha^{-1}. Conversely, there was an increase in K content in root and rhizome at 40 and 80 kg K_2O ha^{-1} with increasing levels of N fertilization (Table 2.)

Table 2. Potassium content (concentration x root mass) in Jiggs bermudagrass roots and rhizomes

N levels (kg ha^{-1})	K levels (kg K_2O ha^{-1})				SE	Polynomial Contrast
	0	20	40	80		
	g pot^{-1}					
0	6.5	12.9	13.2	16.1	6.9	L
50	1.2	14.1	20.8	51.6	11.3	L
100	2.5	5.3	21.0	52.0	10.7	L
SE	1.2	2.4	3.7	5.5		
Polynomial contrast†	L	L	L	L		

† L = linear

Conclusion

- Nitrogen and K should be applied at the same levels to sustain production and persistence of hayfields in Florida.
- The critical level observed in this study should be incorporated in the UF/IFAS fertilization recommendations for bermudagrass.

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