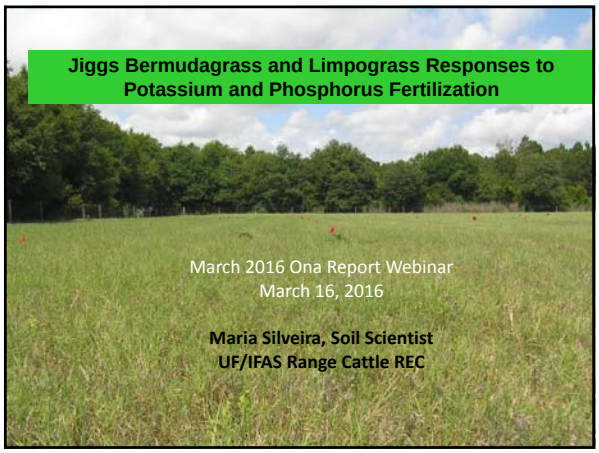

Potassium (K)

Function in plants:
- Involved in maintaining the water status of the plant and the opening and closing of its stomata
- Required for accumulation and translocation of newly formed carbohydrates
- Tissue levels ranging from 1 to 5% dry weight

Adequate K supply is associated with:
- Resistance to disease and stress pressure
- Winter hardness
- Stand longevity

Some forage crops absorb more K than any other nutrient

Soil K

- Present in the soil as K^+ cation
- Plant availability is influenced by soil pH
- Weekly sorbed in soil colloids, particularly in coarse-texture soils
- Subjected to leaching

NPK Fertilizer Efficiency as Affected by Soil Acidity

Soil Acidity	Soil pH	Fertilizer Efficiency (%)		
		Nitrogen (N)	Phosphorus (P)	Potassium (K)
Extreme	4.5	30	23	33
Very strong	5.0	53	34	52
Strong	5.5	77	46	77
Medium	6.0	89	52	100
Neutral	7.0	100	100	100

Source: Jones, 2012

Phosphorus (P)

Function in plants:
- Component of DNA and ATP ("energy unit" of plants)
- Catalyst in biochemical reactions, including the conversion of sun's energy into other compounds
- Tissue levels ranging from 0.1 to 0.5% dry weight

Adequate P supply is associated with:
- Adequate root development

Most forage crops require relatively less P than other macronutrients

Total macronutrients taken up by forage crops

Forage Crop	Yield (T/A)	Uptake (lb/A)		
		N	P_2O_5	K_2O
Jiggs bermudagrass[1]	11	398	146	390
Coastal bermudagrass[2]	8	368	96	400
Ona stargrass[1]	7	316	154	306
Floralta limpograss[1]	6	237	137	200
Bahiagrass[3]	5	192	53	223
Perennial peanut[3]	5	288*	55	229
Red clover[2]	4	300*	50	265

Source: [1]Silveira et al., 2013; [2]Griffith and Murphy, 1996; [3]Mackoviak et al., 2013.
*Legumes obtain nitrogen from the air via symbiotic fixation.

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UF/IFAS P and K Fertilizer Recommendations for Jiggs Bermudagrass

- Maintenance Fertilization of Established Pastures:
80 lb N/A, all of the P_2O_5 (80-60 lb P_2O_5/A), and 50% of the K_2O (40-20 lb K_2O/A) in early spring. Apply 80 lb N and the remaining K2O (40-20 lb K_2O/A) at mid-season

- Hay production:
80 lb N/A and all of the recommended P_2O_5 and K_2O in early spring. Apply an additional 80 lb N and 40 lb K_2O/A after each cutting, except the last in the fall. Include 20 lb of P_2O_5/A in the supplemental fertilizer if the soil tested low or medium in P.

4 cuts (assuming soil tested low in P and K): 240 lb/A of N, 100 lb/A of P_2O_5, and 160 lb/A of K_2O

UF/IFAS P and K Fertilizer Recommendations for Limpograss

- Maintenance Fertilization of Established Pastures:
60 lb N/A and all of the P_2O_5 (20 lb P_2O_5/A if soil tested low) and K_2O (40-20 K_2O/A) in late winter or early spring. Apply an additional 60 lb N in late summer or early fall. For a minimum fertilization alternative, ignore the P and K recommendation and apply only 60 lb N per year.
- Hay production:
80 lb N/A and all of the recommended P_2O_5 and K_2O in late winter or early spring. Apply an additional 80 lb N and 40 lb K_2O/ A after each cutting, except the last in the fall. If the soil tested Low in P, then include 20 lb P_2O_5/A in the supplemental fertilizer if the soil tested low or medium in P.

4 cuts (assuming soil tested low in P and K): 240 lb/A of N, 40 lb/A of P_2O_5, and 120 lb/A of K_2O

Objectives

1. To evaluate Jiggs bermudagrass and limpograss responses to "minimum" potassium and phosphorus fertilization

1. Initial soil pH was 5.3 and M-1 extractable P, K, and Mg concentrations were 23, 12, and 293 lb/A, respectively. These levels are considered to be medium for P, very low for K, and very high for Mg.

3. Application levels:
   - Potassium: 0, 40, and 80 lb K_2O/A (0, 50, and 100% recommended rates for established pastures)
   - Phosphorus: 0, 20, and 40 lb P_2O_5/A (0, 50, and 100% recommended rates)
   - 2 N levels (80 and 160 lb N/A)

Rainfall (inches) during the study period

	2012	2013	2014	71-yr Average
January	0.47	0.5	3.72	2.1
February	0.39	0.7	1.31	2.5
March	0.25	0.7	3.12	3.1
April	2.46	3.6	1.11	2.5
May	1.41	1.8	5.87	3.7
June	9.41	9.7	6.54	8.6
July	7.52	10.4	8.38	8.3
August	6.6	7.4	3.75	8.4
September	7.19	7.3	11.64	7.3
October	5.09	0.5	0.82	3.0
November	0.54	0.9	4.18	1.9
December	1.17	0.1	0.25	2.0
Total	42.5	43.3	50.7	53.4

Effect of K fertilization on 'Jiggs' bermudagrass yield and stand loss[1]

Annual K_2O application level	Cumulative Dry Matter Yield		
	2012	2013	2014
	lb/A		
0	4536	820	1124
40	5719	1815	3959
80	6517	2216	5357
Orthogonal Contrast	Linear***	Linear**	Linear***

44, 170, and 370% increases in DM yield in 2012, 2013, and 2014, respectively

[1]Silveira et al (data not published).
[2]Frequency and ground cover were measured at the end of 2014 growing season.
[3]Values represent the 3-yr average
*** = P ≤ 0.0001

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Effect of K fertilization on 'Jiggs' bermudagrass yield and stand loss[1]

Annual K_2O application level	Cumulative Dry Matter Yield			Frequency [2]	Ground Cover[2]	Crude Protein[3]
	2012	2013	2014			
	lb/A			%		
0	4536	820	1124	37	31	15.2
40	5719	1815	3959	50	52	14.0
80	6517	2216	5357	54	54	13.7
Orthogonal Contrast	Linear***	Linear**	Linear***	Linear***	Linear***	Linear***

[1]Silveira et al (data not published).
[2]Frequency and ground cover were measured at the end of 2014 growing season.
[3]Values represent the 3-yr average
*** = P ≤ 0.0001

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CONTROL
Jiggs – May 5, 2014


40 lb
K_2O/A
Jiggs – May 5, 2014


80 lb
K_2O/A
Jiggs – May 5, 2014


Jiggs – January, 2014


CONTROL
Jiggs – January, 2014


80 lb K_2O/A
Jiggs – January, 2014

Effect of K fertilization on limpograss yield and stand loss[1]

Annual K_2O application level	Cumulative DMY		
	2012	2013	2014
	lb/A		
0	12408	4189	8779
40	11015	4921	10947
80	12135	5798	12900
Orthogonal Contrast	NS	Linear***	Linear ***

38 and 42% increase in 2013 and 2014, respectively

[1]Silveira et al (data not published).
[2]Frequency and ground cover were measured at the end of 2014 growing season.
[3]Values represent the 3-yr average
NS= not significant; * = P ≤ 0.05;** = P ≤ 0.01; *** = P ≤ 0.0001

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Effect of K fertilization on limpograss yield and stand loss[1]

Annual K_2O application level	Cumulative DMY			Frequency[1]	Ground Cover[1]	Crude Protein[2]
	2012	2013	2014			
	lb/A			%		
0	12408	4189	8779	60	65	6.7
40	11015	4921	10947	92	87	6.2
80	12135	5798	12900	94	89	6.1
Orthogonal Contrast	NS	Linear***	Linear ***	Linear **	Linear ***	Linear *

[1]Silveira et al (data not published).
[2]Frequency and ground cover were measured at the end of 2014 growing season.
[3]Values represent the 3-yr average
NS= not significant; * = P ≤ 0.05;** = P ≤ 0.01; *** = P ≤ 0.0001

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Limpo – May 5, 2014

Conclusions

- K increased Jiggs bermudagrass and limpograss dry matter yield and decreased stand loss in the 3-yr study.
- Despite the positive effect of K, Jiggs bermudagrass dry matter yield observed in 2014 was significantly lower than those obtained in the first year of study and considerable stand losses and concomitant weed infestation occurred at the end of the study.
- Although the amounts of K exported via above-ground biomass were, in general, similar or less than those applied as fertilizer, K fertilization at the levels tested in this study were likely not sufficient to sustain the same level of production during the 3-yr study.

Conclusions

- Limpograss may require relatively lower levels of K fertilization than Jiggs bermudagrass to sustain production and stand persistence.
- No effect of P on Jiggs bermudagrass and limpograss responses were observed.

May 17, 2013
Source: Ed Jennings, Multi-county livestock agent

June 28, 2013 (42 days)
Source: Ed Jennings, Multi-county livestock agent

THANKS

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UF/IFAS P and K Fertilizer Recommendations

Table 1. Current Mehlich-3 soil test interpretations used for agronomic crops.

	Mehlich-3, mg kg^{-1}		
Nutrient	Low	Medium	High
P	≤25	26–45	>45
K	≤35	36–60	>60
Mg	≤20	21–40	>40

Source: Mylavarapu, Obreza, Morgan, Hochmuth, Nair, and Wright. 2014. *Extraction of Soil Nutrients Using Mehlich-3 Reagent for Acid-Mineral Soils of Florida*. Gainesville: University of Florida Institute of Food and Agricultural Sciences. http://edis.ifas.ufl.edu/ss620.