MACRO MINERAL CONTENTS OF MIXED *Panicum maximum* AND *Stylosanthes guianensis* AS INFLUENCED BY PLANTING PATTERNS AND AGE AT HARVEST

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ABSTRACT
A 15-week experiment was conducted on the macro mineral contents of mixed *Panicum maximum* and S*tylosanthes guianensis* as influenced by planting patterns and age at harvest. Four planting patterns were employed: *Panicum maximum* (Pm), *Stylosanthes guianensis* (Sg), Single row *Stylosanthes guianensis* with *Panicum maximum* (SSg+Pm), Double row *Stylosanthes guianensis* with *Panicum maximum* (DSg+Pm) and age at harvest: 5, 10, and 15 weeks after planting (WAP). The experiment was laid in a Randomized Complete Block Design (RCBD) at 5% probability level. The macro mineral contents determined were P, Ca Mg, K and Na. At 5 WAP, DSg+Pm had the highest ($p<0.05$) mineral concentrations while SSg+Pm recorded highest content of Ca, Mg and K at 10 and 15 WAP. It can therefore be concluded that interplanting a single row of *S. guinensis* in *P. maximum* and harvesting at 10 weeks after planting will give adequate P, Ca and K concentration to the animals without supplementation. Thus, production and performance of ruminant would be enhanced.

KEY WORDS: *Panicum maximum, Stylosanthes guianensis*, planting pattern, age at harvest

INTRODUCTION
The poor performance of ruminant in Nigeria has been attributed to large dependent on natural pastures which on several occasions has been reported to be low both in quantity and quality in nutrients composition when compared to their counterpart in the temperate region (Tian *et al.,* 2000). Muinga *et al*. (2007) reported that tropical grasses are typically known to have low crude protein that cannot solely sustain ruminant animals throughout the year, hence, need for intercropping with forage legumes become important to boost their nutritional content (Bayble *et al.,* 2007). Intercropping legume with grasses has been discovered to increase forage dry matter yield, crude protein content, voluntary feed intake and digestibility thus improved milk and weight gain (Tukel and Yilmaz, 1987; Muinga *et al.,* 2007). Also, interplanting of legumes with grasses usually results in increased yield, higher quality, improved seasonal distribution and mineral contents of the forage (Baylor, 1994). Minerals play significant role in activities of enzyme, hormone, as constituents of body fluids and tissues, regulators of cell replication and differentiation, however, its deficiencies, imbalances and toxicity could impair health and reproduction status in the livestock (Sharma *et al*., 2007). Although lots of work has been done on yield and chemical compositions, little information is available on the macro mineral compositions of grass-legume interplant. Hence, this study aimed to evaluate the macro mineral compositions of *P. maximum* intercropped with *S. guinensis*.

MATERIALS AND METHODS
Experimental Site
The experiment was carried out at the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso located in the derived Savanna zone of Nigeria. Ogbomoso lies at approximately $8^0$7'North of the equator and $4^0$15'East of Greenwich Meridian. (Olaniyi, 2006)
Field Layout, Management Practices and Design
Plot of 207m² was used for the experiment. The site was cleared, and seed bed measuring 4m × 4m with 1m path between beds was manually ploughed. Legume seed (*Stylosanthes guianensis*) was procured from the National Animal Production Research Institute, (NAPRI) Zaria. *Panicum maximum* (Guinea grass) was sourced from within the University pasture plot. Seed of *Stylosanthes guianensis* were scarified before planting at the rate of 10kg/ha. The experiment has four treatments; Sole *Panicum maximum* (pm), single row *Stylosanthes guianensis* with *Panicum maximum* (SSG+P),

double row Stylosanthesis with *Panicum maximum* (DSG+P), *Stylosanthes guianesis*. Each treatment was replicated thrice with the experiment laid on a randomized completely block design.

Data Collection

Forage samples were harvested at 5, 10, and 15 weeks after planting and air dried for 5 days until a constant weight was attained and stored in an air tight container for laboratory analysis.

Chemical Analysis

Five hundred (500) grams DM of grass-legumes mixtures were taken from dried samples, milled and analyzed for K, Ca, Na and Mg in digest using atomic absorption spectrophotometer and phosphorus was determined by Vonadomolybdate calorimetry method AOAC, (1995).

Statistical Analysis

All data obtained were subjected to analysis of variance using General linear model of SAS(2000).The significant means were separated using DMNRT of the same package.

RESULTS AND DISCUSSION

Results

The planting pattern and age at harvest had significant effects ($P<0.05$) on the macro mineral content of the grass legume mixture as presented in the table below. At week 5, DSg+Pm had the highest ($p<0.05$) content concentration for mineral contents. Mg was similar except for Pm (0.078 -0.081 vs 0.056%). At week 10, SSg+Pm recorded the highest mineral contents. Similar value were observed for Na for SSg+Pm and DSg+Pm (0.37 and 0.040%). SSg+Pm had the highest ($p<0.05$) Ca (3.01%), Mg (0.083%) and K (1.52%) at week 15 while highest ($p<0.05$) content of P and Na were recorded for DSg+Pm (0.25 and 0.037%) respectively.

Effect of planting pattern and age at harvest on macro mineral contents of grass-legume mixture

Parameters	%				
	P	Ca	Mg	K	Na
Week 5					
Pm	0.13^{b}	1.60^{c}	0.056^{b}	1.10^{c}	0.022^{c}
Sg	0.12^{b}	2.27^{b}	0.079^{a}	1.01^{d}	0.025^{b}
SSg+Pm	0.13^{b}	1.65^{c}	0.081^{a}	1.25^{b}	0.023^{b}
DSg+Pm	0.25^{a}	2.54^{a}	0.078^{a}	1.32^{a}	0.043^{a}
SEM	0.03	0.27	0.012	0.21	0.04
Week 10					
Pm	0.13^{d}	2.66^{b}	0.080^{b}	1.80^{a}	0.034^{b}
Sg	0.30^{b}	1.71^{c}	0.054^{b}	1.21^{c}	0.026^{c}
SSg+Pm	0.37^{a}	3.76^{a}	0.083^{a}	1.81^{a}	0.037^{a}
DSg+Pm	0.24^{c}	2.06^{b}	0.079^{b}	1.42^{c}	0.040^{a}
SEM	0.09	0.15	0.011	0.15	0.05
Week 15					
Pm	0.12^{c}	2.13^{b}	0.078^{b}	1.45^{b}	0.029^{b}
Sg	0.24^{b}	1.14^{d}	0.052^{c}	1.07^{d}	0.024^{c}
SSg+Pm	0.21^{b}	3.01^{a}	0.083^{a}	1.52^{a}	0.030^{b}
DSg+Pm	0.25^{a}	1.57^{c}	0.077^{b}	1.37^{c}	0.037^{a}
SEM	0.05	0.1	0.002	0.13	0.06

^{abcd} *means in column are significantly different (p<0.05*). Pm=*Panicum maximum,* Sg= *Stylosanthes guianensis,* SSg+Pm=*single row Stylosanthes guianensis with Panicum maximum,* DSg+Pm=Double row *Stylosanthes guianensis* with *Pamicum maximum,*

Discussion

Phosphorus is vital for differentiation as a component of RNA and is also responsible for the formation of organic bone matrix in farm animals (NRC, 2001). The range of phosphorus concentrations observed in this study except for Pm, Sg and SSg+Pm at 5 weeks of age was higher than 0.15% recommended for ruminant animals (NRC, 1985) while the range for potassium content in

all the studied forages is higher than the recommended value (0.80%) by NRC (1985). Therefore, phosphorus content of mixture of *P. maximum* with double row of *S. guinensis* at 5 weeks of harvest and other forages at 10 and 15 weeks of harvest will adequately meet the dietary requirements of animals without supplementation. Calcium is the most abundant and needed mineral in the animal body and it primarily functions as a component of the skeletal system Amole *et al.* (2015). It is also involved in vital functions such as blood clotting, transmission of nerve impulse, muscle contractions and cardiac regulation (NRC, 2001). The recorded values in this present study were higher than INRA (1988) and NRC (1985) recommendation for animals. Therefore, forages harvested at 5 to 15 weeks of harvest are adequate in furnishing the fed animals with required Ca and P. However, the observed concentration for Mg was lower to 0.12-0.18% recommended by NRC (1985). The variation could be associated to low content of Mg in the soil. Mile and Manson (2000) also reported that the level of P, K, Ca and Mg in the plant depends upon the availability of these minerals in the soil.

The significant difference in mineral concentrations observed for studied forages could be associated with ability of legumes to fix more N into the soil and as well available for their companion grasses. Raynold (1992) reported that as the level of nitrogen in the soil increases the amount of available minerals in the soil increases. Residual effect of decayed leaves through senesces and dead root nodules of associated legumes which are re-mineralized by the plants (Aderinola, 2007) could have contributed to the better result in the sole legume and mixtures as compared with sole panicum. Meanwhile, the decrease observed for the minerals as the age at harvest increases agreed with the observation of Tudsri *et al.* (2014) who reported that as the plant matures in age, their mineral concentrations decrease.

CONCLUSION AND RECOMMENDATION

DSg+Pm at 5 weeks after planting had the highest concentration for mineral contents.

SSg+Pm at 10 weeks after planting recorded highest P, Ca and K while highest Mg was similar at 10 and 15 weeks after planting.

Harvesting single row of *S. guinensis* intercropped with *P. maximum* at 10 weeks after planting is recommended.

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