MACRO-MINERAL COMPOSITIONS OF PANICUM (*Panicum maximum*) intercropped WITH CENTRO (*Centroseina pascuorum*) AND CLITORIA TERNATEA

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ABSTRACT

A study was conducted to determine the mineral compositions of *Panicum maximum* (unimproved) when planted solely or intercropped with *Centrosema pascuorum*or *Clitoria ternatea*. The study was arranged in a randomized complete block design and it include three treatments which are: *Centrosema pascuorum-Panicum maximum* (unimproved); *Clitoria ternatea-Panicum maximum* (unimproved); and Sole *Panicum maximum* (unimproved). The result revealed that the main effect of legume intercrop and age at harvest on the mineral compositions of *Panicum maximum* (Local) as were significantly ($P<0.05$) different. Sole Panicum (SP) had highest contents of Calcium (Ca; 2.98g/kg), Potassium (K; 7.38 g/kg) and Magnesium (Mg; 6.76 g/kg) without legume influence while the intercrop of *Panicum maximum* with *Centrosema pascuorum* (PCP) had highest Phosphorus (P; 2.92 g/kg) due to the effect of legume species. At 4 weeks after planting (4 WAP), K (7.80%) and P (3.30 g/kg) were higher while Ca (3.07 g/kg) and Mg (6.34 g/kg) were higher at 8 WAP. The interactive effect of legume intercrop and age at harvest on the mineral compositions of *Panicum maximum* (Local) were significantly ($P<0.05$) different. At 4 WAP, the intercrop of *Panicum maximum* with *Clitoria ternatea* (PCT) had highest Ca (2.78 g/kg), K (8.58 g/kg) and Mg (6.95 g/kg) contents while PCP had highest P (3.73 g/kg) at the same age at harvest (4 WAP). However, Ca (3.27 g/kg) and Mg (6.85 g/kg) of SP were higher than other interactions at 8 WAP. Though sole Panicum was the richest of all the treatments, but the result revealed that the unimproved *P. maximum* was rich in investigated minerals irrespective of the treatments. The concentrations are within the requirements of the ruminants. In addition, the mineral concentrations of this study didn't reduce with age or stage of maturity of the plant.Hence, harvesting at 8 weeks after planting is hereby recommended without further supplementation of minerals.

INTRODUCTION

Grazing livestock in the tropics most often do not receive mineral supplementation, except for common salt, and must depend almost exclusively upon forages for their requirements (McDowell *et al.*, 1984). Livestock usually obtain most of their dietary nutrients from the feed they consume.An adequate intake of forages and minerals in base feedstuffs by grazing animals determines the level of mineral consumption. The level of minerals in plants depends on interactions amongst a number of factors including soil type, plant species, stage of maturity, dry matter yield, grazing management and climate (McDowell *et al.*, 1985; Khan *et al.*, 2005). However, efforts to minimize the cost of mineral supplementation in livestock production require a thorough knowledge of the supply and availability of mineral nutrients in feed and forages (Dost *et al.*, 1990). Therefore, this study was aimed to evaluate the mineral compositions of *Panicum maximum* (Local) when intercropped with *C. pascuorum*or *C. ternatea*.

MATERIALS AND METHODS

The study was carried out at the Pasture unit of the Teaching and Research Farm, Oyo State College of Agriculture and Technology, Igboora. The area has a mean annual rainfall of 1230mm in a bimodal distribution pattern. Mean monthly temperature ranges between 25.70°C in July and 30.20°C in February. The study was arranged in a randomized complete block design and it include the following treatments:*Centrosema pascuorum+Panicum maximum* (unimproved); *Clitoria ternatea+ Panicum maximum* (unimproved); and Sole *Panicum maximum* (unimproved). A total land area of $100m^2$ was cleared, stumped, manually-tilled, leveled and thereafter divided into 3 equal blocks. Each block was subdivided into 3 equal plots. All treatments

were equally replicated and represented thrice. Each plot measures 3m x 3m with 0.5m spacing between the plots and blocks. After pegging and before planting, soil samples were randomly collected from the plots at the depth of 0-15 cm using soil auger to represent the topsoil. The samples were bulked per replicate, mixed thoroughly and sub-sample was taken for analysis to determine the pre-planting physico-chemical properties of the soil. After land preparation, legumes were drilled along the rows with 100cm inter-row spacing. Crown splits of Panicum were sourced within the College and cut to equal height 15cm. Three tillers of Panicum were sown two weeks after legumes were sown on mixture plots with 50cm and 20cm inter-row and intra-rows spacing, respectively. Inter-row spacing of 50cm was used on sole Panicum plots.

Chemical analysis and Statistical Analysis

The samples were firstly taken through wet ashing prior to the determination of the concentrations of Calcium (Ca), Potassium (K), Phosphorus (P) and Magnesium (Mg) using an Atomic Absorption Spectrophotometer (Fritz and Schenk, 1979). Data collected were subjected to Analysis of Variance (ANOVA) and treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% level of significance (SAS, 1999).

RESULTS AND DISCUSSION

The concentrations of minerals in forages are dependent upon interaction of some factors which include soil, plant species, stage of maturity, yield, pasture management, climate and season of the year (McDowell, 1985). The main effect of legume intercrop and age at harvest on the mineral compositions of *Panicum maximum* (Local) as presented in Table 2 were significantly (P<0.05) different. Sole Panicum (SP) had highest contents of Calcium (Ca; 2.98g/kg), Potassium (K; 7.38 g/kg) and Magnesium (Mg; 6.76 g/kg) without legume influence while the intercrop of *Panicum maximum* with *Centrosema pascuorum* (PCP) had highest Phosphorus (P; 2.92 g/kg) in the effect of legume species. At 4 weeks after planting (4 WAP), K (7.80%) and P (3.30 g/kg) were higher while Ca (3.07 g/kg) and Mg (6.34 g/kg)were higher at 8 WAP.The interactive effect of legume intercrop and age at harvest on the mineral compositions of *Panicum maximum* (Local) as presented in Table 3 were significantly (P<0.05) different. At 4 WAP, the intercrop of *Panicum maximum* with *Clitoria ternatea* (PCT) had highest Ca (2.78 g/kg), K (8.58 g/kg) and Mg (6.95 g/kg) contents while PCP had highest P (3.73 g/kg) at the same age at harvest (4 WAP). However, Ca (3.27 g/kg) and Mg (6.85 g/kg) of SP were higher than other interactions at 8 WAP. Highest contents of K (8.45 g/kg) and P (2.52 g/kg) were obtained in PCTat 8 WAP. However, Ca contents of the grass were above 1.15 g/kg DM recommended for adult sheep weighing 50kg live-weight (ARC, 1980; McDowell, *et al.*, 1993). Also, P contents of the grass falls within and extends beyond 1.60-2.70 g/kg DM recommended for adult sheep (McDowell,*et al.*, 1993). It also fell within 1.6-3.8 g/kg DM range of NRC (1984). Mg plays a key role in the metabolism of carbohydrate and lipids as a catalyst of wide range array of enzymes which requires this element for optimum activity (Wacker, 1969). The Mg contents of this study fell and extended beyond the limit of the recommended (1.00-2.00 g/Kg) requirements for different classes of ruminant animals (Mc Dowell, 1992). The K concentrations of this study are within the critical level (7.00-8.00 g/kg) required for adult sheep (McDowell,*et al.*, 1993; Renner, 2001).

CONCLUSION

Though sole Panicum was the richest of all the treatments, but the result revealed that the unimproved *P. maximum* was rich in investigated minerals irrespective of the treatments. The concentrations are within the requirements of the ruminants. In addition, the mineral concentrations of this study didn't reduce with age or stage of maturity of the plant. Hence, harvesting at 8 weeks after planting is hereby recommended without further supplementation of minerals.

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Table 1: Main effects of legumes and age at harvest on the mineral compositions of *Panicum maximum*

Parameters	Ca	K	Mg	P
		g/kg		
Effect of Legume				
SP	2.98^{a}	7.38^{b}	6.76^{a}	2.27^{c}
PCP	2.41^{c}	6.69^{c}	5.24^{c}	2.92^{a}
PCT	2.86^{b}	2.52^{a}	6.69^{b}	2.79^{b}
SEM	0.14	0.12	0.08	0.9
Age at harvest				
4WAP	2.40^{b}	7.80^{a}	6.22^{a}	3.30^{a}
8WAP	3.07^{a}	7.26^{b}	6.34^{a}	2.02^{b}
SEM	0.10	0.27	0.25	0.14

$^{a, b, c}$:Means in same column with different superscripts are significantly ($p<0.05$) different; SEM=Standard Error of Mean; SP=Sole *Panicum maximum;* PCP=*Panicum maximum + Centrosema pascuorum;* PCT=*Panicum maximum +Clitoria ternatea;* WAP=Weeks after Planting

Table 2: Interactive effects of legume species and age at harvest on the mineral compositions of *Panicum maximum*

Effect of Legume	Age at harvest	Ca	K	Mg	P
			g/kg		
SP	4WAP	2.68^{c}	7.93^{c}	6.66^{c}	3.11^{b}
PCP	4WAP	1.82^{f}	6.88^{d}	5.06^{e}	3.73^{a}
PCT	4WAP	2.78^{d}	8.58^{a}	6.95^{a}	3.05^{b}
SP	8WAP	3.27^{a}	6.83^{e}	6.85^{b}	1.43^{e}
PCP	8WAP	3.00^{b}	6.05^{f}	5.42^{d}	2.10^{d}
PCT	8WAP	2.93^{c}	8.45^{b}	6.43^{c}	2.52^{c}
SEM		0.11	0.20	0.18	0.18

$^{a, b, c.....f}$:Means in same column with different superscripts are significantly ($p<0.05$) different; SEM=Standard Error of Mean; SP = Sole *Panicum maximum;* PCP=*Panicum maximum + Centrosema pascuorum;* PCT=*Panicum maximum + Clitoria ternatea;* WAP=Weeks after planting