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Effect of Intercropping *Panicum maximum* var. Ntchisi and *Lablab purpureus* on the Growth, Herbage Yield and Chemical Composition of *Panicum maximum* var. Ntchisi at Different Harvesting Times

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Abstract: The study was conducted to evaluate the effect of intercropping *Panicum maximum* var. Ntchisi and *Lablab purpureus* on the growth, herbage yield and chemical composition of *P. maximum* var. Ntchisi at different harvesting times at the Teaching and Research farm, Federal University of Agriculture, Abeokuta in a randomized complete block design. Samples were collected at different harvesting times (8, 10, 12, 14 weeks after planting). The growth parameters which were plant height, leaf length, leaf number and tiller number measured showed that the intercropping of grass with legume were higher than in the sole plot of *P. maximum* var. Ntchisi. The plant yield was consistently higher ($p<0.05$) in intercropped forages than in sole throughout the harvesting times. The crude protein contents of the forages were also higher for the intercropped across the treatments. The values of the fibre components were significantly different ($p<0.05$) at different harvesting times and it was increasing as the harvesting time was increasing. From this study, considering the herbage yield and chemical composition of intecropping *Panicum maximum* var. Ntchisi and *Lablab purpureus*, they can be grazed by ruminant animals or harvested at 12 weeks after planting when the quality and quantity will support livestock productivity and can be conserved to be fed to ruminant animals during dry season when feed availability and quality are extremely low.

Key words: Intercropping, growth parameters, herbage yield, *Panicum maximum* var. Ntchisi

INTRODUCTION

Livestock production is a dominant farming enterprise in the semi-humid and humid of Africa. However, livestock keeping is limited by the availability of grazing resources in terms of quantity and quality in meeting the nutrient requirement of the animals. One way of increasing the grazing resources of natural pastures is to integrate forage legumes into the pastures, with the aim of diversifying the sources of forage and at the same time increasing the amount of protein available for the grazing animals and as well as increasing the nitrogen uptake of associated forage grass (Macharia, 2003). *Panicum maximum* species are well known as important grasses and as feed for ruminant animals in the humid zone of Nigeria. One or more species of the grass forms a major component of the natural vegetation that serves as the grazing resource to ruminants in the area (Onayinka and Akinyemi, 1976). *P. maximum* var. Ntchisi is an introduced variety and earlier studies on it (Ezenwa, 1995; Olamite, 2003; Olamite *et al*., 2006) reported its superiority over the naturalized and widely distributed local variety in terms of yield, quality and persistence. Grasses generally are typically known to have low crude protein that cannot solely sustain ruminant animals throughout the year, hence the need for intercropping with forage legumes. In recent years, the use of forage legumes in livestock production systems for ruminants in the tropics has increased with the benefits such as serving as cover against erosion, conversion of atmospheric nitrogen to forms of nitrogen which plants can take up and cycled within the plant-animal-soil system (Tarawali, 1991; Said and Tolera, 1993; Humphreys, 1995). Forage legumes can be grazed, harvested and fed fresh or stored as hay or silage (Harricharan *et al*., 1983). A better way to improving the feeding value of these tropical pasture especially for the poor resource small holders is through intercropping the grasses with forage legumes. With this in mind, the objective of this study is to evaluate the effect of intercropping of forage grass and legume on the growth, herbage yield and chemical composition of *Panicum maximum* var. Ntchisi in the humid zone of Nigeria.

MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research Farm of the College of Animal Science and

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Livestock Production, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The site is situated in the derived savanna zone of the Southwestern Nigeria on latitude 7°13' 49.46'N and longitude 3°26'11.98'E. It has a bimodal rainfall pattern with a mean annual rainfall of 1037 mm and monthly mean temperature ranging between 22.50 and 33.7°C. The land on which the experiment was established had been previous cropped of maize. Analysis of the soil from the site indicated that it was sandy clay with pH of 5.76; organic matter 3.69% and available phosphorus 83.87 mg kg^{-1}, potassium 0.20 cmol kg^{-1}, calcium 0.87 cmol kg^{-1} magnesium 0.57 cmol kg^{-1}, sodium 0.19 cmol kg^{-1} and nitrogen 0.21%. A total area of 480 m^2 used for the experiment was divided into three replicates with each replicate sub-divided into eight equal plots of 4×5 m each. The crown split of the *P. maximum* var. Ntchisi used was sourced from an established plot within the University environs and seeds of *Lablab purpureus* sourced from NAPRI, Zaria. The experiment was laid in a randomized complete block design. There were eight treatments which were made of sole Panicum, *Panicum/Lablab* intercropped, all planted at a spacing of 0.75×0.5 m at four different harvesting times (8, 10, 12, 14 weeks after planting (WAP). The treatments were replicated three times. Basal fertilizer of NPK (15:15:15) at the rate of 200 kgN ha^{-1} was applied at 3 weeks after planting and plots weeded at 4 and 8 weeks. Growth parameters data were taken at the harvesting times (8, 10, 12 and 14 WAP) which were later harvested for estimation of dry matter yield and forage quality. The samples collected were oven dried at 60°C for 48 h and grounded. The finely ground samples were analyzed for Crude Protein (CP) according to AOAC (1995). Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ADF) and Acid Detergent Lignin (ADL) were determined by method of Van Soest and Robertson (1985) and Hemicellulose and Cellulose were gotten by differences. Data were recorded and analyzed by Analysis of Variance (ANOVA) and means were separated and compared (Duncan, 1955).

RESULTS AND DISCUSSION

Figure 1 shows the effect of intercropping *Lablab purpureus* on the herbage yield of *Panicum maximum* var. Ntchisi. *P. maximum* in mixture with Lablab had higher herbage yield than the sole *Panicum* at all the harvesting times. This result agrees with Ajayi *et al*. (2007), who also recorded higher herbage yield for *P. maximum* var. Ntchisi in mixture with *Aeschynomene histrix* and/or *Stylosanthes guianensis* than in sole *Panicum* and Akinyemi and Onayinka (1982) while working on *Panicum* and *Centrosema pubescens*.

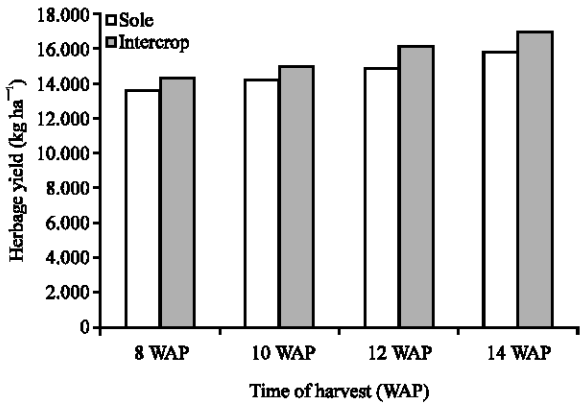

Fig. 1: Effects of *Lablab purpureus* on the herbage yeild of *Panicum maximum* var. Ntchisi at different time of harvest

Table 1: Effects of intercropping *Panicum maximum* var Ntchisi with *Lablab purpureus* on the growth parameters of *Panicum maximum* var Ntchisi

	Plant height (cm)	Leaf length (cm)	Leaf No./stand	Tiller No./stand
8 WAP				
Sole	84.90^{e}	70.18^{d}	35.64^{f}	8.47^{d}
Intercrop	89.63^{e}	77.81^{c}	44.37^{f}	9.88^{d}
10 WAP				
Sole	106.13^{d}	79.73^{c}	55.45^{e}	11.31^{c}
Intercrop	117.72^{cd}	85.49^{bc}	67.87^{d}	13.95^{c}
12 WAP				
Sole	132.02^{c}	85.33^{bc}	85.67^{c}	17.46^{b}
Intercrop	139.78^{b}	89.97^{b}	85.93^{c}	17.37^{b}
14 WAP				
Sole	165.87^{a}	87.45^{b}	100.89^{b}	21.43^{a}
Intercrop	168.07^{a}	93.77^{a}	117.98^{a}	23.02^{a}
SEM	2.78	1.98	3.52	1.11

Means in each column with different superscripts are significantly different ($p<0.05$)

The values for the plant height, leaf length, leaf number and tiller number were significantly ($p<0.05$) different across the treatments (Table 1). The plant height was highest (168.07 cm) for the intercropped at 14 WAP but not significantly different from the sole (165.87 cm) at the same age but is in line with what was reported by (Dele, 2008) for sole *P. maximum* var. Ntchisi that was fertilized at the rate of 400 kgN ha^{-1} of nitrogen at the same age. For the leaf length, the intercropped was significantly longer than the sole across the harvesting times; this was also supported by the report of Dele (2008) at the same age. Table 2 shows the effect of intercropping on the chemical composition of Panicum. The CP, NDF, ADF, ADL, Hemicellulose and Cellulose differed ($p<0.05$) significantly. The crude protein (15.27%) of the intercropped at 8 weeks after planting (WAP) been the highest and the sole (6.87%) at 14 WAP been the least. The crude protein contents of the intercropped across the

Table 2: Effects of intercropping *Panicum maximum* var Ntchisi with *Lablab purpureus* on the nutritive qualities of *Panicum maximum* var Ntchisi

	CP	NDF	ADF	ADL	HEM	CEL
8 WAP						
Sole	13.44^{ab}	52.48^{d}	35.92^{d}	10.27^{b}	16.56^{b}	25.65^{c}
Intercrop	15.27^{a}	59.42^{bc}	34.96^{d}	10.19^{c}	24.46^{a}	24.77^{c}
10 WAP						
Sole	11.69^{b}	58.34^{c}	44.83^{c}	10.42^{ab}	13.51^{c}	34.41^{b}
Intercrop	13.98^{ab}	59.57^{bc}	42.70^{c}	10.27^{b}	16.87^{b}	32.43^{bc}
12 WAP						
Sole	9.55^{c}	60.83^{b}	47.94^{ab}	10.47^{ab}	12.89^{c}	37.47^{ab}
Intercrop	11.87^{b}	60.98^{b}	45.77^{b}	10.27^{b}	15.21^{b}	35.50^{b}
14 WAP						
Sole	6.87^{d}	64.78^{a}	49.97^{a}	10.71^{a}	14.81^{bc}	39.26^{a}
Intercrop	9.35^{c}	62.81^{b}	46.03^{b}	10.35^{b}	16.78^{b}	35.68^{b}
SEM	1.73	1.71	1.97	0.14	2.01	3.08

Means in each column with different superscripts are significantly different ($p<0.05$), WAP: Weeks after planting, CP: Crude protein, NDF: Neutral detergent fibre, ADF: Acid detergent fibre, ADL: Acid detergent lignin, HEM: Hemicellulose, CEL: cellulose

harvesting times were higher than those of the sole Panicum at each time of harvest. This is in line with the report of Ajayi *et al.* (2007), that *Panicum* intercropped with legumes have higher crude protein than its sole. This might be as a result of the beneficiary association of the legumes as supported by Njoka-Njiru *et al.* (2006) that legumes has relatively high nitrogen content in their vegetative matter and also possess the ability to fix atmospheric nitrogen. The decline in the CP content from 8WAP for both the sole (13.27%) and intercropped 15.27 to 6.87 and 9.35% for sole and intercropped respectively at 14 WAP was observed to be as a result of maturity and is in line with the findings of McDonald *et al.* (1995). At 14 WAP for the sole, the CP content is below the minimum needed (7%) to meet the daily nutrient requirement of ruminant animals in the tropics as reported by NRC (1985). The NDF and ADF values of the grass followed reversed pattern as in the CP with the NDF and ADF values (64.78 and 49.97%, respectively) of the grass harvested at 14 WAP having the highest value and at 8 WAP having the least value (52.48 and 34.96%, respectively). It was also recorded that ADF value of sole *Panicum* had higher value than that of the intercropped. The higher value of NDF and ADF with advance in age in this study is in line with the report of Van Soest (1982) that as grasses mature they become fibrous, hence the higher value of NDF and ADF recorded in this study. While the less value recorded for the ADF for the intercropped is in line with the report of Njoka-Njiru *et al.* (2006) that intercropping legumes benefit the associating grasses by improving the CP content, thereby reducing the fibre content. The ADL values of the sole *Panicum* was higher than that of the intercropped across the harvesting times and this shows that the sole is less digestible to the intercropped by the animals, while the higher hemicellulose value of the intercropped shows that it is more digestible than the sole. The fibre contents recorded in this study at 12 WAP and below are all within the range that can be degraded by ruminant animals as reported by Anele *et al.* (2008).

CONCLUSION

The results showed potential to produce high quantity of livestock feed of comparatively higher nutritional quality fodder grass with the incorporation of legume. The legume inclusion improved the yield of the intercropped grass as compared with the sole grass. The results further indicated that there was significant gain in CP of the associating grass and reduced ADF by the inclusion of legume. This will improve herbage quality, intake and digestibility of the associating grass by the ruminant animals. This shows that incorporation of legume into grass fodder production is a panacea to improved livestock production.

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