International Journal of AGRICULTURE AND BIOSCIENCES

www.ijagbio.com P-ISSN: 2305-6622 E-ISSN: 2306-3599 editor@ijagbio.com

RESEARCH ARTICLE

Effect of Number of *Canavalia ensiformis* Rows on Herbage Yield, Nutritive Quality and Performance of West Afican Dwarf (WAD) Sheep Fed Native *Panicum maximum*

Alalade JA[1]*, AA Akingbade[2], WB Akanbi[3], SR Amao[4] and AK Daramola[1]

[1]Department of Animal Health and Production, Oyo State College of Agriculture, P.M.B. 10, Igbo Ora, Oyo State, Nigeria; [2]Department of Animal Production and Health, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Oyo State, Nigeria; [3]Department of Crop Production, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Oyo State. Nigeria; [4]Department of Agricultural Education, (Animal Science Division), School of Vocation and Technical Education, Alayande College Education, P.M.B.1010, Oyo, Oyo State, Nigeria

ARTICLE INFO

Received: May 13, 2013
Revised: June 12, 2013
Accepted: July 12, 2013

Key words:
Canavalia ensiformis
Feed intakes
Herbage yield
Number of row
Nutritive value
Panicum maximum
Wad Sheep

***Corresponding Address:**
Alalade JA
alaladeja@yahoo.com

ABSTRACT

The effect of number of *Canavalia ensiformis* rows on herbage yield and nutritive quality of native *Panicum maximum* was assessed at Teaching and Research Farm of Ladoke Akintola University of Technology Ogbomoso, Oyo State in the derived Savannah Zone of Nigeria. The experiment was laid out in a randomized complete block design with each plot replicated thrice. *Canavalia ensiformis* seeds were inter-planted with native *Panicum* at 8weeks cut back of establishment using different inter-sown spacing of 25cm, 16.7cm and 12.5cm with 1row, 2rows and 3rows of legume, respectively. Parameters investigated at 12weeks old on native *Panicum* were biomass yield, tillers number and height, leaf length and width, chemical and mineral compositions. The grass herbage harvested from experimental plot were fed as sole diets to West African dwarf ram to determine feed intake (g/d/kg $^{0.75}$), nutrient digestibility (g/kg) and weight gain (g/h/d). Results showed that herbage yield, chemical and mineral composition of *Panicum* at 12 weeks old improved. Biomass yield (26800 kg/ha), number of tillers (25.00), tiller height (159.96 cm), leaf length (75.70 cm) and leaf width (2.89 cm) were significantly higher for native *Panicum* inter planted with 3rows of *Canavalia ensiformis*. Crude protein (9.85%) and gross energy (3.78 kca/kg) content of *Panicum* inter planted 3rows of legume spacing were (P<0.05) higher than 2 and 1 row. K (0.22 %), Ca (0.28%),P (0.31%), Mg (0.38 mg/100g), Fe (39.60 mg/100g), Zn (35.70 mg/100g) and Cu (7.40 mg/kg) of *Panicum* inter planted at 3rows of *Canavalia ensiformis* spacing were (P<0.05) better than others. The feed intake (57.76g/d/kg $^{0.75}$), nutrient digestibility (70.20 g/kg) and weight gain (35.7 g/h/d) of animals fed *Panicum* inter-planted with 3rows of *Canavalia ensiformis* was significantly (P<0.05) highest compared to its counterpart. This study revealed that intercropping of *Canavalia ensiformis* with native *Panicum* at 3 inter rows spacing promoted higher herbage yield and nutritive value for the *Panicum maximum*. Animals fed with this as sole diet experienced higher weight gain.

Cite This Article as: Alalade JA, AA Akingbade, WB Akanbi, SR Amao and AK Daramola, 2013. Effect of number of *Canavalia ensiformis* rows on herbage yield, nutritive quality and performance of west afican dwarf (WAD) sheep fed native *Panicum maximum*. Inter J Agri Biosci, 2(5): 242-247. www.ijagbio.com

INTRODUCTION

Livestock production is a dominant farming enterprise in the semi-humid of Africa. However, livestock keeping is limited by the availability of grazing resources in terms of quality and quantity in meeting the nutrient requirement of the animals. One way of increasing the grazing resources of natural pasture 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 as well as increasing the nitrogen uptake of associated forage grass (Macharia, 2003). *Panicum maximum* species are well known and important grasses as feed for the ruminant animals in the humid zone of Nigeria (Alalade, 2012). 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. The importance of forage legumes in increasing herbage production from grasses and to enhance the quality of feed produced has been recognized (Muinga *et al*., 2007). Legumes benefit grasses by contributing nitrogen to the soil through atmospheric fixation, decay of dead root nodules or mineralization of shed leaves (Aderinola, 2007). Muinga *et al.* (2007) reported that inclusion of a legume in *Panicum maximum* based diet resulted on an improved animal performance in terms of milk production and weight gain because of their high nutrient contents.

Intercropping forage legume with grasses has been discovered to increase forage dry matter yield, forage quality in term of crude protein content, voluntary feed intake and digestibility (Tukel and Yilmaz, 1987). Legume grown with grasses offer several advantages over grasses grown alone. Baylor (1994) noted that including legumes usually results in increased yield, higher quality and improved seasonal distribution of forage. Legume-grass mixtures have reduced weed encroachment and erosion and have led to greater stand longevity than legume or grass monoculture (Droslom and Smith, 1976).

Creeping legume such as *Canavalia ensiformis*, *Pueraria phaseliodes* and *Centrosema pubescences* are high in crude protein and are well adapted to varying weather and ecological soil conditions apart from being relished by ruminants' farmers, often use these legumes for soil reclamation (Babayemi and Bamikole, 2006).The objective of this study is to investigate the effect of number of *Canavalia ensiformis* rows on herbage yield, nutritive quality and performance of WAD Sheep fed native *Panicum maximum.*

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 Savannah zone of Nigeria. Ogbomoso lies at approximately 8^{0}7'North of the equator and 4^{0}15'East of Greenwich Meridian. The location has the lowest temperature of about 18^{0}C during the peak of harmattan and the highest of about 37^{0}C recorded during the peak of dry season with moderate to heavy seasonal rainfall (1247 mm annually) and high relative humidity. The natural vegetation is considered to be low land rainforest but under the influence of high agricultural activities comprising of a bush fallow system of farming, little high forest remains. Therefore, it is regarded as a derived savanna vegetation zone because grassy vegetation has followed the clearing of land and cultivation with soil elevation of 1150 ft (Adeniyi, 2005).

Field layout and management practices

The area of land used was 1504 m^2. The land was cleared, stumped and leveled manually to obtain a clean seed bed. Seeds of the legume (*Canavalia ensiformis)* were procured from the International Institute of Tropical Agriculture, (IITA) Ibadan, Oyo State, Nigeria. *Panicum maximum* (Green Panic) were sourced from within the University pasture demonstration plot. Treated seeds of *Canavalia ensiformis* planted into the soil by drilling along the rows at the rate of 10 kg/ha. Each treatment was replicated thrice and each experimental plot measured 10m x 15m with 1m path between plots. At the time of establishment crown splits with 2 tillers, 15cm height of *Panicum maximum* were planted per stand with a spacing of 50x50 cm. At eight weeks of age, the *Panicum* was cutback and intercropped with *Canavalia ensiformis* in three different inter-row spacing of 1row, 2rows and 3rows of legume at different inter-row spacing of 25.0cm, 16.7cm and 12.5cm, respectively. Soil samples were collected before and after 12weeks of planting, bulked, air dried and kept till required and subjected to chemical analysis. Weeding was done manually as often as required to prevent weeds from competing with the legume and *Panicum maximum* for the nutrients.

Data collection

Twelve (12) weeks after legume-inter sown with *Panicum maximum* data were collected on nine *Panicum maximum* stand per plot on tiller number, tiller height, leaf width and leaf length. Tiller number and height, leaf length and leaf width measured randomly within each plot with the aid of the measuring tape, while the tillers were visually counted. Biomass yield was determined by manual harvesting of the grasses within each replicate in a 1m^2 quadrat thrown once and weighed.

Soil Analysis

Before imposing treatments soil samples were randomly taken with the aid of soil auger at twenty (20) different locations within each replicate at 0-15cm depth and the analysis was done. At 12 weeks after establishment, soil samples for each treatment were also randomly taken with the aid of soil auger and analyzed as described by AES (1998).

Animals and their management

Nine (9) West African dwarf sheep, about one year old weighing 12-15kg purchased from local markets were used in the study. These were randomly divided into 3 animals per treatment with each animal constituting a replicate. The animals on arrival were confined in the quarantine pen which had been previously washed and distinfected using lodophor solution. The animals were treated against internal and external parasite using Ivomec at 1ml to 10kg of body weight. They were also given long acting anti-biotic at 1ml to10kg of body weight. The animal was transferred into individual pens having the floor covered with wood shaving for the growth trial study.

Experimental diets

Panicum maximum forages were harvested manually at 12 weeks of regrowth at about 10cm above the ground level and chopped between 5 to 10cm lengths with the aid of cutlass and separately fed *ad libitum* to each experimental animal. *Panicum maximum* intercropped with 1row, 2rows and 3rows of *Canavalia ensiformis* were fed to the animals at 3% of the body weight without legume supplement daily and water was given *ad libitum*.

Digestibility study

Nine (9) West Africa Dwarf sheep were used for digestibility study. Three rams were selected per treatment. The animals were transferred into individual metabolic cages that allowed for separate collection of feaces and urine. They were in the cages for 21 days during which daily feed and fecal production were evaluated. They were given *Panicum maximum* alone. The animals were allowed to acclimatize for 14 days after which data on feed offered and faecal output were collected and weighed daily for 7 days. Sub samples of feed and faeces were taken and oven dried at 60^0C for 24 hours to determine dry matter content. Samples of the feed and feaces were kept till required for chemical analysis.

Chemical Analysis

Collected grass samples were oven dried at 60^0C for 48 hrs and ground. The finely ground samples were analyzed for Crude protein (CP) according to AOAC (1995). Neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL) and gross energy (GE) were determined by the method of Van Soest *et al.* (1991). The mineral contents for K, Ca, Mg, Fe, Zn and Cu in digest were determined using atomic absorption spectrophotometer and Phosphorus was determined by Vonadomolybdate calorimetry method AOAC, (1995).

Statistical Analysis

Data obtained were subjected to analysis of variance using General linear model of SAS (2000). The significant means were separated using Duncan multiple range test.

RESULTS AND DISCUSSION

Significant (P<0.05) differences were observed on the effect of *Canavalia ensiformis* rows on herbage yield of *Panicum maximum* in Tables 1. 3rows of *Canavalia ensiformis* inter row spacing with 1 row *Panicum maximum* revealed highest significant (P<0.05) value for biomass yield, tillers number, tillers heights, leaf length and leaf width. This result might be due to the residual effect of decay leaves and reduced direct sunlight and erosion. Legumes are known to fix nitrogen directly or indirectly which aid the growth of companion grasses. More nitrogen could have been fixed by closer spacing of the leguminous crop. This observation agrees with the result of Volence and Nelson (1983), who observed that improved soil nitrogen increased leaf elongation rate and size in plants. The herbage yield increased in 3 rows of *Canavalia ensiformis* intercropped with *Panicum maximum*, might be due to closer spacing of legumes to the grass. This agrees with the findings of Fujital *et al.* (1992) that closer legumes transfer more nitrogen in legume grass mixture than distant legume. Spacing had a significant effect on forage yield of *Canavalia ensiformis* and *Stylosantes hamata* Akinlade *et al.*(2004) and the lowest spacing (50cm×50cm) was observed to produce the highest herbage yield than the higher spacing as a result of effect of density of plant population. This increased biomass yield was due to increase in leaf production, increased number of tillers, increased rate of leaves extension which stimulated the greater light capture and hence photosynthesis and thus increases yield. This also agrees with the report of Tulkel and Yilmaz (1987) that spacing influence herbage yield. Tulkel and Yilmaz (1987) also reported that intercropping forage legume with grasses improved forage yield. Increased concentration of nitrogen in the soil could have stimulated tillering and stolon production. Reynolds (1992) also reported that the closer the legumes are to the grass the faster the rate of transfer of more nitrogen in the legume-grass mixture than other distant legume.

Table 2 showed the effect of number of *Canavalia ensiformis* rows on chemical composition of *Panicum maximum*. There were significant (P<0.05) differences among the different rows of *Canavalia ensiformis* considered. *Panicum* intercropped with 3 rows of *Canavalia ensiformis* had the highest CP (9.85%) and GE (3.78 kca/kg). Number of legume rows affected the CP and GE contents of the companion grass. The NDF, ADF and ADL contents decreased with increase in level of CP and GE in the grass. This is in line with the findings of Adepoju (2005) who observed a decrease in CF percentage as the CP percentage increases. It also agreed with report of Ezenwa and Akenova (1998) that the effect of component in grass/legume mixture would increase the quality of the mixture. Similarly, Ajayi *et al.* (2007) reported that higher values of crude protein were obtained when *Panicum maximum* was intercropped with *Stylosanthes* and *Aeschynomene histrix*. The result also was in harmony with the report of Akinlade *et al.* (2003) that legumes maintain the protein level longer while reducing the crude fibre content.

The significant effect was observed for *Panicum maximum* intercropped with different rows of *Canavalia ensiformis* on mineral composition in Tables 3. *Panicum maximum* intercropped with 3 rows of *Canavalia ensiformis* had highest K, Ca, Mg, P, Fe, Zn and Cu over 2 rows and 1 row, respectively. The mineral (K, Ca, Mg, P, Fe, Zn and Cu) contents of *Panicum maximum* intercropped with *Canavalia ensiformis* at 3 inter row spacing were increased. It was observed that closer planting rows of legume with grass resulted into higher contents of these mineral in the *Panicum maximum.* This observation agree with the report of Jones (1990), and Fisher and Baker (1996) that herb and leguminous specie consistently have higher concentration of some important minerals than perennial grasses which when planted together are made available for the grasses uptake through the senesces and decay of leaf and rooting materials of the legumes.

The significant (P<0.05) differences were observed for feed intake (g/d/kg $^{0.75}$) of WAD sheep fed *Panicum maximum* intercropped with *Canavalia ensiformis* at different planting rows in Table 4. 3 rows produced higher values for DMI (514.48 g/d/kg $^{0.75}$) and CPI (57.76 g/d/kg $^{0.75}$) for the *Panicum maximum* intercropped with 3 rows of *Canavalia ensiformis* than the *Panicum maximum* intercropped with 2 and 1 row. Higher dry matter and crude protein intake were observed for close grass-legume row spacing and the dry matter intakes decreased with decreased legume-grass inter row spacing. The observed variation in dry matter intake could be as a result of increased bacteria production in the rumen (Singh *et al.*, 1981).

Table 1: Effect of number of *Canavalia ensiformis* rows on herbage yield of *Panicum maximum*

Canavalia rows	Biomass yield (kg/ha) (cm)	tiller no	Tiller height	leaf length (cm)	leaf width (cm)
1	8500^{c}	17.00^{c}	147.46^{c}	57.92^{c}	2.84^{c}
2	21600^{b}	20.00^{b}	153.49^{b}	62.74^{b}	2.86^{b}
3	26800^{a}	25.00^{a}	159.96^{a}	75.70^{a}	2.89^{a}
SEM	340.89	4.20	19.18	8.99	0.09

^{abc}Means along the same column with different superscripts were significantly (P<0.05)different.

Table 2: Effect of number of *Canavalia ensiformis* rows on chemical composition of *Panicum maximum*

Canavalia row	CP%	NDF%	ADF%	ADL%	G.E (kca/kg)
1	7.49^{c}	75.28^{a}	59.46^{a}	16.44^{a}	3.72^{c}
2	8.83^{b}	72.41^{b}	49.87^{b}	13.33^{b}	3.74^{b}
3	9.85^{a}	66.28^{c}	44.42^{c}	13.11^{c}	3.78^{a}
SEM	0.89	8.90	5.17	2.89	0.02

^{abc}Means along the same column with different superscripts were significantly (P<0.05)different.

Table 3: Effect of number of *Canavalia ensiformis* rows on mineral composition of *Panicum maximum*

Canavalia rows	K%	Ca%	P%	Mg (mg/ 100g)	Fe (mg/ 100g)	Zn (mg/ 100g)	Cu (mg/kg)
1	0.14^{c}	0.13^{c}	0.19^{c}	0.25^{c}	23.90^{c}	29.60^{c}	6.30^{c}
2	0.15^{b}	0.21^{b}	0.22^{b}	0.29^{b}	25.70^{b}	33.40^{b}	6.70^{b}
3	0.22^{a}	0.28^{a}	0.31^{a}	0.38^{a}	39.60^{a}	35.70^{a}	7.40^{a}
SEM	0.1	0.01	0.02	0.01	4.32	5.07	0.10

^{abc}Means along the same column with different superscripts were significantly (P<0.05) different.

Table 4: Feed intakes (g/d/kg $^{0.75}$) of WAD sheep fed *Panicum maximum* intercropped with *Canavalia ensiformis* at different planting rows

Rows	Chemical composition (g/d/kg $^{0.75}$)			
	DM (g/d/kg$^{0.75}$)	CP (g/d/kg$^{0.75}$)	NDF (g/d/kg $^{0.75}$)	ADL (g/d/kg $^{0.75}$)
1 row	508.37^{c}	40.28^{c}	372.50^{b}	68.57^{b}
2 rows	510.20^{b}	41.93^{b}	347.50^{c}	82.04^{c}
3 rows	514.48^{a}	57.76^{a}	339.30^{d}	66.65^{d}
Control	506.97^{d}	38.21^{d}	385.20^{a}	83.87^{a}
SEM	45.89	9.09	40.99	6.89

^{abcd}Means along the same column with different superscripts were significantly (P<0.05)different.
1= 1 row of *Panicum maximum* to 1 row of *Canavalia ensiformis*
2= 1 row of *Panicum maximum* to 2rows of *Canavalia ensiformis*
3= 1 row of *Panicum maximum* to 3rows of *Canavalia ensiformis*
4= Sole stand of *Panicum maximum*

Table 5: Nutrient digestibility (g/kg) of WAD sheep fed *Panicum maximum* intercropped with *Canavalia ensiformis* at different planting rows

Rows	Chemical composition (g/kg)			
	DM(g/kg)	CP(g/kg)	NDF(g/kg)	ADL(g/kg)
1 row	69.86^{c}	58.49^{c}	76.32^{b}	77.84^{a}
2 rows	69.93^{b}	68.70^{b}	75.92^{c}	78.33^{b}
3 rows	76.84^{a}	74.20^{a}	70.31^{d}	75.02^{d}
Control	68.57^{c}	58.15^{d}	78.28^{a}	81.10^{a}
SEM	7.89	5.88	8.07	9.16

^{abcd}Means along the same column with different superscripts were significantly (P<0.05) different.
1= 1 row of *Panicum maximum* to 1row of *Canavalia ensiformis*
2= 1 row of *Panicum maximum* to 2 rows of *Canavalia ensiformis*
3= 1 row of *Panicum maximum* to 3rows of *Canavalia ensiformis*
4= Sole stand of *Panicum maximum*

Table 6: Weight change of WAD sheep fed with *Panicum maximum* intercropped with *Canavalia ensiformis* at different inter row spacing

Parameter	Treatments			
Legume at different inter row	1	2	3	4
Number of animals	3	3	3	3
Duration of feeding(in days)	28	28	28	28
Average Initial weight	15	15	15	15
Average final weight	15.6	15.8	16.0	15.3
Average weight gain(g/h/d)	17.9	28.6	35.7	10.71

The nutrient digestibility by WAD sheep fed *Panicum maximum* intercropped with *Canavalia ensiformis* at different inter row spacing was shown in Table 5. There were significant (P<0.05) differences among inter row spacing for nutrient digestibility. The digestibility of dry matter DM (76.84g/kg) and crude protein CP (74.20g/kg) were highest for animal fed *Panicum maximum* intercropped with 3 rows of legumes. The least value was obtained in the animals fed sole *Panicum maximum* stand. Increased crude protein content of forages could have induced higher crude protein nutrient digestibility, though increase in bacteria production in the rumen content at the expense of protozoa development (Tarakony and Sommer, 1983) and an increased escape of dietary protein to intestine due to ruminal retention time associated with high levels of feed intake (Firkin *et al.*, 1986) could have occurred. Tukel and Yilmaz (1987) observed that intercropping forage legume with grass increase crude protein digestibility of the grass. The result obtained for nutrient digestibility by WAD sheep fed *Panicum maximum* inter row with 3rows of *Canavalia ensiformis* were within the range result for CP digestibility (61.97-79.67 g/kg) without supplementation with concentrate diets given to lambs reported by Murphy *et al*. (1994). HadjiPanayioton (1990) reported digestible CP of (73-76 g/kg) for lambs and (74-75g/kg) for kids fed concentrate supplemented with hay. Abazinge *et al.* (1994) however obtained (64.8-74.4 g/kg) digestible CP for sheep fed grass with concentrate and silage.

Table 6 showed the weight gain (g/h/d) of WAD sheep fed *Panicum maximum* intercropped with *Canavalia ensiformis* at different inter row spacing. Animal fed on grass intercropped significantly (P< 0.05) had higher body weight gained on all treatment. The highest body weight gained was observed on animal fed *Panicum maximum* inter planted with 3 rows of *Canavalia ensiformis*. The highest value found in animal fed *Panicum maximum* inter planted with 3 rows of *Canavalia ensiformis* could be attributed to higher CP intake and digestibility as compared to the control (diet sole grass). The closer the inter row spacing of *Canavalia ensiformis* the higher the weight gained (g/h/d) by the animal and this agreed with the report of Aye (2002) who reported a progressive increase in live weight gain as the crude protein intake and nutrient digestibility increases. An improvement in voluntary feed intake is often attributed to increased rate of forage digestion which may permit improved body condition in ruminants (Weder *et al.*, 1999). The increase in weight gain (g/h/d) recorded may be attributed to improved forage composition and feed intake brought about by legume-grass spacing effect. The legume at different inter row spacing fed to WAD sheep had positive impact on weight gain of the animals. This might be due to residual effect of legume on grass. The result of feed intake (g/d/kg $^{0.75}$), nutrient digestibility (g/kg) and daily weight gain (g/h/d) of animal fed *Panicum maximum* intercropped with 3rows of *Canavalia ensiformis* were better. This result is in line with the report of Aina and Onwuka (2002) that CP and DM digestibility and weight gain was greatly influenced by the observation that intercropping forage legumes with grasses.

REFERENCES

Abazinge DAM, JP Fontent and VG Allen, 1994. Digestibility Nitrogen Utilization and Voluntary intake of ensiled crab waste-wheat straw mixture fed to sheep. J Anim Scie, 7: 565-571.

Aderinola OA, 2007. Herbage Production and Utilization of *Andropogon tectorum* as Influenced by fertilizer application and legume intercrop. PhD Thesis Department of Animal Production Health, Ladoke Akintola University Technology, Ogbomoso.

Adeniyi SA, 2005. Effect of legume intercrop (*Carnavalia ensiformis*) on the yield and quality of *Panicum maximum* cv T58. Unpublished B Tech, Thesis, LAUTECH Ogbomoso, Oyo State, Nigeria.

Adepoju AO, 2005. Performance and digestibility of West African Dwarf Sheep fed on Andropogon subjected to varying levels of fertilizer Nitrogen during a water stress period. Unpublished B Tech, Project Report, Ladoke Akintola University Technology, Ogbomoso, Oyo State, Nigeria. pp: 18-19

AES, 1998. Agricultural Experimental Station of North Central Region of America.

Aina AB and SC Onwukwa, 2002. Estimation of nutrient content of some selected grasses as affected by age of cutting in production. Proceeding of 7th Annual Conference of Animal Science Association of Nigeria. (ASAN). Sept. 16-19, 2002, pp: 212-214.

Ajayi FT, OJ Babayemi and AA Taiwo, 2007. Effect of stylosanthes guianensis and *Aeschynomene histrix* on the yield, proximate composition and In-situ drymatter and crude protein degradation of Panicum maximum (Ntchisi). Livestock for Research for Rural Development. Volume, 19(3).

AOAC, 1995. Official Methods of Analysis (15th edition). Association of Analytical Chemists, Washington DC, USA, pp: 69-88.

Akinlade JA, AA Sanusi, GO Farinu, AJ Gbadamosi, OA Aderinola and VA Togun, 2003. Forage yield chemical composition, drymatter intake and nutrient digestibility of Velvet beans (*Mucuna pruriens*) leaves offered a basal diet of *Panicum maximum*. Proceeding of the 28th Annual Conference of the Nigeria Society for Animal Production pp: 268-270.

Akinlade JA, GO Farinu, OA Aderinola, GO Tona, IO Lamidi, and FG Sodeinde, 2004. Effect of three spacing on forage production potentials of Jack beans. (*Canavalia ensiformis*). Proc 9th Ann Conf Animal Sciences Association of Nigeria (ASAN) Sept 13-16th,2004. Ebonyi State University Abakaliki Nigeria. pp: 340-346.

Alalade JA, 2012. Effect of intercropping legumes and application of manure on herbage yield and nutritive value native *Panicum maximum.* PhD Thesis Department of Animal Production Health, Ladoke Akintola University Technology,Ogbomoso.

Aye PA 2002. Effect of *Gliricida sepium* leaves intake and digestibility in West African Dwarf goat fed dried elephant grass. Proceeding of 27th Annual Conference of Nigerian Society Animal Production (NSAP), March, 17-21th 2002, FUTA, Akure, Nigeria, 234-236.

Babayemi OJ and MA Bamikole, 2006. Effect of *Tephrosia candida* DC leaf and Its mixture with guinea grass on In-vitro fermentation changes a feed for ruminants In Nigeria. Pak J Nutr, 5: 14-18.

Baylor JE, 1994. Satisfying the nutritional requirements of grass-legume mixture in DA, May (eds) forage fertilization. ASA, CSSA and SSSA Madison W.I.

Droslom PN and D Smith, 1976. Adapting species for mixtures. In Papendick RI, *et al*., (eds) multiple cropping. Madison, WI: ASA, CSSA, SSSA, 1976: 223-234.

Ezenwa I and ME Aken'ova, 1998. Performance of mixture of selected Grasses and adapted herbaceous legumes in south west, Nigeria. Trop Grassland, 32, 131-138.

Fisher G and C Barker, 1996. The chemical composition of forb species in grassland. In parente, Gframe J and Orsis (eds). Grassland and land use systems. Proceeding of 16th General meeting of European grassland federation, Grado, Italy September 1996, 429-437.

Fujital K, KG Ofosu-Budu and S Ogota, 1992. Biological nitrogen fixation in mixed cereal cropping systems. Journal of Plant and Soil. Vol. 141, No. 1-21 March, 1992. pp: 155-175.

HadjiPanayiotu J, 1990. Effect of grain processing on the performance of early weaned lambs and kids. Anim Prod, 51: 565-572.

Jones C, 1990. Forage chicory at a site in south east England. In polilt G (ed) Milk and\meat forage crops. British Grassland society occasional symposium, No 24, 67-69.

Murphy TA, SC Loerch and FE Smith, 1994. Effect of feeding high concentration diet at restricted intake on digestibility and nitrogen metabolism in growth lambs. Agri Anim sci, 72: 1583-1590.

Muinga RW, JG Mureithi, H Juma and HM Saha, 2007. The effect of supplementing Napier grass or maize stover basal diet with either Gliridia, Clitoria or Mucuna on manure quality and quantity in Jersey cows. Tropical and sub tropical Agroecosystems, 7: 157-163.

Reynolds SG, 1992. Contribution of yield nitrogen fixation and transfer by local and exotic legumes in tropical grass-legume mixtures in western Samion. Trop grass land, 16: 76-80.

SAS, 2000. Statistical Analytical System Institute SAS User's Guide-IncCary, NewYork.

Singh UB, DN Verman and VR Mchru, 1981. Notes on rumen bacterial growth and its relationship with intake of drymatter, nitrogen digestible organic matter and volatile fatty acids in buffaloes. Indian J Anim Sci, 51: 223-233.

Tarakanov BV and A Sommer, 1983. Effect of dietary protein level on microbial nitrogen content in the

rumen of cows. Nutrition Abstract and review series B, vol, 50: 396.
Tulkel T and E Yilmaz, 1987. Research on determining the most suitable ratio of Vetc (*Vicia sativa* L) and barely (*Hordeum vulgae* L) mixtures grwn under dry condition of cukurova. Turk tarins ve ormancilik Dergisi Dogu, 11: 171-178.
Van soest PJ, JB Robertson and BA Lewis, 1991. Methods for directory neutral detergent fibre and non-starch polysaccharides in relation to animal nutrition. J Dairy Sci, 74: 3583-3597.
Volenec JJ and CJ Nelson, 1983. Responses of tall fascue leaf meristem to nitrogen fertilization and harvest frequency. Crop Sci, 24, 907-912.
Weder CE, T Delarts, T Svejcar, JR Jaeger and RK Barley, 1999. Influence of supplemental alfalfa quality on the intake, used and subsequent performance of beef cattle consuming low quality roughages. J Anim Sci, 77: 1266-1276.