

HERBAGE YIELD AND QUALITY OF *LABLAB PURPUREUS* DURING THE LATE DRY SEASON IN WESTERN NIGERIA

T. A. AMOLE^{1,2*}, B. O. ODUGUWA¹, O. SHITTU¹, A. FAMAKINDE¹, N. OKWELUM¹,
V. O. A. OJO², P. A. DELE², O. J. IDOWU², B. OGUNLOLU², A. O. ADEBIYI²

¹ Institute of Food Security, Environmental Resources and Agricultural Research, University of Agriculture, Abeokuta, Nigeria

² Department of Pasture and Range Management, University of Agriculture, Abeokuta, Nigeria

ABSTRACT

The objective of this study was to determine the herbage yield and nutritional quality of *Lablab purpureus* during the peak of dry season in South Western Nigeria and to ascertain its capacity as dry season supplement for ruminant animals in that region. The experiment was carried out at the Livestock Research Farm, Federal University of Agriculture, Abeokuta from May 2008 till March 2009. The 3 treatments consisted of 3 cutting periods replicated four times. The average CP content of lablab varied from 180 g.kg⁻¹ DM to 220 g.kg⁻¹ DM with the leaf fraction in March having the highest CP content of 220 g.kg⁻¹ DM as a result of sudden rainfall. The highest (2745 kg/ha) yield was recorded in January while the least dry matter content was recorded in February. The ash and the ether extract content of lablab during the late dry season in South West Nigeria ranged from 50 g.kg⁻¹ DM to 90 g.kg⁻¹ DM and 55 to 80 g.kg⁻¹ DM, respectively. The NDF, ADF and lignin content increased significantly (P<0.05) with advancing the harvesting stage with stem fraction higher (P<0.05) than that leaf fraction. The herbage yield and quality of *L. purpureus* in terms of its crude protein, fibre and minerals from this study shows that the appropriate time to harvest and use lablab as supplement to animal diet during the late dry season is January, which has the highest herbage yield and quality.

Key words: forage legume; *Lablab purpureus*; dry season; herbage yield; quality

INTRODUCTION

Poor nutrition is a major constraint to livestock production in small-holder crop-livestock farming system, especially during the dry season when available feed quantity is low and quality extremely poor (Alhassan, 1987). Basically this is due to the dependence of livestock on naturally available feed resources and little development on forage crops for feeding to animals (Whiteman, 1980). Normally it is during the dry season when problems such as sickness and weight loss due to poor dietary profile, scarcity of forages, reduction in yield and quality of forages arises.

The productivity of Nigerian livestock is below its genetic potential, principally due to poor nutrition and

inadequacy of good quality feed (Lamidi *et al.*, 2005). The feed shortage is most pronounced in the rural areas where the arable land is used for growing food and cash crops and not for fodder production (Kibiria *et al.*, 1994).

One of the ways of improving the utilization of such crop residue is by proper supplementation with leguminous forage (Poppi and McLennan, 1995). High quality sown forage such as leguminous fodder has been found to provide adequate dry season supplementation and improve the productivity of grazing cattle.

The legume can be sown as pure stand in protein banks or undersown in food crops. It can be grazed, harvested and fed fresh or stored as hay or silage (Harricharan *et al.*, 1988). As a consequence of

*Correspondence: E-mail: gokeamole@yahoo.com
T. A. Amole, Institute of Food Security, Environmental Resources and
Agricultural Research, University of Agriculture, Abeokuta, Nigeria

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different biochemical pathway of carbon fixation during photosynthesis, nitrogen fixing legume have higher concentration of cellular protein than tropical grasses (Bjorkman *et al.*, 1976), as such tropical legume are rich in protein which is limiting nutrient in tropical animal diet most especially during the dry season. They are more digestible and enhance dry matter intake by grazing animal.

Lablab purpureus combines a great number of qualities that can be used successfully under various conditions. Its first advantage is its adaptability, not only it is drought resistant, it is able to grow in diverse range of environmental conditions worldwide. Staying green during the dry season, it has been known to provide up to six tones of dry matter per hectare (Murphy and Colucci, 1999). Being palatable to livestock, it is an adequate source of much needed protein and can be utilized in several different ways. In several experiments, it has been observed to increase livestock weight and milk production during the dry season (Murphy *et al.*, 1999).

Lablab is a legume that thrives well in the dry season between November and February in the northern Nigeria. It is drought resistant and is usually sown after the normal cropping season, thereby acting as a buffer crop for ruminant feed during the dry season (Adu *et al.*, 1992). However its productivity during the dry season has not been evaluated in the western part of Nigeria which is known to have high rainfall and humidity with consequently short period of dry season. It is then necessary to determine the effects of seasonal change on the herbage yield and the nutritive value of *Lablab purpureus*.

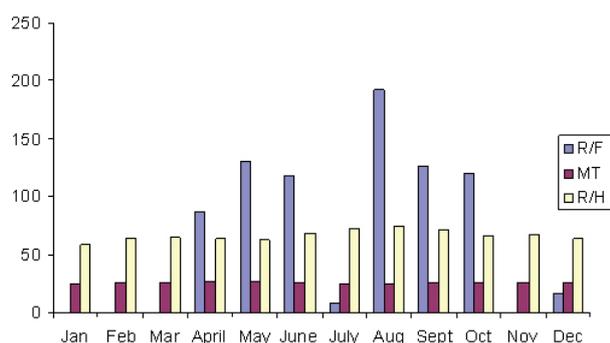


Fig. 1: Agrometrological observation at Ogun-Osun River Basin Development (OORBD)* in 2008
R/F: Rainfall (mm); MT: Mean Temperature (°C); R/H: Relative humidity (%)
Source: Ogun-Osun River Basin Development, Alabata Road, Ogun State
* 5 km from experimental site

MATERIAL AND METHODS

The experiment was carried out at the Teaching and Research Farm, University of Agriculture, Abeokuta (UNAAB), located on latitude 7°13'49.46"N, longitude 3°26'11.98"E of Ogun State, Nigeria (Google Earth, 2006). The research site was located in the derived savannah zone of Southwest Nigeria with monthly rainfall which ranged from 120 mm in May to 195 mm in September and mean monthly temperature ranging from 22.5° to 33.7°C. The area is characterized by bimodal rainfall pattern which peaks in July and September and a major dry season between November and March. The relative humidity in the rainy (late March-October) and dry (November-early March) season ranged between 63-96 % and 55-84 %, respectively. The rainfall data for the two years of experiments (2008 and 2009) are presented in Figures 1 and 2.

Experimental Plot

The site for planting was cleared and ploughed twice. Thereafter, the land was harrowed and levelled. A total of 12 plots, each measuring 20 m x 25 m was measured out and demarcated by 2 m spaces between plots and 3 m spaces between blocks. Three core samples of soil (0 – 15 cm) were randomly collected from the plots before planting. These were bulked for each block and analyzed for physical (particle size) and chemical properties (pH, total N, organic carbon, C: N ratio, available P, available N, cation exchange capacity and acidity).

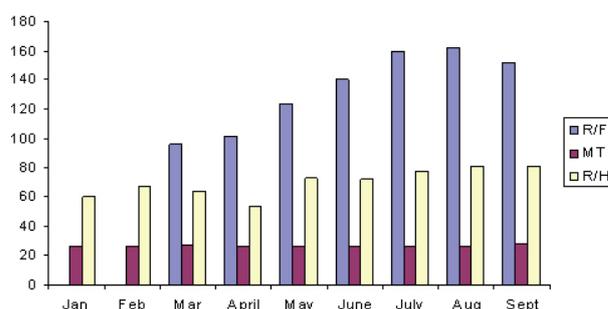


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The seed of *Lablab purpureus* var. Highworth, which has a purple band near the leaf axil, purple flowers and black seeds, was used in this experiment. It is an early flowering line with high seed-yielding ability; it is suitable for pulse production and forage uses. The seeds were obtained from National Animal Production Research Institute (NAPRI), Zaria and were planted at the rate of 15 kg/ha and spacing of 50 x 50 cm with one seed per hole.

Twelve (12) experimental plots each measuring 10 x 20 m was established in May 2008 with 3 treatments which were 3 cutting periods replicated four times. Single superphosphate (SSP) fertilizer was applied in July 2008. The site was weeded and fenced to prevent accidental grazing. The quality and quantity evaluation study was conducted in the first 3 months of the following year (during the dry season period of January to March in South Western Nigeria).

Data Collection

Evidences of flowers and green pods were noticed in November and December (6-7 months after planting). Since the focus of this study was not after grain production, flowers and pods were separated at each harvest and were not included in the yield estimate.

Herbage yield was estimated by cutting from 1 m² quadrants randomly thrown five (5) times on each plot using knife, with each stand cut at 5 cm above the ground level every month. Samples were separated into leaf and stem from each replicate and weighed in the laboratory using the sensitive scale, to determine the leaf to stem ratio. Two hundred grams (200 g) sub-sample was taken from each replicated leaf sample and 100 g from each replicated stem sample. The sub-samples was put in individual paper bag and dried in the drying cabinet till constant weight was attained. The dry matter yield of each replicate was calculated as:

$$\frac{\text{Oven dried sub-sample}}{\text{Fresh sub - sample}} \times 100$$

The samples were oven dried, hammer-milled and sieved through a 1 mm mesh and were used for the analysis. Dry matter (DM) content was determined by drying at 80°C for 48 h (AOAC, 1995) while ash content was determined with a muffle furnace at 510°C for 18 h. Crude protein (N % x 6.25) content in the samples was determined by LECO FP-200 Analyzer (St Joseph, MI, USA) while oil (as ether extract) was extracted with petroleum spirit (b.p. 40 to 60°C) by the Soxhlet method (AOAC, 1995). The method of Van Soest and Robertson (1991) was used to determine the neutral detergent fibre (NDF), the acid detergent fibre (ADF) and acid detergent lignin (ADL). Cellulose was taken as the difference between ADF and ADL while hemicellulose

was calculated as the difference between NDF and ADF.

The samples were thoroughly washed in water to remove extraneous matter and then dried at 60°C for 2-3 days in an oven before milling. The samples were digested by nitric and perchloric acids mixture (ratio = 4.1 v/v) and the concentrations of the minerals (Calcium (Ca), Potassium (K), Phosphorus (P) and Magnesium (Mg) in the samples were determined by an Atomic Absorption Spectrophotometer (Buck scientific model 200a; Buck Scientific, East Norwalk, CT 06855, USA).

The data obtained was analyzed using Two Way Analysis of Variance (ANOVA) in a completely Randomized Block Design. Analysis of variance of growth and nutritional parameters was performed using the general linear models procedure of SAS (1996).

$$Y_{ij} = a + \beta_i + t_j + e_{ij}$$

Where:

Y_{ij} = dry matter yield and nutritional parameters

a = general mean of the treatments

β = block effects

i = I, II, III, IV (blocks)

t = treatment effects (days post germination)

j = 1,2,3, (sampling period)

e = experimental error

Differences between means were compared using the Duncan's Multiple Range Test (Duncan 1995).

RESULTS AND DISCUSSION

The average crude protein (CP) content of lablab varied from January to March ranging from 180 g.kg⁻¹ DM to 230 g.kg⁻¹ DM with the leaf fraction in March having the highest CP content of 226 g.kg⁻¹ DM (Table 1).

The CP content in the leaf fraction was higher than that of the stem throughout the experiment. The CP content of the leaf fraction decreased (P<0.05) from January to February and then increased (P<0.05) later in March, while there was significant (P<0.05) reduction in the CP content of stem fraction as lablab increased in age during experimental period.

The dry matter yield (DMY) of lablab both leaf and stem reduced from January (1028 kg/ha and 2745 kg/ha respectively) to February and then increased in March. The highest (P<0.05) yield was recorded in January.

The dry matter content of lablab (leaf and stem fraction) in January was comparable (P>0.05) with that of March while the least dry matter content was recorded in February.

The crude fibre content of *Lablab purpureus* during the dry season ranged from 292 g.kg⁻¹ DM to 371 g.kg⁻¹ DM in the leaf fraction while the stem fraction

Table 1: The herbage dry matter yield and approximate composition (g.kg⁻¹ DM) of *L. purpureus* during the late dry season

Treatment		DMY (kg/ha)	DMC	CP	CF	ASH	EE	NFE	GE (kJ kg ⁻¹ DM)
JAN	Leaf	1028 ^c	775 ^b	215 ^b	292 ^d	55.0 ^f	55.6 ^e	183 ^a	47.3 ^d
	Stem	2745 ^a	777 ^b	204 ^c	304 ^{cd}	80.9 ^c	529 ^f	159 ^b	53.2 ^c
FEB	Leaf	862 ^c	720 ^c	204 ^c	310 ^e	65.6 ^e	70.4 ^b	150 ^b	66.6 ^b
	Stem	1743 ^b	737 ^c	195 ^d	365 ^b	83.5 ^b	60.6 ^d	960 ^c	66.6 ^b
MAR	Leaf	977 ^c	755 ^b	226 ^a	371 ^b	68.7 ^d	75.6 ^a	589 ^d	67.8 ^b
	Stem	2123 ^b	771 ^b	181 ^c	422 ^a	86.3 ^a	70.4 ^c	473 ^d	76.2 ^a
SEM		0.57	0.01	0.01	0.05	0.00	0.01	0.05	0.02

^{a, b, c, d, e, f} means with different superscripts in the same column differ significantly (P<0.05)

CP: Crude Protein; CF: Crude Fibre ASH: Ash content; EE: Ether Extract ; NFE: Nitrogen Free Extract ; DMY: Dry Matter Yield; DMC: Dry Matter Content; GE: Gross Energy; JAN: January; FEB: February; MAR: March

ranged from 304 g.kg⁻¹ DM to 422 g.kg⁻¹ DM. The CF content of the stem and leaf fraction increased (P<0.05) monthly.

The ash and the ether extract content of lablab during the late dry season in South West Nigeria ranged from 55 g.kg⁻¹ DM to 90 g.kg⁻¹ DM and 55.6 g.kg⁻¹ DM to 80 g.kg⁻¹ DM, respectively. The ash content of the stem was higher (P<0.05) than the leaf fraction throughout the experiment. However, the ether extract content of the leaf was higher (P<0.05) than the stem fraction throughout the dry season period.

The gross energy of the leaf content increased (P<0.05) from 47.3 kJ.kg DM in January to 68.2 kJ.kg DM in

March. The stem fraction followed similar trend and reached the highest (P<0.05) value of 76.2 kJ.kg DM in March.

The NDF content of lablab during the late dry season increased significantly (P<0.05) from 660 g.kg⁻¹ DM in leaf fraction harvested in January to 700 g.kg⁻¹ DM % in stem fraction harvested in March. ADF and lignin followed similar trend with its contents in the stem fraction higher (P<0.05) than that of leaf fraction. The hemicellulose content reduced (P<0.05) both in the leaf and the stem fraction as lablab increased in age from January to February. The cellulose content increased in both leaf and stem fraction and reached its peak (310 g.kg⁻¹ DM) in March.

Table 2: The fibre composition (g.kg⁻¹ DM) of *L. purpureus* during the late dry season

Treatment		NDF	ADF	LIGNIN	HEM	CEL
JAN	Leaf	661 ^c	295 ^c	41.4 ^f	366 ^a	254 ^d
	Stem	656 ^f	358 ^c	51.2 ^c	298 ^d	307 ^{bc}
FEB	Leaf	686 ^d	354 ^d	48.4 ^e	333 ^b	305 ^c
	Stem	695 ^b	361 ^b	53.1 ^b	334 ^b	308 ^b
MAR	Leaf	691 ^c	363 ^b	49.7 ^d	328 ^c	313 ^a
	Stem	701 ^a	369 ^a	55.2 ^a	332 ^b	314 ^a
SEM		0.01	0.01	0.02	0.01	0.01

^{a, b, c, d, e, f} means with different superscript in the same column differ significantly (P<0.05)

NDF: Neutral Detergent Fibre; ADF: Acid Detergent Fibre; HEM: Hemicellulose; CEL: Cellulose

Table 3: The mineral composition of *L. purpureus* (g.kg⁻¹ DM) during the late dry season

Treatment		Ca	K	P	Mg
JAN	Leaf	5.10 ^e	2.40 ^c	3.10 ^d	2.00 ^d
	Stem	7.1 ^d	1.60 ^b	2.90 ^c	3.40 ^c
FEB	Leaf	9.4 ^{bc}	2.30 ^b	2.50 ^{ab}	3.40 ^c
	Stem	8.7 ^c	1.50 ^a	2.80 ^b	4.10 ^b
MAR	Leaf	10.1 ^{ab}	2.30 ^b	2.60 ^a	4.50 ^b
	Stem	10.7 ^a	1.60 ^a	3.00 ^a	6.20 ^a
SEM		0.01	0.01	0.01	0.01

^{a, b, c, d, e} means with different superscript in the same column differ significantly (P<0.05)

Ca: Calcium; K: Potassium; P: Phosphorus; Mg: Magnesium

The mean Ca concentration in both the leaf and stem fraction increased as the dry season progressed. However, the two fractions became comparable (P>0.05) from February to March with 10.1 g.kg⁻¹ DM and 10.7 g.kg⁻¹ DM for leaf and stem, respectively.

Concentration of K of the leaf fraction was higher (P<0.05) than the stem fraction in each month of the experiment. However, the K concentrations of leaf and stem were similar in February and March.

Concentration of Mg in the leaf fraction ranged from 2.0 to 4.5 g.kg⁻¹ DM which were significantly (P<0.05) lower than values recorded in the stem fraction in the dry season. As the dry season progressed, concentration of Mg increased (P<0.05) in each fraction.

Phosphorus (P) concentration ranged from 2.6 to 3.1 g.kg⁻¹ DM in the leaf fraction with significant reduction from January to March, while the stem fraction fluctuated (P<0.05) in the dry season.

The dry matter yield of lablab observed in the late dry season ranged from 1028 and 2745 kg DM/ha. These values were similar to the values reported by Karachi (1983) who reported that total green DM yields ranged from 2000 to 12000 kg ha⁻¹, and most of the yield was stem with the green leaf DM yields ranging from 400 to 3300 kg ha⁻¹. The biomass yield of *Lablab purpureus* (cv. Rongai white) in this study was found to be lower than 4700 kg/ha 17 weeks after sowing recorded during dry season in Honduras (Murphy, 1998) while Nworgu and Ajayi (2005) also reported 48.66 and 44.58 t/ha/yr for *Lablab purpureus* at Ibadan in 2001 and 2002, respectively. Amodu *et al.*, (2005) reported a yield of 4.5 to 4.9 t/ha in November at a location in the Northern part of Nigeria. However, Kiflewahid and Mosimanyana (1987) reported an average dry-matter yield (ton/ha) of 1.08 to 1.94 from 0, 100 and 250 kg/ha rate of SSP fertilizer during low seasonal rainfall and distribution

patterns in the project areas (262 to 414 mm rainfall) of Botswana, which are in agreement with the results of this study. Variations in the yields could be attributed to the level of soil fertility, climatic zones, seasons and agronomic practices adopted. Cameron (1988) and Mayer *et al.* (1986) noted that dry matter yield per hectare varies with rainfall, soil condition and time of seeding. Differences in the yield could also be as a result of much shedding of leaves during the peak of the dry season as observed in the present study.

Notwithstanding, the dry matter yield recorded in the present experiment is substantial as supplements for grazing animals in dry season depending on the breed and the number of herds. Such DM yield of *L. purpureus* at the peak of dry season can be attributed to its aggressive and vigorous growth habit (Skerman *et al.*, 1988) and its ability to maximize low soil moisture content for growth as drought resistant. Nworgu and Ajayi (2005) reported mean monthly rainfall of 125 mm to 0.65 mm for August to December 2001 and 2002 at Ibadan (40 km from where this experiment was carried out) and concluded that such amount was adequate for the growth of a drought resistant forage legume.

A significant difference was observed between crude fibre content of leaf and stem throughout the experimental period.

The fibre composition of *L. purpureus* during the late dry season in western Nigeria was higher than that reported by Nworgu and Ajayi (2005), and that of Murphy and Colucci (1999) who summarized the crude fibre of the whole lablab plant as 27.8 %, which could be attributed to the time of harvest. Crude fibre content of legumes generally increases with maturity (Minson, 1990). High temperatures decrease the soluble carbohydrate content of plants, resulting in increased fibre content and decreased digestibility. The fibre levels

recorded in leaves are lower than that in the stem fraction. The quality of stems is largely affected because of their structural function while the leaves are metabolic organs (Shehu *et al.*, 2001). Therefore, selection for immature leaves with low cell wall content by grazing animals will improve nutritive value and digestibility over that indicated by a whole plant crude fibre value.

The NDF and ADF values recorded in this study were comparable to 51.2 % and 69.2 % reported by Karachi (1997) for lablab harvested 100 days after planting during the short and long rain in Kenya. These values were higher than the average values of 43 % and 38.6 % for the lablab plant and various fractions on dry matter basis reported as Murphy and Colucci (1999).

The increase in NDF content of the stem from January to March is related to physiological changes that occur as plant ages, that lead to a decrease in cell cytoplasm highly soluble components (cell contents), accompanied by an increase in cell wall fibre components (Nogueira *et al.*, 2000). The cell wall of the leaf fraction exhibits higher proportions of hemicellulose (NDF - ADF) and lower proportions of cellulose (ADF - ADL) than the stem fractions. These differences are reflected in higher ratios of hemicellulose to cellulose in the leaf than in the stem. Karachi (1997) also reported a greater neutral detergent fibre (NDF) in stem than the leaf, due to the higher amounts of fibre and lignin in it. Hall *et al.* (1997) also reported that soluble fibre decreased with maturity in stems but not in leaves.

The CP content of lablab in the late dry season of South Western Nigeria ranged between 18 % and 22 % and these values fall within the range reported in the literature for tropical herbaceous legumes (Topps and Oliver, 1993; Norton and Poppi, 1995).

The CP content of lablab in this study agrees with results obtained by Hendricksen and Minson (1985) and Cameron (1988) who reported leaf protein in lablab to be 21.6 % - 27.9 % and 15 % - 33 %, respectively. The average stem crude protein content falls within the range as reported by Murphy and Colucci (1999).

The observed decline in CP content of lablab with increasing maturity is in agreement with results from another study (Khorasani *et al.*, 1997). This decline is attributed to an increase in cell wall accumulation while cell contents decline (Buxton, 1989). Zinash *et al.* (1995) also reported the decline in CP content of the pasture along with increasing age of harvesting, which might be due to the dilution of the CP content by increasing structural carbohydrates of forages harvested at late maturity (Hassan *et al.*, 1990). The results of this study showed that the CP content of leaf was higher than that of stem. This was in agreement with the report of Van Soest (1994) that the leaf fraction of legumes often has a better nutritional quality in comparison to the more fibrous stems. The leaf fraction of legumes has been reported

in earlier studies to have a higher CP content than the stems (Adjei and Fianu, 1985; Cameroon, 1988). The crude protein content of the leaf and stem of lablab decreased as the dry season advanced from January to February. It has been established that as legumes mature, the content of protein decreases (Milford and Minson, 1968). However, the increase in the CP content of the leaf fraction in March (22.60) could be as a result of sudden rainfall (92 mm) experienced in early March in 2009 (Figure 1) which brings about the emergence of new plant materials. Thus it appears that the rain had an effect on the protein profile of the leaf fraction through the emergence of new plant material. This implies that lablab could make use of the minimum available precipitation for new plant growth.

The protein content of lablab during the late dry season as expressed in this experiment is in excess of that proposed as the minimum requirements for lactation (120 g CP/kg DM) and growth (113 g CP/kg DM) in ruminants (ARC, 1984). This makes it good source of protein when given to ruminants as protein supplements to low quality roughage thereby reducing farmers' cost in procuring of concentrate in dry season.

Phosphorus (P) and potassium (K) content of lablab was considerably lower than the value reported by Nworgu and Ajayi (2005) who reported that *L. purpureus* contain 0.33 % to 0.41 % P and 0.24 % to 0.28 % K in the early dry season. The increase and decrease in some mineral composition could be attributed to the age and time of maturity of the plant.

The magnesium content of the leaf was lower than that of the stem throughout the experiment. However, mean Mg concentration in both fractions of lablab sampled in the dry season were higher than the suggested critical level of 0.2 % (McDowell and Arthington, 2005) for ruminants in the tropics signifying that lablab could adequately supply required amount of Mg for ruminant animals during the dry season which is characterized by low quantity and quality forage in turn affecting the livestock industry in terms of weight gain, reproduction, growth rate, productivity.

Mean K concentration in lablab was lower than the critical level established (McDowell and Arthington, 2005), indicating that the forage legume is low in K concentration. However, McDowell and Valle (2000) reported that there are very few confirmed reports of K deficiency for ruminants grazing exclusively on forages. In beef cattle, a severe deficiency of K is unlikely but a marginal potassium deficiency results in decreased feed intake and retarded weight gain (NRC, 1996). With maturity, mineral concentration declines due to a natural dilution process and the translocation of minerals to the root system (Pastrana *et al.*, 1991).

Forages are generally good sources of calcium, and legumes are higher in Ca content than grasses.

The calcium content in forages is affected by species, portion of plant consumed, maturity, quantity of exchangeable Ca in the soil, and climate (Minson, 1990). The concentration of Ca reported in this trial is similar to the result of Nworgu and Ajayi (2005). Calcium concentration recorded in this study increased as the dry season progressed while Temesgen and Mohammed (2012) observed seasonal differences for Ca with concentration in the wet season being higher than that of the dry season. Based on the lower limits of ruminant requirements (McDowell and Arthington, 2005), both leaf and stem fractions contained higher concentration of Ca needed to meet ruminant requirements. Nworgu and Ajayi (2005) reported that *Lablab purpureus* can withstand the dry season better than *Centrosema pubescens*, *Centrosema pascuorum* and *Aeschynomene histrix* with higher Ca concentration than some tropical forage legumes.

The ash content of the stem was higher than the leaf fraction throughout the experiment. The decline in ash content with increasing maturity could be due to a natural dilution process as dry matter accumulation outstrips mineral uptake as the forages mature (Bittman *et al.*, 1988). Alia *et al.* (2007) also reported that the ash content of the plant parts browsed by camels during the wet season was higher compared to those browsed during the dry season.

CONCLUSION

The potential of any feed to support animal production depend on the quality consumed by the animal and extend to which the feed meets energy, protein, minerals and vitamin requirement (Minson, 1990). Nutritive quality range varies from area to area, between seasons and growing stages. In many cases determination of crude protein, fibre fractions and minerals is sufficient to give an adequate assessment of forage quality (Sileshi *et al.*, 1996). The herbage yield and quality of *L. purpureus* in terms of its crude protein, fibre and minerals from this study shows that the appropriate time to harvest and use lablab as supplement to animal diet during the late dry season is January which has the highest herbage yield and quality. Lablab could as well be fed as supplement throughout the dry season due to its persistence and quality. A sustainable way of improving the feeding value of poor quality crop residues and pastures as feed for livestock is through supplementation with forage legumes in which *L. purpureus* has been tried, proved and now recommended for livestock feeding during the late dry season.

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