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Effect of varieties on growth components and dry matter yield of *Lablab Purpureus* (L) sweet in the semi-arid region of Nigeria

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Target Audience: Ruminant nutritionist, Researchers, Pastoralist

Abstract

Two years field trials were conducted in Maiduguri the Borno State Capital Nigeria to evaluate the effect of varieties on growth components and dry matter yield of three lablab varieties Lablab purpureus (L) sweet (white, black and brown). The experiment was laid in a randomized complete block design. Growth components were determined at 4, 6, 8, 10 and 12 weeks after planting and dry matter yield was determined at 12 weeks after planting in 2014 and 2015 cropping season. Results revealed that there was significant (P<0.05) difference between plant heights with the highest plant height (100.44cm) being for white variety in week 10 of 2014. There was no significant (P>0.05) difference recorded in leaf height in throughout the study period. There was no significant difference in dry matter yield however, highest yield of 28.10 t/ha was recorded for Brown lablab variety in 2014 compared to other varieties. From this study, it can be concluded that varietal difference has significantly affected the growth components and dry matter of three lablab varieties. The varieties of lablab investigated can be used as forage legumes which can improve animal performance and productivity.

Keyword: Lablab varieties, dry matter yield, plant height, leaf number

Description of Problem

The forage legumes are known to have an important role in the nutrition of ruminant in terms of providing energy, protein, minerals for chewing and rumination (1). This nutrient supplementation affects voluntary feed intake and digestibility positively. The use of forage legumes such as lablab purpureus as feed supplement has been shown to enhance intake of poor quality forages, improve growth rates and increase production efficiency in ruminants (2). Feed intake increases as digestibility of energy and crude protein increases. Based on the available information on the use of herbaceous legumes in sheep nutrition, lablab legumes can be grown for stall feeding, grazing or preserved as hay or silage for use during the dry season, when there is scarcity of grazeable materials. Lablab is one of the major leguminous forage and valuable feed resource for ruminant production. It can be grazed by both small and large ruminant and also be fed as fresh foliage hay or silage (3).The introduction and use of herbaceous

legume may contribute to agricultural intensification, especially in the context of sustainable crop and livestock production system, with the potential to mitigate the recurrent shortage of forage and lowered productivity of ruminants during the dry season (4). The objective of this study was to determine varietal effect on growth components and dry matter yield of *lablab purpureus* (L) sweet.

Materials and Methods

The land was cleared, ploughed and harrowed to soften the soil for ease of planting and germination and to get a clean seed bed. The meteorological data of the experimental area at the time of the study is presented in Table 1. Ridges were made at 0.75m apart with hoe. The experimental area was divided into plots by an alley of 50x50 cm between and within rows. Each plot size measured 3x4m ($12m^{12}$) replicated thrice each. The three lablab varieties used for this experiment were; White, - Grif 1246, Black – ILRI 147 and brown – NAPRI 3 all obtained from NAPRI. two seeds per hole were sown at inter and intra row spacing of 50x50 cm. Stands were thinned to one stand at two weeks after planting in June 2014 and 2015 cropping seasons. Weeding was done manually at two weeks interval.

The experiment was laid out in a Randomized Complete Block Design and data was collected as follows; Meteorological data of the experimental area was obtained from the Meteorological unit of the Maiduguri International Airport. The height of the plant was measured from the ground to the tip using meter ruler at every two weeks interval to 12 weeks after planting. This involved measuring the leaves of six sampled plants by measuring the base of the stalk to the tip of the leaf using meter ruler. Leaf number per six sampled plant were taken by counting.

The dry matter yield of the lablab varieties were estimated by cutting the plants 12 weeks after planting. This was carried out by harvesting plants from net plot area. The cut fresh materials were weighed and oven-dried at 65^{o}C to constant weight for determination of percent dry matter (% DM). The % DM was used to estimate the DM yield of the legumes and then converted to tones/ha.

All data collected were subjected to analysis of variance (ANOVA) using the SPSS version 19 where treatments were significant, Duncan Multiple Range test (DMRT) was used to separate means (5).

Table 1: Monthly Record of Relative Humidity, Temperature and Rainfall at Maiduguri Station 2014-2015

Year	1	2	3	4	5	6	7	8	9	10	11	12
Relative Humidity												
2014	24	20	11	18	36	53	64	72	66	42	21	21
2015	20	14	16	21	41	55	75	75	71	59	24	24
Temperature												
2014	31.1	36.3	39.9	41.0	40.9	37.1	34.4	30.5	33.7	37.0	35.7	31.6
2015	33.7	37.6	38.6	42.7	41.5	37.1	32.1	31.4	32.8	36.1	37.2	33.1
Rainfall												
2014	0.0	0.0	0.0	62	10.7	31.3	166.3	267.6	67.8	2.2	0.0	0.0
2015	0.0	0.0	0.0	0.0	63.5	141.6	154.4	205.6	96.8	1.2	0.0	0.0

1-January, 2 –February, 3- March, 4 – April, 5 – May, 6 – June, 7 – July, 8 – August, 9 – September, 10 – October, 11 – November, 12 – December.

Source: Meteorological unit of Maiduguri International Airport

Table 2: Effects of varieties on growth components

	Weeks after planting 2014					Weeks after planting 2015				
Varieties	**4**	**6**	**8**	**10**	**12**	**4**	**6**	**8**	**10**	**12**
					Plants height					
White	14.17[a]	69.79[ab]	65.68[b]	100.44[a]	52.33	10.38[b]	20.80	41.52	42.50	86.40
Black	8.65[b]	56.34[b]	87.25[ab]	95.25[ab]	67.00	14.95[a]	20.65	48.50	48.63	85.61
Brown	13.43[a]	83.96[a]	94..43[a]	81.85[b]	65.95	10.84[b]	22.14	43.58	44.51	93.65
SEM	0.81	8.47	7.77	6.44	5.88	0.74	2.48	3.77	3.84	5.46
LS	*	*	*	*	NS	*	NS	NS	NS	NS
					Leaf number					
White	18.31[a]	47.88	75.67	111.04[b]	40.63[b]	11.79	22.21	34.75	35.70	63.38
Black	11.69[c]	40.63	91.04	164.67[a]	54.88[a]	12.63	20.88	40.50	41.50	65.71
Brown	14.24[b]	48.58	86.33	111.96[b]	53.75[a]	12.04	23.25	42.71	44.70	58.67
SEM	0.24	5.13	9.37	17.97	4.10	0.56	1.50	3.64	3.84	0.14
LS	*	NS	NS	NS	*	NS	NS	NS	NS	NS
					Leaf length					
White	6.45	8.64	9.02	8.83	7.02	5.57	7.40	7.72	8.00	8.01
Black	5.57	11.63	9.19	8.10	7.25	5.16	7.34	7.80	8.01	8.05
Brown	6.21	9.52	9.34	8.71	6.77	5.47	7.51	8.02	8.72	8.71
SEM	0.22	1.58	0.31	0.29	0.25	0.22	0.04	0.03	0.27	0.28
LS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
					Plant width					
White	1.80	2.94[a]	2.59	3.60	2.56	1.47[b]	1.43	1.10	1.10	3.94
Black	1.55	2.05[b]	2.71	3.26	2.86	1.65[a]	1.35	2.97	2.97	3.17
Brown	1.75	2.12[b]	2.81	3.05	2.73	1.59[a]	1.35	2.18	2.18	3.41
SEM	0.08	0.29	0.19	0.21	0.11	0.04	0.05	0.04	0.04	0.14
LS	NS	*	NS	NS	NS	*	NS	NS	NS	NS

*=P< 0.05, SEM = Standard error mean, NS = Non significant and LS Level of significance

Results and Discussion

Table 1 shows the monthly relative humidity; temperature and rainfall of 2014-2015. The year 2015 had higher temperature and relative humidity than 2014. Rainfall in July and August of 2014 were 166.3 and 267.6mm 2014 while 154.4 and 205.6 mm were recorded for same months in 2015.

Table 2 shows the plant height mean values obtained in 2014 and 2015. There was significant (P<0.05) difference observed between plant heights throughout the experimental weeks of 2014 except at week 12th which recorded no significant (P>0.05) difference. In week 4, brown and white varieties recorded their tallest height of 14.17 and 13.43cm respectively and lower height value of 8.65cm was obtained for black similarly, highest height of 83.96cm for brown, followed by 69.79cm for white and 56.43cm for black variety were obtained respectively at week 8. In week 10, highest plant height observed was 100.44cm for white variety followed by black with 95.25cm and 81.55cm for brown varieties respectively. However, in 2015, there was no significant (P>0.05) difference recorded except in week 4 which had significant (P<0.05) difference. Black variety was the tallest with 14.95cm, followed by brown with 10.84cm. The shortest was obtained for white variety with 10.38cm respectively. It's been observed that white variety of lablab produced the highest plant height (100.44 cm) at 10 weeks after planting in 2014.

This result is in contrast with (4) who stated that brown variety had the highest plant height owing to the fact that it is a new accession that have the potential to contribute to grain or fodder production and that it has similar morphological characteristics with the white variety. However, (6) recorded no significant (P>0.05) difference when plant height of 5 lablab accessions were compared, however the highest plant height obtained in 2014 might be attributed to the high amount of rain fall recorded in 2014 compared to 2015. The decrease in plant height during the 12^{th} week of 2014 may be as a result of the sharp decline in amount of rainfall at that time.

The mean value for effects of varieties on leaf number for 2014 and 2015 is presented in Table 3. There was no significant (P>0.05) difference observed throughout the experimental weeks of 2014 accepts in weeks 4 and 12. In week 4, white variety had the largest leaf number (18) followed by brown (14) and black (11) respectively. But at week 12, both black and brown had the largest leaf number (164 and 111) respectively. White variety had the lowest number of leaves (40). However, there was no significant (P>0.05) difference observed for leaf number throughout the experimental periods of 2015. Leaf number values for varieties in this study has shown that black and brown varieties were better than white variety throughout the periods, this agrees with (7) and (8) who worked on brown and black varieties found-them good in performance. The result of this study also agrees with (6) who recorded a significantly (P<0.05) highest leaves for black variety.

The mean values for effects of varieties on leaf length for 2014 and 2015 were presented in Table 4. There was no significant difference observed in all the experimental periods for both 2014 and 2015 respectively. Although is been generally observed that leaf length at weeks 8 and 10 for 2014 recorded higher values. Results on effects of varieties on leaf length obtained in this study indicated no significant (P>0.05) difference among varieties. This agrees with (4) who reported that most accessions in the same morphological group appeared to be the same genotype, although the origin of introduction comes from different countries. However, values obtained in this study for brown variety is in conformity with the value of 9.9cm leaf length at 10^{th} week for dibbling method reported by (7). Similarly, (8) reported similar value of 9.03cm leaf length for unspecified variety in the semi-arid region of Nigeria.

Means of plant width values for the varieties in this study both for 2014 and 2015 is presented in Table 1. There was no significant (P>0.05) difference observed in 2014 except at week 6 which had significant (P<0.05) difference. The thickest plant width was 2.94cm obtained for white variety followed by 2.05 and 2.21cm for black and brown varieties respectively. Similarly, there was no significance (P>0.05) difference observed throughout the study weeks of (2015) except in week 4 which had significant (P<0.05) difference. Black and white varieties had the thickest plant width with 1.65 and 1.59cm respectively, and 1.47cm width was obtained for the white variety. Leaf width values for this study showed white and black varieties seem better in all the periods, they are the most common varieties that has been in cultivation for a long time, their performance did not come as surprise. Similarly, (9) reported better performance of white Rongai on semi-arid soil, while (15) reported a good performance for black variety (Highworth) fertilizer or without fertilizer. In this case the lower the value for plant width, the better because bigger plant width contributes to the stem fraction of the forage which is not preferred by animals. Leaf fraction of forage is highly relished by animals and that is the most desired part during grazing. Cultivars with

more leaves have been reported to be much higher in quality than cultivars that produced more stems (10). Stem fractions of forage usually fibrous, low in nutrient density and digestibility and thus poorly utilized by ruminants animals (11; 12). *Lablab purpureus* is used as forage hay, the leaf is very palatable but the stem is not and it is one of the most palatable legumes for ruminants (13).

Mean dry matter yield as affected by varieties for 2014 and 2015 is presented in Table 3. There was no significant (P>0.05) difference observed in both 2014 and 2015. However, highest yield (28.10 t/ha) obtained for brown, followed by white and black with 24.50 and 24.66 t/ha in 2014 compared to 15.10, 13.93 and 14.03 t/ha for white, black and brown varieties respectively in 2015. It's been observed that brown variety was better than black and white in this study. This agrees with (4), who reported that the variety is an accession developed for both grain and fodder production. However, dry matter yield obtained in this study is much higher than yield obtained by (9) who reported a value of 6.59 ton/ha for white variety in the semi-arid region of Nigeria. Similarly, its higher than values reported by (14) who reported a dry matter yield of 4.7 ton/ha at 6 weeks of age for unspecified variety. Most research works were done with black variety and was found to be excellent in yield (15; 8). Similarly, (7) obtained a dry matter yield of 10kg/ha for black variety in the semi-arid region of Nigeria.

Table 3: Effect of varieties on dry matter yield (t/ha)

	Varieties				
Years	**White**	**Black**	**Brown**	**SEM**	**LS**
2014	24.50	24.66	28.10	1.63	NS
2015	15.10	13.93	14.03	1.94	NS

SEM = Standard error of means, LS = Level of significance

Conclusion and Applications

1. From this study, it can be concluded that varietal difference significantly affected the growth components and dry matter of three lablab varieties.
2. All the varieties of lablab investigated can be used as forage legumes, which can improve animal performance and productivity.

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