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Performances of Improved Lablab Varieties for their Agronomic characteristics and chemical compositions in Adola sub-site of Bore Agricultural Research Center

Teshale Jabessa* and Genet Dejene

Oromia Agricultural Research Institute (**IQQO**) Bore Agricultural Research Center (**BOARC**), P.O.Box. 21 Bore, Ethiopia

*Corresponding author, email: teshalejabessa@gmail.com

Abstract: A study was conducted with the objective to identify adaptable and chemical composition of Lablab varieties. Three Lablab Beresa-17, Gabis-55 and Local variety +were tested in randomized complete block design (RCBD) with three replications. The result revealed that date of maturity was significantly ($p<0.05$) differ between the tested treatments. Among the tested varieties Gabis-55 was took longer day (144 days) while, the local varieties required the short (129.2 days) to reach for seed maturity. Fresh biomass yield, seed yield, plant height, pod per plant and pod length were not significantly ($p>0.05$) differ among the tested varieties. The analyzed chemical compositions indicated, Beresa-17 variety had the highest in Organic matter (OM), crude protein (CP), neutral detergent fiber (NDF) and dry matter (DM) and less in acid detergent fiber (ADF), acid detergent lignin (ADL), and total ash content (TASH) content while, Gabis-55 was highest in acid detergent lignin (ADL) and acid detergent fiber (ADF) and less in crude protein (CP) content. The local variety had the highest in neutral detergent fiber (NDF) and total ash content (TASH) and less in dry matter (DM) content than the rest varieties. The result of this study implied that Gabis-55 variety was adapted and being productive regarding the plant height, biomass yield and seed yield of each variety, which is hopeful to fill the gap of low quantity feed. In addition to the nutritional values were promising particularly the crude protein (CP), Dry matter (DM) and Organic Matter (OM) content in Beresa-17 variety. Based on its

adaptability, high biomass yield, high seed yield, good CP, DM and OM of Gais -55 is recommended for further promotion in the midland of East Guji zone.

Keywords: Adola; Chemical composition; Lablab; Nutritive value

1 Introduction

In Ethiopia, like other sub-Saharan African countries, livestock production is the major component of the agriculture sector. However, their production is characterized by low productivity levels in terms of growth rate, meat production and reproductive performance. Among the multiple factors, under nutrition and malnutrition are considered to be the most important limiting factors constraining animal production in Ethiopia Bekele W. (2010). In almost all parts of Ethiopia, annual pasture grasses that are the main sources of feed (54.6%) for the ruminant populations grows during the main rainy seasons and thus decline in quantity and quality in less than half of the years. For most of the year, the animals rely on crop residue which contributed 31.6% of the total feed sources in the country (Tolera et al., 2000; Mengistu A. 2004; CSA, 2017). Feed stuff of such composition, natural grass and crop residue, are insufficient to provide adequate quantity and quality of nutrient beyond maintenance requirement. Among other, tropical grasses are usually deficient in crude protein which is one of the most and costly part of ruminant ration (McDonald, 2002; Matiwos, 2007). Leguminous forage can potentially be considered for use as a plant protein supplement to offset limitations associated with low feed quality in systems where livestock are increasingly becoming dependent on low quality roughages (Umuna, 1995).

It combines a great number of qualities that can be used successfully under varies conditions. Its first advantage is its adaptability, not only its 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 6 tons of dry matter per hectare. Being palatable to livestock, it is adequate sources of much needed protein and can be utilized in several different ways (Murphy, 1999). However in Guji zone forage legumes were not evaluated. As a result there were shortages of improved forage varieties for their livestock feeding purpose. Therefore, this study was conducted to test (evaluate) lablab forage varieties as alternation plant protein sources. Lablab purpureus varieties were among forage legume

evaluated on site by Bore Agricultural Research Center to be used as alternative feed sources. Lablab purpureus is an annual or short-lived perennial fodder legume sown for grazing and conservation in tropical environments. Therefore, the present study was initiated with the objective to evaluate herbage dry matter production potential and nutritive value of *L. purpures* varieties and recommend the best performing for us as alternative livestock feed in study area.

2 Materials and Method

2.1 Description of the study area

The experiment was carried out at Adola sub-site of Bore Agricultural Research Center, Adola district, Guji Zone of Oromia. Adola district is located around at a distance of 470 km from Addis Ababa and 120 Km from the zonal capital city, Negele Borena. It is an area where a mixed farming and sami-nomadic economic activity takes place, which is the major livelihood of the local people. The total area of the district is 1254.56km$^{2.}$ The district is situated at 5^{o}44'10" - 6^{o}12'38" N latitudes and 38^{o}45'10" - 39^{o}12'37" E longitudes. The district is characterized by three agro- climatic zones, namely highland 11%, mid-land 29% and low-land 60% respectively. The major soil type of the district is nitosols (red basaltic soils) and orthic Acrosols (Yazachew and Kasahun, 2011).

2.2 Experimental treatments and design

The study was executed using Beresa-17, Gabis-55 and local varieties. The experiment was conducted in randomized complete block design with three replications. Seeds were sown in rows at spacing of 30 cm with seed rate of 30 kg ha^{-1}. Plot size of 1.8 m x 3 was used. NPS fertilizer at 100 kg ha^{-1} was uniformly applied for all treatments at sowing time.

2.3 Data collection

All relevant datas including days to flowering, days to forage harvest (maturity), plant height, logging %, forage dry matter yield, seed yield and nutritive value were collected. Seed yield weight was calculated at 10% moisture content. At 50% flowering stage the middle rows of each plot were harvested for dry matter herbage determination and chemical analysis. Plants were harvested at ground level and fresh biomass weighed

immediately using a 0.1 g scale. Then, a sub-sample of 15-20% of the total weight was separated and put into a paper bag for dry matter herbage determination. The samples were oven dried at 105 ^{0}C for 24 hours. To determine grain yield, the pods were harvested from the rest rows at optimum physiological maturity by hand picking.

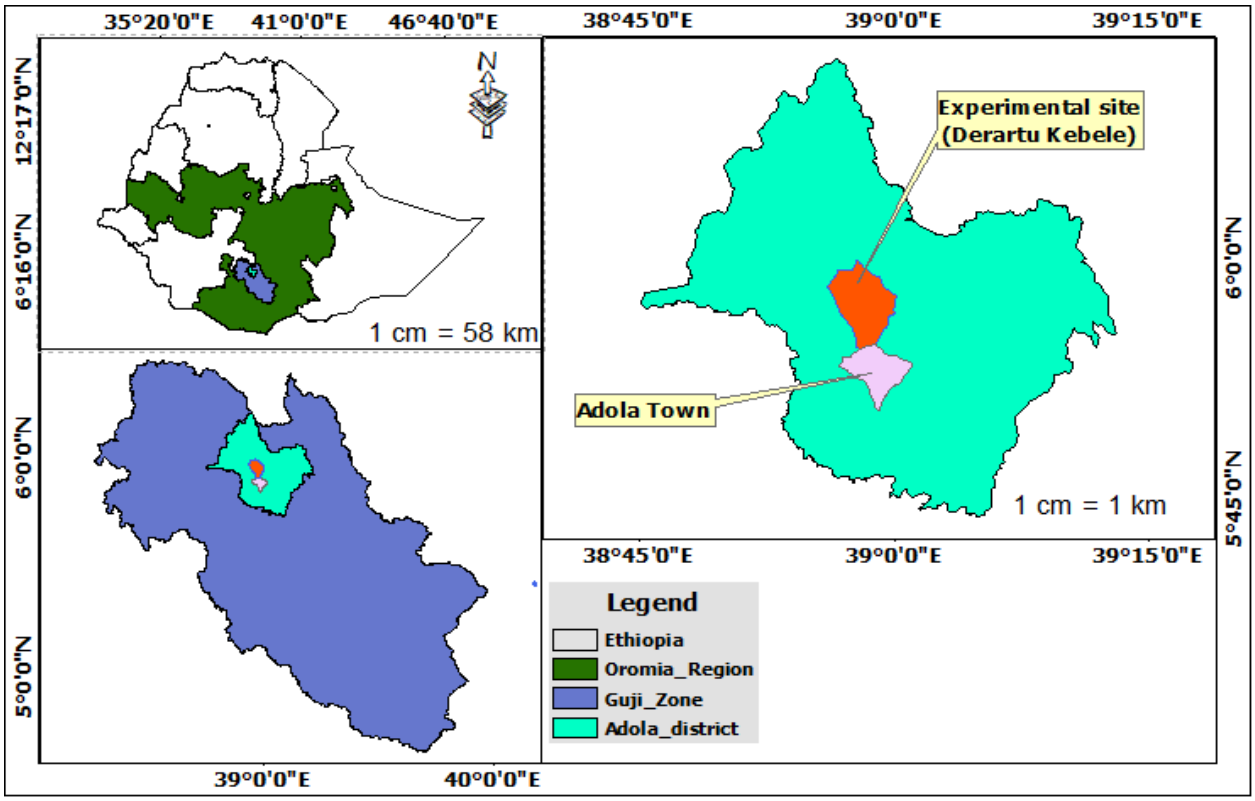

Fig 1. Descriptions of study area

2.4 Statistical analysis

All collected data were analyzed using general linear model procedure SAS (SAS, 2002) version 9.1. Means were separated with least significant difference (LSD) at 5% significant level. The statistical model for the analysis data was: $Y_{ijk}= \mu + A_j + B_i + e_{ijk}$

Where; Y_{ijk}= response of variable under examination, μ = overall mean, A_j = the jth factor effect of treatment/ cultivar, B_i = the ith factor effect of block/ replication, e_{ijk} = the random error.

3 Results and Discussion

3.1 Yield and yield components

Mean value of all agronomic and yield parameters of lablab varieties are shown in (table 1). The results showed that days to 50% flowering, plant height, pod per plant, pod length per plant, fresh biomass yield and seed yield were not significantly ($p>0.05$) differ between treatments. However, numerically Gabis-55 variety showed higher biomass yield, whereas Beresa-17 variety produced the maximum seed yield. The local variety took longer days (86.6 days) to reach 50% flowering while beresa-17 and gabis-55 reached 50% flowering at 83.1. The highest plant height was measured from Gabis-55 variety (138 cm) followed by Beresa-17 (126.6 cm) while, the shortest plant height was obtained from genotype local (112.8 cm). The mean value observed in plant height of lablab varieties in the current study in the study area was 1.258 cm. However, lower than the value that observed by (Denbela and Worikicha, 2015) reported 0.21 cm. The highest biomass yield 6.54 t/ha was recorded from of Gabisa-55 variety followed by local variety 5.16 t/ha while the lowest biomass yield of 4.22 t/ha was obtained from Beresa-17 variety. The Mean biomass yield of the tested varieties in the study area were 5.309 t/ha^{-1}, which was highly different from the result of (Denbela and Worikicha, 2015) reported 39.32 t/ha^{-1}. The variability might be related to differences in geographical location, sowing time and soil type. However significant ($p<0.05$) different to date of maturity was observed between treatments. The local variety was early maturing (129.2 days) and followed by Beresa-17 (131 days) whereas, the late to seed maturing variety was Gabis-55 (144 days).

3.2 Chemical Composition

The analysis of chemical composition indicated that DM, CP, NDF, ADL, ADF, TASH and OM was not significantly ($P>0.05$) different between treatments. Numerically Beresa-17 variety was highest in OM , CP , NDF and DM and less in ADF , ADL , and TASH content, Gabis-55 was highest in ADL and ADF and less in CP content were as, the local variety had the highest in NDF and TASH and less in DM content than the rest accessions. As herbaceous forage legume, *Lablab purpureus* forage has an average protein content of about

18% of DM, which varies from 13 to 24% depending on local conditions and stage of harvest (Abuye Tullu, 2017). In the current study average crude protein of Beresa-17 was 28.7% which was not agreed with the reported by (Abuye Tullu, 2017). This difference might be occurred due to season of sowing the crops and harvesting interval of the variety.

Table 1. Yield and yield components of Lablab varieties

Varieties	D50%F	DM	Ppp	Pol (cm)	Ph (cm)	FBMY (t/ha)	GY qt /ha
Gabis-55	85.3	144a	15.7	3.7	138	6.54	29.3
Baresa-17	83.1	131b	22.1	2.3	126.6	4.22	33.9
Local	86.6	129.2b	13.2	3.3	112.8	5.16	14.4
Mean	85	134.7	17	3.08	125.8	5.309	25.8
CV	5.8	8.7	65	52.9	21.05	59.6	182.6
LSD (5%)	ns	*	ns	ns	ns	ns	ns

[a,b]Mean in a column within the same category having different superscripts differ significantly at ($p<0.05$) D50%F=days to 50% lowering, DM=Maturity date, Ppp=Pod per plant, Pol=Pod length centimeter, Ph=plant height centimeter, FBMY= fresh biomass yield tone per hectare, GY=grain yield, Cv=Coefficient of variation, LSD= Least significant difference. ns=Non significant,*=significant

Table 2. Mean chemical composition of lablab varieties.

Varieties	DM%	CP%	NDF%	ADL%	ADF%	TASH%	OM%
Beresa-17	89.9	28.7	65.2	8.4	33.6	11.7	78.3
Gabis-55	89.4	20.4	68.2	13.7	37.7	12.1	77.3
Local	88.3	26.5	76.8	10	35.6	14.4	73.9

ADF= Acid Detergent Fiber; ADL= Acid Detergent Lignin; CP = Crude Protein; NDF = Neutral Detergent Fiber and OM = Organic Matter; TASH=Total Ash; DM=Dry matter.

Conclusion and Recommendations

The result of this study indicated that Gais -55 variety was well adapted and being productive regarding the plant height, biomass yield and grain yield of each variety, which is hopeful to fill the gap of low quantity ruminant feed supply of the community. In addition the nutritional values (chemical composition) were promising particularly the crude protein (CP), Dry matter (DM) and Organic Matter (OM) content in Gais -55 variety. Thus it

could be possible to conclude that the Lablab varieties especially Beresa-17 used as a protein supplement for midland of Guji which are suffering from poor quality roughage and low protein and digestible crop residues which are the major ruminant feed sources particularly in Guji. Based on its adaptability and chemical compositions Gabis-55 is recommended for further promotion in the midland of Guji zone and similar agro-ecologies.

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