



Effect of Intercropping Dates of Lablab (*Lablab purpureus* L.) with Maize (*Zea mays* L.) on Forage and Maize Grain Yields

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Authors' contributions

This work was carried out in collaboration between both authors. Author MR took the responsibility of designed the study, performed the statically analysis and wrote the first draft of the manuscript. Author DT was managed the analysis of the study and follow up the field activity. Both authors read and approved the final manuscript.

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ABSTRACT

This study was conducted to evaluate effect of intercropping dates of lablab (*Lablab purpureus* L.) with maize (*Zea mays* L.) on forage and maize grain yields. It was carried out at Gereb Giba in Tanqua Abergelle district, Tigray, Ethiopia. Randomized Complete Block Design (RCBD) with four treatments and four replications were used. The treatments were sole maize sown (T1) and lablab sown at 10, 20 and 30 days after emergence of maize for T2, T3 and T4 respectively. Intercropping did not affect height and days for 50% flowering of lablab. Similarly, it was not affected height and days for physiological maturity of maize. Lablab forage yield was significantly greater ($p < 0.01$) in T2 and T3 than T4. Maize Stover dry matter (DM) yield was similar among treatments while total forage DM yield was significantly higher ($p < 0.0001$) in T2, T3 and T4 than T1. Moreover, among the intercrops, total forage yield was significantly highest ($p < 0.0001$) for T2 compared to T4 but similar in T2 and T3. Maize grain yield was significantly superior ($P < 0.0001$) in T2 and T3 compared to T1 and T4. Though, T2 and T3 had similarity in all parameters measured, T2 provided

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higher forage and maize grain yields than T1 and T4. Therefore, lablab intercropping at 10 days after emergence of maize is appropriate in Tanqua Abergelle district and other areas with similar agro ecologies.

Keywords: After emergence; lablab forage; maize stover; Tigray.

1. INTRODUCTION

One of the major constraints limiting livestock production in tropical countries is unavailability of both high quantity and quality of feeds [1]. Animals are dependent predominantly on high-fiber feeds that are deficient in nutrients essential for microbial fermentation. In countries like Ethiopia, growing forage crops as sole crop for animal feed is difficult due to shortage of cultivable lands and labour to plant the forages. The only possibility is the use of small farm land for integrated food and forage production. Growing of forage legumes through intercropping is one way of introducing forage crops in crop-livestock systems. The system offers a potential for increasing fodder without appreciable reduction of grain production. [2] suggested that intercropping is the lead in improving and ensuring the quality and quantity of food and feed. Intercropping improves forage quality by increasing crude protein yield of forage [3]. It enables to get a variety of returns from land and labor, to increase efficiency of resource use and to reduce risks which may be caused by bad weather, disease and pests [4]. Moreover, it improves soil fertility through biological nitrogen fixation with the use of legumes [3]. [5] Noted that maize residues tend to be high in carbohydrates but low in protein and hence, adding leguminous plants can contribute to improved livestock nutrition. Lablab (*Lablab purpureus* L.) is one of the herbaceous forage legumes which were identified for its adaptability and good forage yield [6]. [7] indicated that intercropping of cowpea-maize and lablab maize is more advantageous than mono crop maize. However, there is limited information on appropriate time of intercropping of lablab with maize. Therefore, the objective of this study was to evaluate effect of intercropping dates of lablab (*Lablab purpureus* L.) with maize (*Zea mays* L.) on forage biomass and maize grain yields.

2. MATERIALS AND METHODS

2.1 Study Area Description

The study was conducted at Gereb Giba in Tanqua Abergelle district, Tigray, Ethiopia. The

district is located at 13°14'06" N latitude and 38°58'50" E longitude. It is categorized as hot to warm sub moist lowlands (SM1- 4) sub agro ecological zone of the region with an altitude of 1300 to 1800 m.a.s.l and its mean annual rainfall ranges from 400 to 600 mm while its annual temperature ranges from 28 to 42°C [8].

2.2 Experimental Design and Treatments

A Randomized Complete Block Design (RCBD) with four treatments and four replication was used. The plots were chosen randomly and assigned for the treatments within the blocks. The plot size was 3 m by 3.75 m. The maize (*Zea mays* L.) was sown at the mid of June with a spacing of 30 and 75 cm between plants, rows, respectively. Lablab (*Lablab purpureus* L.) was also planted with 30 cm intra-spacing. The treatments included sole maize sown (T1), lablab sown/intercropped with maize after 10 days, 20 days and 30 days emergence of maize for T2, T3 and T4, respectively. It was observed that the maize plants emerged within six to eight days of planting. Weeding activity was done for all treatments uniformly. The lablab was harvested at 50% of flowering while the maize was harvested at 114 to 116.5 days of planting.

2.3 Data Collection

The collected were planting date, emergence date, days taken for 50% of lablab flowering, days taken for physiological maturity of maize, lablab height at 50% of flowering, maize height at physiological maturity, lablab forage biomass, maize Stover yield and total forage yield.

2.4 Data Analysis

The collected data were subjected to analysis of variance (ANOVA) using the general linear model procedure of SAS version 9.0 [9]. Significant treatment means were compared using Tukey's studentized range (HSD) test. The statistical model used for the data analysis was:

$Y_{ij} = u + t_i + b_j + \epsilon_{ij}$, where; Y_{ij} = response variable; u = overall mean; t_i = effect of treatment i ; b_j = effect of block j and ϵ_{ij} = random error.

3. RESULTS AND DISCUSSION

3.1 Plant Height, Days to Flowering and Maturity

There were no significant differences for lablab height at 50% flowering and days to 50% flowering of lablab among the different treatments (T2, T3 and T4) (Table 1). Besides, the treatments had similar height of maize at physiological maturity and days to physiological maturity of maize. [10] reported no significant difference in plant height and days to physiological maturity between sorghum monocropped and sorghum intercropped with lablab and cowpea.

3.2 Forage Dry Matter Herbage and Maize Grain Yields

The lablab forage DM yield was significantly greater ($p < 0.01$) for T2 and T3 than T4 (Table 2). This might be due to the later planting date which was exposed to moisture stress as rainfall occurrence is early stopped. As a result, forage biomass yield of lablab was low for the lately sown. The maize Stover DM yield was similar among treatments which indicate lablab intercropping could not affect for the biomass

yield of maize. This result was consistent with many other studies [11,12,13]. The total forage DM yield was significantly higher ($p < 0.0001$) for the intercrops than sole maize planting. Comparable to this result, [14] reported higher total fodder DM yield for intercrops than monocrop in lablab-maize intercropping system. Among the intercrops, the total forage DM yield was significantly superior ($p < 0.0001$) for T2 compared to T4 but similar in T2 and T3. It is noted that initially, growth of lablab is slow [15] and therefore, due to this reason, lablab intercropping with maize some days after maize emerged might not compete with maize during its initial growth stage rather it might have more chance of improving the soil fertility for the earlier than more delayed intercropped one.

The maize grain yield was significantly higher ($P < 0.0001$) in T2 and T3 compared to T1 and T4. Comparable to this research result, [16] indicated that under sowing lablab into maize between 2 and 4 weeks after maize planting gives appreciable yield of high quality fodder and optimum grain yield. On the other hand, reduced maize grain yield was reported by [12] for vetch and lablab intercropped 15 days after the emergence of maize compared to sole maize cropping.

Table 1. Plant height and days to harvest

Parameters	T1	T2	T3	T4	SEM	SL
Height of lablab at 50% flowering (cm)	-	131.8	129.5	124.0	2.459	ns
Height of maize at maturity (cm)	143.8	147.3	146.5	144.6	1.372	ns
Days to 50% flowering of lablab	-	72.0	74.5	76.0	1.147	ns
Days to physiological maturity of maize	116.0	114.0	115.0	116.5	1.038	ns

T1=Sole maize; T2= Lablab sown at 10 days after emergence of maize; T3=Lablab sown at 20 days after emergence of maize; T4= Lablab sown at 30 days after emergence of maize; SE= Standard error of mean; SL= Significant level and ns= Not-significant

Table 2. Forage biomass and maize grain yields

Parameters	T1	T2	T3	T4	SEM	SL
Lablab forage biomass yield on DM basis ($t\ ha^{-1}$)	-	2.16 ^a	1.91 ^a	1.48 ^b	0.084	**
Maize stover yield on DM basis ($t\ ha^{-1}$)	4.51	4.89	4.71	4.49	0.125	ns
Total fodder yield on DM basis ($t\ ha^{-1}$)	4.51 ^c	7.05 ^a	6.62 ^{ab}	5.97 ^b	0.157	***
Maize grain yield ($t\ ha^{-1}$)	2.60 ^b	3.28 ^a	3.17 ^a	2.72 ^b	0.065	***

^{abc} = mean in the same row with different superscript differ significantly; **= ($p < 0.01$) and ***= ($p < 0.0001$);

T1=Sole maize; T2= Lablab sown at 10 days after emergence of maize; T3=Lablab sown at 20 days after emergence of maize; T4= Lablab sown at 30 days after emergence of maize; SE= standard error of mean; SL= Significant level and ns= Not-significant

4. CONCLUSION AND RECOMMENDATIONS

Among the different intercropping dates indicated in this study, yields of lablab biomass, total fodder and maize grain were most appreciable for lablab intercropped at 10 days after emergence of maize and therefore, it is recommended as appropriate intercropping date for lablab-maize integration in Tanqua Abergelle district and other areas with similar agro ecologies.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Osuji PO, Nsahlai IV, Khalili H. Feed evaluation. ILCA Manual 5, International Livestock Centre for Africa, Addis Ababa, Ethiopia. 1993;40.
2. Belel MD, Halim RA, Rafii MY, Saud HM. Intercropping of corn with some selected legumes for improved forage production: A review. *Journal of Agricultural Science*. 2014;6(3):48-62.
3. Lithourgidis AS, Dordas CA, Damalas CA, Vlachostergios DN. Annual intercrops: An alternative pathway for sustainable agriculture. *Australian Journal of Crop Science*. 2011;5(4):396-410.
4. Tessema Zewdu, Getenet Assefa, Yohanes Tereffe. Effect of under sowing of annual forage legumes and fertilization on wheat grain, straw and forage production at Adet. In: *Proceeding of 3rd Conference of Ethiopian Society of Animal Production (ESAP)*, Addis Ababa, Ethiopia. 1995;245-249.
5. Jones J, MacRobert AL, Chandiramani M. The importance of legumes in cereal cropping systems. International Rice Research Institute (IRRI); 2009.
6. SARC. Annual Research Progress Report of Sirinka Agricultural Research Center. Sirinka, Ethiopia; 1999.
7. Abraha Lemlem. The effect of intercropping maize with cowpea and lablab on crop yield. *Herald Journal of Agriculture and Food Science Research*. 2013;2(5):156-170.
8. OoRD. Annual Report of Tanqua Abergelle District Office of Agriculture and Rural Development. Yechila, Ethiopia; 2015.
9. SAS. SAS/STAT Guide to Personal Computers, Release 9.0. Statistical Analysis System Institute. Inc., NC. North Carolina, USA; 2004.
10. Getachew Haile. Effect of intercropping forage legumes in different intra-row spacing with sorghum on performance of component crops in Gibe District, Southern Ethiopia. MSc Thesis Haramaya University, Haramaya, Ethiopia; 2014.
11. Birteeb PT, Addah W, Jakper N, Addo-Kwafo A. Effects of intercropping cereal-legume on biomass and grain yield in the savannah zone. *Livestock Research for Rural Development*. 2011;23(9):1-7.
12. Getachew Bekele, Ketema Belete, Sharma JJ. System productivity of forage legumes intercropped with maize and performance of the component crops in Kombolcha, Eastern Ethiopia. *East African Journal of Sciences*. 2013;7(2):99-108.
13. Mergia Abera. The effect of under sowing of forage legumes in maize on dry matter yield and nutritional value of the fodder in Baresa watershed, Ethiopia. *International Journal of Science and Research*. 2014;3(8):1070- 1077.
14. Kabirizi J, Mpairwe D, Mutetikka D. The effect of intercropping maize with lablab on grain and fodder production in small holder dairy farming systems in Masaka district, Uganda. *Uganda Journal of Agricultural Sciences*. 2005;11:39-44.
15. Sheahan CM. Plant guide for lablab (*Lablab purpureus*). USDA-natural Resources Conservation Service, Cape May Plant Materials Center. Cape May, NJ. 2012;08210.
16. Gbaraneh LD, Ikpe FN, Larbi A, Wahua TAT, Torunana JMA. Influence of lablab (*Lablab purpureus*) on grain and fodder yield of maize (*Zea mays*) in a humid forest region of Nigeria. *J. Appl. Sci. Environ. Mgt*. 2004;8(2):45-50.

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