

PLANT HEIGHT OF FORAGE SORGHUM AND LABLAB AS AFFECTED BY PLANTING PATTERNS AND DAYS OF INTERCROPPING IN SHIKA, NIGERIA

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ABSTRACT

The choice of planting patterns and days of intercropping was believed to be a relevant agronomic management option to minimize intercrop competition effects on the main crop. A field experiment was conducted during 2017 and 2018 rainy seasons at the breeder seed experimental site of Feeds and Nutrition Research Programme, National Animal Production Research Institute, Ahmadu Bello University, Shika, Zaria. To determine the yield and competition indices of forage sorghum and lablab as affected by planting patterns and days of intercropping. The experiment was laid out in a 5 x 4 factors in Randomized Complete Block Design replicated three times. The factors employed were five planting patterns of forage sorghum and lablab rows (4:0, 3:1, 2:2, 1:3 and 0:4) and four days of intercropping lablab (same day, 7 days, 14 days and 21 days) after emergence of forage sorghum. Planting patterns and days of intercropping significantly ($P < 0.05$) affected the plant height of both crops. In both years, 2017 and 2018 pooled, revealed a non-significantly ($P > 0.05$) higher plant heights of forage sorghum in 4:0, 3:1 and 2:2 rows but lowest in 1:3 rows. Intercropping the same day favors plant height of lablab (54.71cm) but when delayed it favors plant height of forage sorghum (251.17cm). In conclusion therefore, for a sustainable forage production and profitability of forage sorghum-lablab intercrop combinations, a planting pattern of three rows forage sorghum to one row lablab (3:1) and intercrop lablab the same day should be adopted.

Key words: Yield, Forage sorghum, Lablab, Planting patterns, Intercropping

INTRODUCTION

Forage sorghum or Columbus grass (*Sorghum alnum*) is a short-lived perennial forage species which is easily established from seed with rapid growth and fodder yield accumulation within the year of establishment. It is widely recognized and valued for its high yield of palatable herbage, suitable for ensiling, hay making and grazing especially in intensive livestock system. The potential of this grass has not been sufficiently exploited despite its competitive ability with most legumes. Mohammed and Muhammad (2015) reported an advantage in intercropping *S. alnum*-burgundy (2:2) with relative yield total of 3.3t/ha and that 2 rows of *S. alnum* and 2 rows of burgundy (2:2) sowing proportion appears to be the best. Lablab (*Lablab purpureus* L. Sweet) on the other hand, is a creeping legume which produces high quality conserved fodder (Amodu *et al.*, 2003) and if utilized in conjunction with natural pasture, sown pasture, browse plants and crop residue, will help to reduce weight losses common to livestock during the dry season. Forage sorghum and lablab are two forages that can be ensiled for improved nutritional quality. Forage sorghum and lablab mixtures are important source of nourishment for ruminant livestock in many production systems. Forage sorghum and Lablab are among the few neglected crops that are not cultivated by farmers in Nigeria in both wet and dry seasons even though some studies in Nigeria highlighted their potentials for crop-livestock integration (Hassan *et al.*, 2014). This study will provide a basis for the development of recommended planting patterns and days of intercropping using different competition indices.

MATERIALS AND METHODS

Description of the experimental site

The study was conducted during the 2017 and 2018 rainy seasons at the breeder seed experimental farm of Feeds and Nutrition Research Programme, National Animal Production Research Institute (NAPRI), Shika, Zaria. Shika is located on Latitude 11° 12'W. Longitude 07° 33'E and altitude 660m above sea level, 22km North-West of Zaria in the Northern Guinea Savannah zone of Nigeria (GPS, 2018). The climate of the study

area is characterized by a defined wet and dry season. Wet season starts from April to early May and ends in late September to early October while the dry season from October to April. Long-term annual rain fall (2006-2016) ranges from 1110 to 1160mm with a maximum temperature of 37°C in May and minimum temperature of 11.5°C recorded in December/January and relative humidity of approximately 70% (IAR, 2018).

Soil sampling and analyses

Soil samples were collected from the experimental site with the aid of soil auger at 4 corners and centers of the plots at 15 and 30cm depth and thoroughly mixed to make a composite sample for soil analysis before the commencement of the experiment. The soil samples were analyzed for physical and chemical properties as described by (A.E.S 1998), to determine texture, particle size, total nitrogen, total carbon, phosphorus, soil pH and cations exchange capacity (CEC). The analysis was done at the Department of Soil Science, Faculty of Agriculture, Ahmadu Bello University, Zaria.

Experimental layout, Treatments and Design

A total land area of 1620 m² (90 m x 18 m) was used. The land was ploughed and harrowed twice to provide a clean seed bed and to enhance early seed germination. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 5 x 4 factorial arrangement consisting of 5 planting patterns of forage sorghum and lablab rows (4:0, 1:3, 2:2, 3:1 and 0:4) and 4 days of intercropping lablab (0, 7, 14 and 21 DAS) replicated three times. The experimental plot was subdivided into 5 main blocks (30 m x 18 m) each, with 2 m pathways which representing planting patterns. The blocks were subdivided into 4 sub-plots each measuring (6 x 4 m) with 1m pathways representing days of intercropping lablab, totalling 60 sub-sub plots.

Source of Experimental materials and Agronomic study

Forage sorghum (*Sorghum almum*) and *Lablab purpureus* (cv. white Rongai) seeds were sourced from the Feeds and Nutrition Research Programme of the National Animal Production Research Institute (NAPRI) Shika, Zaria. Seeds of forage sorghum were planted on ridges at a spacing of 25 cm within rows and 85 cm between rows with 2 cm depth using seed rate of 15 kg/ha. Lablab seeds were treated with seed dressing chemical (Apron plus 50DS) at recommended rate of 2g to 2kg of seeds (Adegbite *et al.*, 2005). Lablab seeds were sown on hills in rows at 3 seeds per hole. First and second weeding was done manually with hoes at 3 and 6 weeks after sowing. The forage sorghum was thinned to 3 plants per stand after the first weeding and a uniform single dose of fertilizer was applied at the rate of 100 kg NPK (20:10:10) per hectare in two split doses.

Data collection

Measurement of plant height of Forage sorghum and Lablab

The plant height measurement was done by tagging five plants within each plot and measured using a standard meter rule from the ground to the tip of the flag leaf as described by Mohammed *et al.*, (2015).

Statistical analysis

Data collected for 2017 and 2018 were subjected to statistical analysis of variance using the General Linear Model Procedure of (SAS, 2005) package. Significant means were compared by applying the probability difference (PDIFF) option of least square means of the same SAS package at 95% confidence level.

RESULTS AND DISCUSSION

Plant height

Plant height of forage sorghum and lablab in sole and intercropped as affected by planting patterns and days of intercropping was presented in Table 1. Planting patterns and days of intercropping significantly ($P<0.05$) affected plant height of forage sorghum and lablab in both years. In 2017, significantly ($P<0.05$) highest plant height (262.17cm) was obtained in two rows of forage sorghum and two rows of lablab (2:2) than other planting patterns except for three rows of forage sorghum and one row of lablab (3:1). The pooled values of both years 2017 and 2018 showed that, the plant height of forage sorghum (251.17cm) at 21 days before intercropping lablab increases significantly ($P<0.05$) than other intercropping days. Interaction does not affect the plant height of lablab in any way. Plant height is an indication of forage yield (Lanyasunya *et al.*, 2007). The plant height of forage sorghum as observed to be higher in 2017 than in 2018 and vice versa for lablab. This may be attributed to variation in rainfall and temperatures of both years which affected initial planting dates. In this study planting pattern of 3:1 resulted in increased plant height of forage sorghum compared to

monocropped. Higher plant density in maize/cassava intercrop was reported to cause an increase in plant height of maize (Adeniyani *et al.*, 2014). However, delaying planting of lablab for 21 days resulted in higher plant height of forage sorghum. These was in agreement with Hirpa, (2014) who reported an increase in plant height of maize to 2.4m at 6 weeks after planting maize in 1:2 maize and Haricot beans intercropped.

Table 1: plant height (cm) of forage sorghum and Lablab as affected by planting patterns and days of intercropping

Planting patterns	Years of trial				Pooled (2017-2018)	
	2017		2018			
	F. Sorghum	Lablab	F. Sorghum	Lablab	F. sorghum	Lablab
FS:L (4:0)	242.08 ^b	-	238.92 ^a	-	240.50 ^a	-
FS:L (3:1)	257.08 ^a	47.83 ^{ab}	240.08 ^a	53.63 ^c	248.58 ^a	52.89
FS:L (2:2)	262.17 ^a	50.08 ^a	231.42 ^a	55.71 ^{bc}	246.79 ^a	50.73
FSL (1:3)	217.83 ^c	47.17 ^{ab}	217.64 ^b	56.25 ^b	217.74 ^b	51.71
FS:L (0:4)	-	45.25 ^b	-	59.67 ^a	-	52.73
SEM	5.88*	1.91*	6.27*	1.67*	4.38*	1.25 ^{NS}
Days of intercropping						
Same day	228.75 ^c	48.92	232.03	60.50 ^a	230.39 ^b	54.71 ^a
7 DAS	240.50 ^{bc}	45.83	233.33	57.17 ^{ab}	236.90 ^b	51.50 ^b
14 DAS	243.67 ^b	45.67	226.61	52.25 ^c	235.14 ^b	48.96 ^c
21 DAS	266.25 ^a	49.92	236.08	55.33 ^{bc}	251.17 ^a	52.63 ^{ab}
SEM	7.35*	2.39 ^{NS}	7.84 ^{NS}	2.09*	5.48*	1.56*
Interaction						
P x D	0.0002	0.39	0.76	0.20	0.003	0.10

*abc Means with same superscript are not significantly ($P>0.05$) different, NS= not significant, FS= forage sorghum, SEM standard error of mean, L = Lablab, D = days of intercropping, DAS = days after sowing sorghum.

CONCLUSIONS AND RECOMMENDATION

Conclusion

In general, this study, demonstrated that integration of forage sorghum and lablab as an intercropping system can increase productivity per unit land and income to the farmer. It could be concluded that Intercropping can enhance plant height of forage sorghum and lablab when planted in 3:1 or 2:2 planting patterns and intercropping lablab after 21 days of sowing forage sorghum favored the both crops.

Recommendation

It could be recommended that farmers, Research Institutes and Universities should adopt planting pattern of 3:1 for higher plant heights and intercropped lablab at the same day for higher yield.

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