



**EFFECT OF DIFFERENT PHOSPHORUS LEVELS AND SOWING DATES ON
YIELD AND YIELD COMPONENT OF LABLAB (*Lablab purpureus* L. walp)
VARIETIES IN RINGIM JIGAWA STATE, NIGERIA**

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ABSTRACT

Field experiment was conducted at the Jigawa State Horticultural Farm Ringim, during 2019, 2020 and 2021 wet seasons to investigate the effect of phosphorus levels and sowing date on the yield and yield components response of lablab varieties. The treatments consisted of four phosphorus levels (0, 20, 40 and 60 kg P/ha), three sowing dates (1st July, 15th July and 29th July) and two varieties of lablab (*Dan Farankachi* and *Dan Inusa*), which were factorially combined to give 24 treatments combination and laid out in a randomized complete block design (RCBD) replicated three times. Data were collected on number of root nodules per plant, number of days to physiological maturity and seed yield per hectare, and subjected to analysis of variance and Duncan's Multiple Range Test (DMRT) was adopted in separating the means. The results showed that, application of 60 kg P/ha produced significantly higher yield characters of lablab. In terms of date of sowing, sowing lablab on 29th of July was found to be statistically ($P \leq 0.01$) better in promoting yield of the crop than the other sowing dates. Variety *Dan Inusa* proved to be significantly ($P \leq 0.01$) better than *Dan Farankachi* throughout the study period. Based on the result of this study, it could be concluded that application of 60 kg P/ha, *Dan Inusa* and sowing date of 29th July could be adopted by farmers for better yield of lablab in the study area, hence recommended for better yield.

Keywords: Phosphorus, Sowing Date, Lablab, Treatment, Yields.

INTRODUCTION

Lablab purpureus L. Sweet, also known as 'hyacinth bean' (synonyms: *Dolichos lablab*) is in the *Fabaceae* family and is often considered an indigenous African species, proclaim that East Africa is the "centre of hyacinth bean diversity origin". Robotham., (2017) and Vidigal *et al.* (2018). Lablab seed contains high nutrients with potentials to meet the nutritional requirements of human being (Amino acid 18-25%, Zinc, Iron, Potassium, Magnesium and Calcium). As global population is increasing geometrically and food production is increasing arithmetically special attention has to be directed towards research on cultivation and utilization of those plant species that are either neglected and or underutilized Lablab inclusive (Ravindra *et al.*, 2020). Colonial British rule in Africa forced local lablab farmers to replace it with common bean intended for export to Europe and in the process eroded its familiarity with end-users, its genetic diversity and the farmers' knowledge of it (Maass, 2016). Traditional crops such as lablab were often replaced with other legume species less adapted to their environment and consequently, more prone to adversity such as drought and



pest attacks (Nahashon *et al.*, 2016). As a consequence of continuous population growth and environmental restrictions, the pressure on land and resources is increasing the challenge of agricultural production in the semi-arid areas of Africa. Lablab (*Lablab purpureus* L. Sweet) is one of those crops that have the ability to grow deep tap roots enabling the plant to reach deep residual soil moisture (Zelege *et al.*, 2019). In order to bring lablab back on farmers' fields, there is need to identify phosphorus level and sowing date that are well-adapted to the environmental conditions in semi-arid areas and well-accepted by farmers (Whitbread *et al.*, 2011). Therefore, studies have to be conducted on suitable variety, appropriate sowing period and optimum phosphorus level for better yield of lablab.

MATERIALS AND METHODS

The experiment was conducted in 2019, 2020 and 2021 wet seasons at the Field trials were conducted during the 2019, 2020 and 2021 cropping seasons at the Jigawa State Horticultural Farm Ringim (12° 11'N and 12° 14'N and Longitude of 8° 10' and 8° 38' E) in the semi arid zone of Jigawa state, Nigeria. The rainfall distribution pattern is unimodal. The soil of the sites was sandy loam. The rainfall starts mostly in June and ends in October with a mean annual rainfall of about 400 - 800 mm. The maximum and minimum temperature of Ringim ranges from 36 to 14°C, respectively. The treatments consisted of factorial combinations of four levels of phosphorous (0, 20, 40 and 60), two local varieties of lablab (Dan Inusa and Dan Farankachi) and three dates of sowing (24 treatment combinations) laid out in a randomized complete block design (RCBD) replicated 3 times.

The seeds of cowpea varieties were obtained from the farmers of the research area and sown on the 1st, 15th and 29th of July for all cropping seasons. Two seeds were sown per hill at a depth of 3 - 4 cm and 100 cm apart at a plant-to-plant spacing of 50 cm within a row. Urea at the rate 20 kg·ha⁻¹ was applied as a starter dose to all the plots while P₂O₅ was applied as per treatment (0, 20, 40, and 60 kg P₂O₅ ha⁻¹). Glyphosate (1.8 kg *a.i.* ha⁻¹) was applied before land preparation, while hoe weeding was carried out at 6WAS, supplementary hand pulling was carried out for undesirable weed species that grew above the canopy.

The data collected were subjected to analysis of variance to test the significance of treatment effects as described by Snedecor and Cochran (1967), and the means were separated using Duncan's Multiple Range Test (DMRT) (Duncan, 1955).

RESULTS AND DISCUSSION

Number Nodules Per Plant

The effect of phosphorus levels and sowing dates on number of nodules per plant of lablab varieties during 2019, 2020 and 2021 wet seasons are presented in Table 1. There was a highly significant effect of phosphorus fertilization on number of nodules per plant in all the seasons. 60 kg pha⁻¹ recorded higher number of nodules per plant; 20.56 in 2019, 19.72 in 2020, 20.11 in 2021 wet seasons. 0 kg pha⁻¹ had least number of nodules per plant. There was however, highly significant effect on sowing date in 2019, 2020. S1 had observed higher number of nodules in 2019, 2020 wet seasons with 19.00 and 18.00, respectively. Least number of nodules per plant was recorded with S3. There was no significant varietal response in all the seasons. Highly significant response of number of nodules per plant could be attributed to the role of phosphorus nutrition in legume growth as greatly stimulate root development and increasing its ability to absorbed nutrient from the soil. The results are in agreements of Naeem *et al.* (2009) and Ogedegbe *et al.* (2011) as this could be connected with ability of P uptake in rapidly promoting growth and development. The highly significant response of lablab to



sowing date observed at 2019, 2020 wet season and combined on number of nodules per plant. This might be due to optimum temperature which encouraged rate of nutrients uptake, increased photosynthesis of individual plant which led to higher dry matter accumulation per plant. The result agrees with findings of Petal *et al* (2010).

Table 1: Effect of sowing date on the phosphorus level on Number of Nodules on lablab varieties in 2019, 2020 and 2021 wet seasons at Ringim

Treatments	2019	2020	2021
Phosphorus Levels (kg/ha)			
0	15.17d	13.17c	13.61c
20	17.06c	14.67d	14.94b
40	19.39b	19.06a	19.61a
60	20.56a	19.72a	20.11a
Level of Probability	**	**	**
SE \pm	0.377	0.246	9.42
Sowing Dates			
S1	19.00a	18.00a	17.86
S2	18.17a	16.92b	17.17
S3	16.96b	15.04c	16.96
Level of Probability	**	**	NS
SE \pm	0.327	0.213	8.15
Varieties			
Dan Farankachi	17.86	16.67	16.89
Dan Inusa	18.22	16.64	17.25
Level of Probability	NS	NS	NS
SE \pm	0.267	0.174	6.66

NS= not significant, ** & * = significant @ 0.01 & 0.05 probability level, respectively.

Physiological Maturity

Effect of phosphorus levels and sowing dates on days to physiological maturity of Lablab varieties at 2019, 2020 and 2021 wet seasons was presented in Table 2. Highly significant ($P \leq 0.01$) effect was observed with phosphorus fertilization. 0 kgPha⁻¹ recorded longer days to maturity in all the trials. Shorter days to maturity were with 60 kg Pha⁻¹. There was no significant difference between sowing date on days to physiological maturity. There was also a highly significant ($P \leq 0.001$) effect on varieties, where Dan Inusa recorded longer days to maturity (203.08) and similar to other samples. Least days to maturity was recorded with Dan Farankachi in all the trials. Highly significant response of P levels might be connected with phosphorus is considered as one of the major elements for plant nutrition that promote vegetative production and making plant to mature early. The result is in agreement with the report of Sexana *et al.* (1996) that P application strongly influenced lablab nodulation, which resulted in increases assimilation of other macro elements that leads to early maturity. The highly significant effect of varieties on days to physiological maturity might be due to its greater capacity for accumulation of more photosynthates in less time that favored induction of early flowering and fruiting and/or due to the genetic makeup of the varieties. Similar variations in days to first picking of Indian bean varieties were reported by Mohan *et al.* (2009), Joshi and Rahevar (2015) and Choudhary *et al.* (2016) in Indian bean.



Table 2: Effect of Phosphorus Levels and Sowing Dates on Days to Physiological Maturity of Lablab Varieties in 2019, 2020, 2021 wet seasons and combined at Ringim

Treatments	2019	2020	2021
Phosphorus Levels (kg/ha)			
0	199.17a	199.28a	199.28a
20	194.39b	194.78b	194.78b
40	190.44c	190.00c	190.39c
60	187.83d	187.78d	187.83d
Level of Probability	**	**	**
SE \pm	0.165	0.135	0.135
Sowing Dates			
S1	193.08	193.00	193.04
S2	193.00	192.96	193.13
S3	192.79	192.92	193.04
Level of Probability	NS	NS	NS
SE \pm	0.143	0.117	0.117
Varieties			
Dan Farankachi	183.03b	182.83b	183.19b
Dan Inusa	202.89a	203.08a	202.94a
Level of Probability	**	**	**
SE \pm	0.116	0.095	0.096

NS= not significant, ** & * = significant @ 0.01 & 0.05 probability level, respectively.

Seed Yield Per Hectare (t/ha)

Table 3 shows the effect of phosphorus rates, sowing dates on seed yield per hectare of lablab varieties in 2019, 2020 and 2021 wet season at Ringim. There was highly significant (0.001) effect of phosphorus rate of lablab in 2019, 2020 and 2021 wet seasons. Maximum seed yield was recorded with 60 kg P ha⁻¹ in 2019 wet season (3.194 tha⁻¹) and in 2020 wet season (3.389 tha⁻¹) and with 40 kg P ha⁻¹ in 2021 wet season (3.179 tha⁻¹). There was a highly significant (0.01) effect of sowing date on lablab seed yield in 2019 and 2020 wet season. Sowing two had higher seed yield in 2019 wet season (2.872 tha⁻¹) and sowing three had higher seed yield in 2020 wet season (2.995 tha⁻¹). Least seed yield was with sowing one; in 2019 wet season. There was highly significant (0.01) varietal response in all the trials. Dan Inusa had recorded higher seed yield; in 2019 wet season (2.935 tha⁻¹), in 2020 wet season (3.016 tha⁻¹), and in 2021 wet season (3.084 tha⁻¹). Least seed yield was with Dan Farankachi. The highly significant (0.01) effect of phosphorus might be attributed that phosphorus fertilizer has added some important nutrient to the soil which were important for nodulation and seed formation. The result is in line with report of Naecm *et al.* (2009) that favorable response of lablab beans to phosphorus application most especially in case of root nodules, nodules dry wet and seed yield could be attributed to phosphorus nutrition and sowing date. This result is in agreement with those reported by many workers including Nikfarjam and Aminpanah (2015), Adak and Kibritci (2016), El-Agrodi *et al.* (2017) and Sarkar *et al.* (2017). The highly significant response on seed yield per plant and per hectare may also be attributed to superiority of varieties over the others with respect to yield components and yield may be due to their genetic potential to utilize the growth resources effectively and translocate the photosynthates from source to sink. Similar result has been reported by Parmar *et al.* (2013) and Choudhary *et al.* (2016) who reported varieties indicated significant variation for weight of 10 pods.



Table 3: Effect of different Phosphorus levels and sowing Dates on Seed Yield per Hectare of Lablab Varieties in 2019, 2020 and 2021 West Seasons at Ringim

Treatments	2019	2020	2021
Phosphorus Levels (kg/ha)			
0	2.4772d	2.4072d	2.611d
20	2.5983c	2.6317c	2.939c
40	3.1222b	3.3233b	3.179a
60	3.1939a	3.3894a	3.017b
Level of Probability	**	**	**
SE \pm	0.01	0.02	0.02
Sowing Dates			
S1	2.8162b	2.9179b	2.949
S2	2.8717a	2.9008b	2.932
S3	2.85558a	2.9950a	2.929
Level of Probability	**	**	NS
SE \pm	0.01	0.01	0.02
Varieties			
Dan Farankachi	2.760b	2.8603b	2.789b
Dan Inusa	2.9353a	3.0156a	3.084a
Level of Probability	**	**	**
SE \pm	0.10	0.01	0.02

NS= not significant, ** & * = significant @ 0.01 & 0.05 probability level, respectively.

CONCLUSION AND RECOMMENATIONS

The results obtained from this trial indicated that application of 60kgPha⁻¹ under wet season condition resulted to highest growth and yield of *Dan Inusa* lablab variety in Ringim Jigawa State, Nigeria. Accordingly, the sowing at 29th July is then recommended for best yield of the lablab.

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