

ORIGINAL ARTICLE

Effects of Methods of Tillage and Levels of Fertilizer on Growth and Yield Attributes of Lablab Bean (*Lablab purpureus* L.)

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ABSTRACT

The research project entitled, "Effects of tillage and levels of fertilizer on growth, yield and quality of lablab bean (*Lablab purpureus* L.)" was conducted on plot No. 42 of 'A' block of Agronomy Farm, College of Agriculture, Dapoli. Dist. Ratnagiri during rabi season of 2014-2015. The field experiment was laid out in a split plot design. The main plot treatments comprised four tillage methods and sub plot treatments comprised five levels of fertilizer application. Thus, there were all twenty treatment combinations replicated three times. The gross plot size was 4.4 m x 3.6 m and net plot size was 3.6 m x 2.7 m, respectively. Sowing of lablab bean was done on 17th November, 2014 by using the seed rate of 55 kg ha⁻¹ of lablab bean. The sowing of treated seeds was done as per treatments. The quantity of fertilizer dose for each plot was calculated and applied through soil and foliar application was made as per the treatments. All levels of fertilizer applied through soil deep placement except treatment F₃ in which 75% RDF applied through deep placement and 2% DAP through foliar spray twice at 50% flowering and pod filling stage. The other common package of practices were followed time to time and periodical growth observations were recorded at an interval of 20 days from 20 DAS up to harvest of the crop. Crop was harvested at physiological maturity and data on yield attributes and yield were recorded. The tillage methods viz. T₁ (conventional tillage) and T₃ (minimum tillage) were found significantly superior over rest of the treatments i.e. T₂ (conservation tillage) and T₄ (zero tillage) and also found at par with each other and recorded higher grain yield of 16.40 q ha⁻¹ and 16.10 q ha⁻¹, respectively. Also the values of straw yield, growth parameters, yield attributes, nutrient uptake, gross income, net returns and B: C ratio recorded higher under treatments T₁ (conventional tillage) and T₃ (minimum tillage) in that descending order of significance. The levels of fertilizer application (100% RDF deep placement) i.e. treatment F₄ was found significantly superior over rest of the treatments and recorded higher grain yield (16.91 q ha⁻¹) than rest of the treatments under study followed by the treatment F₃ (75% RDF deep placement with 2% DAP foliar spray) and F₁ (100% RDF line application) which were found significantly superior over remaining treatments i.e. F₂ (75% RDF deep placement) and F₀ (control) but statistically identical with each other and recorded grain yield of 15.97 q ha⁻¹ and 15.68 q ha⁻¹, respectively. They also significantly influenced growth parameters, yield attributes, nutrient uptake and increased straw yield, gross income, net returns and B: C ratio. From the results of the present investigation it can be concluded that, lablab bean crop should be grown in conventional tillage method along with fertilizer application (deep placement) of 100 per cent recommended dose of fertilizer (RDF) at sowing time, to obtain higher yield, better quality, net returns and B: C ratio.

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INTRODUCTION

In Konkan region total pulse area was 27.2 thousand hectores which was produced 16.70 thousand tonnes. Maharashtra rank first in area and production of pulses with total production of pulses in Maharashtra was 2.73 million tonnes from an area of 3.38 million ha.. In India total production of pulses was 18.69 million tonnes from an area of 26.28 million ha with average productivity of 689 Kg ha⁻¹. In Maharashtra, Lablab bean is one of the important pulse crop grown in Konkan region of Maharashtra. Konkan region alone accounts 80% of total area under lablab bean and it is about 60,000 ha. The crop is mostly grown in rabi season i.e after end of the monsoon on residual moisture. In Maharashtra it is popularly known as

“wal”. The mechanical manipulation of the soil for loosening the surface crust aimed at bringing conditions favorable for germination of seeds or planting of seedlings and the growth of crops is called as tillage, while the physical conditions brought about by tillage operation is called as tith. Tillage was considered as an ‘art’ and in the recent years, research evidence has focused tillage as ‘science’. There are various systems of tillage, such as, conventional tillage, conservation tillage, minimum tillage and zero tillage etc. From time immemorial various methods of ploughing have been tried by trial and error, based on the labour availability and economic status of the farmer. Tillage is an important aspect regarding crop production as tillage accounts 30 per cent of cost of production. Now a day, considering the high cost of tillage there is needed to plan suitable tillage system for profitable crop production. Zero tillage is cultivation practice that not only helps to preserve soil fertility but also conserves scarce water and increases farmer’s profits by reducing their production costs. Instead of ploughing the fields, farmers use zero tillage and deposit seeds into holes dibbled into unploughed fields. Due to zero tillage the cost is reduced about 15 to 16 per cent. In *konkan* region *kharif* rice followed by pulses like lablab bean, horse gram, cowpea etc. are commonly grown by the farmers, either on residual moisture or by giving protective irrigation. The reason for the low yield of the pulse crop may be many but the important one is that the pulse crop hardly receives any fertilizer or manure. The only way to improve the yield of the pulse crop lies in the use of fertilizers. Altering the soil nutrients and fertility status by providing balanced and adequate major nutrients like nitrogen, phosphorus and potassium as per the crop requirement is one of the easiest ways to boost up seed crop productivity of lablab bean. Hence it is important to standardise optimum levels of major nutrients for realizing better seed crop productivity. “Konkan wal no-2” a variety of lablab bean has been found quit promising because of its short duration and high yield. The variety becomes ready for harvest within 100 to 105 days. It can be grown successfully during *Rabi* season where the irrigation facilities are available. To increase seed production and productivity of lablab bean the experiment was carried out on variety konkan wal no-2 in 2014 -2015 with following objectives to study the effect of tillage methods on growth, yield and quality of lablab bean, to study the effect of levels of fertilizer on growth, yield and quality of lablab bean, to study the interaction effect of tillage methods and levels of fertilizer on growth, yield and quality lablab bean and economics of various treatments.

MATERIAL AND METHODS

The present investigation was conducted at Agronomy Farm, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.) during *rabi* 2014-15. As experiment is based on different tillage methods, immediately after harvesting of *kharif* rice applying tillage operations according to different tillage methods and *rabi* lablab bean was sown. The main plot treatments comprised four tillage methods and sub plot treatments comprised five levels of fertilizer application. **A) Main plot treatment - Methods of tillage:** T₁ - Conventional tillage, T₂ - Conservation tillage, T₃ - Minimum tillage, T₄ - Zero tillage. **B) Sub plot treatment - Levels of fertilizers:** F₀ - Control, F₁ - 100% RDF through line application, F₂ - 75% RDF (deep placement), F₃ - 75% RDF (deep placement) + foliar spray 2% DAP (at flowering and pod filling), F₄ - 100% RDF (placement below seed). Fertilizers were applied uniformly to the whole plot in the holes dibbled earlier at the spacing of 45 x 20 cm. RDF was applied at 4 different levels *viz.*, 100 % (line application) and 75% (placement below seed), 75% + 2% DAP (foliar spray) and 100% (placement below seed) each through urea (46.4% N) and single super phosphate (16% P₂O₅). The whole quantity of urea and single super phosphate was applied in a single below seed placement before sowing of seeds for treatments F₂ to F₄. In treatment F₃ there was 75% of RDF applied through soil and remaining 2% DAP through foliar spray. The fertilizers for F₁ plots were applied through line application after germination of crop.

RESULTS AND DISCUSSION

Effect of tillage methods on growth attributes:

Treatment T₁ (conventional tillage) and T₃ (minimum tillage) significantly increased the growth parameters of lablab bean such as, plant height, number of functional leaves per plant, number of branches per plant and dry matter accumulation per plant as compared to T₂ (conservation tillage) and T₄ (zero tillage). Treatment T₂ was found to be significantly superior over treatment T₄ *i.e.* zero tillage. The increase in values of growth parameters under above treatments were mainly attributed due to good tith resulted from the tillage methods. Similar findings were also reported by Chendge [2] and Raut [5].

Effect of levels fertilizer application on growth attributes:

At 40, 60, 80, 100 DAS and at harvest growth parameters *viz.*, plant height, number of functional leaves per plant, plant spread, number of branches per plant and dry matter accumulation per plant, were the

highest in treatment F₄ (100% RDF placement below seed) which were significantly superior over rest of treatments. Similarly treatment F₃ (75% RDF+ 2% DAP foliar spray) and F₁ (100% RDF through line application) which was at par with each other and found significantly superior over treatment F₂ (75% RDF placement below seed) and F₀ (control) in that descending order of significance. Significantly, the lowest values of plant growth parameter was observed in the treatment F₀ (control) over rest of the treatments. The increase in the growth parameters of lablab bean under treatment F₄ was significantly superior due to 100% RDF (deep placement) through soil as compared with rest of the treatments. After supplying higher dose of N, P₂O₅ and K₂O as in case of F₄ and (75% RDF+ foliar application of 2% DAP) under treatment F₃ contributed probably higher chlorophyll content which enables the crops photo synthetically more active and therefore higher dry matter accumulation which has reflected in recording of superior values of growth parameters such as plant height (cm), number of leaves, number of branches and dry matter accumulation (g) followed by treatments F₁, F₂ and F₀. Nutrients application through soil at the time of sowing had increased the growth attributes over control due to availability nutrients through roots at early stages of growth. Similar findings were also be reported by Bhukan [1], Game [3] and Tahir *et al.* [6].

Table No.1 Effect of tillage methods and levels of fertilizer application on growth attributing characters of Lablab bean.

Treatment details	Plant height (cm) at harvest	Mean number of functional leaves/plant at harvest	Mean leaf area per plant (cm ²) at harvest	Number of branches at harvest	Plant spread (cm) at harvest	Dry matter accumulation per plant (g) at harvest
A) Main plot treatment - (Methods of tillage)						
T ₁ - Conventional tillage	109.72	35.16	1290.54	11.99	63.93	21.55
T ₂ - Conservation tillage	99.78	31.50	1160.42	10.25	56.60	19.63
T ₃ - Minimum tillage	107.62	34.94	1244.05	11.84	62.69	21.43
T ₄ - Zero tillage	94.59	28.60	1079.10	9.74	52.08	18.19
F. test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.Em. ±	1.49	0.68	22.91	0.30	1.40	0.37
C.D. at 5%	5.16	2.36	79.30	1.05	4.84	1.28
B) Sub plot treatment - (Levels of fertilizer application)						
F ₀ - Control	92.98	28.00	1071.44	9.32	47.08	17.87
F ₁ - 100 % RDF(L.A.)	104.75	33.38	1200.79	11.30	60.88	20.72
F ₂ - 75% RDF(D.P.)	99.03	30.94	1136.50	10.36	53.98	18.64
F ₃ - 75% RDF(D.P.) +2% DAP (F.S.)	106.06	33.94	1246.43	11.65	62.64	21.24
F ₄ - 100 % RDF(D.P.)	111.81	36.49	1312.47	12.15	69.54	22.53
F. test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.Em. ±	1.98	0.84	22.91	0.30	2.38	0.36
C.D. at 5%	5.69	2.41	79.30	0.87	6.85	1.05
Interaction effect						
F. test	N.S	N.S	N.S	N.S	N.S	N.S
S.Em. ±	3.95	1.67	43.94	0.60	4.75	0.73
C.D. at 5%	-	-	-	-	-	-
General mean	102.93	32.55	1193.53	10.96	58.82	20.20

Table No.2. Effect of tillage methods and levels of fertilizer application on yield attributes and yield of Lablab bean.

Treatment details	No. of pods plant ⁻¹	Weight of pods plant ⁻¹	No. of grains pod ⁻¹	100 grain weight	Grain yield (q ha ⁻¹)	Stover yield (q ha ⁻¹)
A) Main plot treatment - (Methods of tillage)						
T ₁ - Conventional tillage	31.40	30.53	4.16	23.82	16.40	39.22
T ₂ - Conservation tillage	28.95	27.55	3.28	20.87	14.47	36.06
T ₃ - Minimum tillage	31.07	30.37	4.01	22.81	16.10	39.02
T ₄ - Zero tillage	26.47	24.75	2.90	19.28	13.30	33.72
F. test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.

S.Em. \pm	0.61	0.75	0.09	0.45	0.29	0.67
C.D. at 5%	2.11	2.60	0.32	1.57	1.02	2.31
B) Sub plot treatment - (Levels of fertilizer application)						
F ₀ - Control	26.13	25.08	3.16	19.38	12.13	32.95
F ₁ - 100 % RDF(L.A.)	30.21	28.86	3.62	21.90	15.68	37.89
F ₂ - 75% RDF(D.P.)	28.15	26.61	3.39	20.66	14.64	35.45
F ₃ - 75% RDF(D.P) + 2% DAP (F.S.)	30.37	29.42	3.76	22.57	15.97	38.08
F ₄ - 100 % RDF(D.P.)	32.49	31.54	4.00	23.98	16.91	40.65
F. test	Sig	Sig.	Sig.	Sig.	Sig.	Sig.
S.Em. \pm	0.69	0.69	0.06	0.41	0.30	0.84
C.D. at 5%	2.00	1.99	0.18	1.19	0.87	2.41
Interaction effect						
F. test	N.S	N.S	N.S	N.S	NS	NS
S.Em. \pm	1.39	1.38	0.13	0.83	0.60	1.67
C.D. at 5%	-	-	-	-	-	-
General mean	29.47	28.30	3.58	21.70	15.07	37.01

Effect of tillage methods on yield attributes of lablab bean:

The main objective of the agronomist is to increase the economic yield which is grain in case of lablab bean. The grain yield per unit area in lablab bean is a function of yield attributes of an individual plant *viz.*, number of pods per plant, number of grains per pod, weight of pods per plant and 100 grain weight. The results revealed that, treatment T₁ (conventional tillage) significantly improved all the yield attributing characters followed by treatment T₃ (minimum tillage) which were at par with each other and found significantly superior over T₂ (conservation tillage) and T₄ (zero tillage). Treatment T₂ (conservation tillage) was significantly increased all yield attributes over T₄ (zero tillage). The possible reason of high yield attributing characters may be traced due to the increased dry matter production might have resulted in greater synthesis of photosynthates contributing to an increase in yield attributes.

Effect of levels fertilizer application on yield attributes:

The grain yield per unit area in lablab bean is a function of yield attributes of an individual plant *viz.*, number of pods per plant, number of grains per pod, weight of pods per plant and 100 grain weight. The results revealed that, application of 100% RDF (deep placement) which was statistically significant over rest of treatments *i.e.* F₃, F₁, F₂ and F₀ in respect of yield contributing characters. Similarly, treatment F₃ and F₁ were at par with each other and found significantly superior over treatment F₂ (75% RDF deep placement) and F₀ (control). 100% RDF (line application) significantly improved the yield attributing characters over rest of treatments *i.e.* F₂ and F₀. Treatment F₂ was significantly superior over treatments F₀. The plant nutrients are most important for growth and development of crops. Availability of optimum amount of essential plant nutrients resulted in a production of superior yield attributes. These results are in line with those reported by Bhukan [1], Game [3], Kumar *et al.* [4] and Tahir *et al.* [6].

CONCLUSION

From the results it can be concluded that, lablab bean crop should be grown in conventional tillage method along with fertilizer application (deep placement) of 100 per cent recommended dose of fertilizer (RDF) at sowing time, to obtain significantly superior growth and yield attributes to obtain higher yields.

REFERENCES

1. Bhukan, A. U. (2013). Response of Urid bean [*Vigna mungo* (L.) Hepper] response to different Fertility and Boron levels. M.Sc. (Agri) Thesis, Swami Keshwan and Rajasthan Agricultural University, Bikaner.
2. Chendge P. D. (2012). Effect of tillage system and integrated weed management on growth, yield and quality of summer cowpea (*Vigna unguiculata* L.) M.Sc. (Agri.) Unpublished thesis, submitted to Dr. B.S.K.K.V., Dapoli.
3. Game, V. N. (2013). Effect of irrigation and levels of fertilizer application on zero tilled cowpea (*Vigna unguiculata* L.) M. Sc.(Agri.) Unpublished thesis, submitted to Dr. B.S.K.K.V., Dapoli. *Madras Agric. J.*, **95** (1-6):57-60.
4. Kumar, C.V., Vaiyapuri, K., Mohamed, M. and Gopaldaswamy, G.(2013). Influence of Foliar Spray of Nutrients on Yield and Economics of Soybean (*Glycine max* L. Merill). *J. of Biological Sci.*, **13** (6):563-565.
5. Raut, S. D. (2014). Response of horse gram (*Dolichos biflorus* Roxb) to different methods of fertilizer application under varying tillage conditions during *rabi* season. Unpublished thesis, M.Sc. (Agri.) submitted to Dr. BSKKV., Dapoli.

6. Tahir, M., Maqbool, R., Majeed, A., Rehman, A. and Zafar, A.M. (2014). Potential of foliar applied Diammonium Phosphate (DAP) and Potassium (K) in achieving maximum productivity and quality of Mash bean (*Vigna mungo* L.), *Sci. Agri*, 7 (3): 147-149.

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