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ORIGINAL ARTICLE

Response of Plant Growth Regulator With Different Spacing On Growth, Yield And Economics Of Zero Tilled Lablab Bean (*Lablab purpureus* L.).

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ABSTRACT
The field experiment was conducted on plot No. 37 of 'B' block of Agronomy Department Farm, College of Agriculture, Dapoli. Dist. Ratnagiri during rabi 2014-15 to study the "Effect of levels of spacing and plant growth regulator on growth, yield and quality of zero tilled lablab bean (Lablab purpureus L.)". The experiment was laid out in a strip plot design with three replications. The horizontal treatments were four spacing levels, viz., 30 x 15 cm (S_1), 30 x 20 cm (S_2), 45 x 20 cm (S_3) and 60 x 20 cm (S_4).The vertical treatments comprised four levels of plant growth regulator viz., water spray (P_0), foliar application of 50 ppm paclobutrazol (P_1), foliar application of 100 ppm paclobutrazol (P_2) and foliar application of 150 ppm paclobutrazol (P_3) at 30 DAS. Thus, there were in all 16 treatment combinations. The gross plot size was 4.2 m x 3.6 m. Results revealed that spacing level of 45 x 20 cm recorded significantly higher growth as well as yield attributes resulting in higher seed and straw yield (q ha^{-1}) followed by spacing 60 x 20 cm, 30 x 20 cm and 30 x 15 cm in that descending order. Significantly higher values of protein, N, P and K content in seed and straw and total uptake by lablab bean were recorded due to spacing of 45 x 20 cm. The highest net return of ₹ 44484 ha^{-1} with B: C ratio 1.89 was obtained due to spacing of 45 x 20 cm. Foliar application of 100 ppm paclobutrazol recorded significantly higher growth as well as yield attributes resulting in higher seed and straw yield (q ha^{-1}) followed by 150 ppm paclobutrazol spray over rest of the treatments. Significantly higher values of protein, N, P and K content in seed and straw and total uptake by lablab bean were recorded due to foliar application of 100 ppm paclobutrazol followed by 150 ppm paclobutrazol spray over rest of the treatments. The highest net returns of ₹ 41280 ha^{-1} with B: C ratio 1.82 was obtained due to foliar application of 100 ppm paclobutrazol on lablab bean. In respect of economics, it was observed that the treatment combinations S_3P_2 (spacing of 45 x 20 cm with foliar application of 100 ppm paclobutrazol) has given highest net returns (₹ 48555 ha^{-1}) and B: C ratio (1.97).
Keywords: Lablab bean, paclobutrazol, plant growth regulator

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INTRODUCTION

Lablab bean (wal) is one of the important pulse crop grown in *Konkan* region of Maharashtra especially for seed purpose. The crop is mostly grown on residual soil moisture after harvesting of *kharif* rice. So, mostly zero tillage is followed in Maharashtra for the cultivation of lablab bean.Plants grown under normal spacing will have optimum population density per unit area which provides optimum conditions for luxuriant crop growth and better plant canopy area due to maximum light interception, photosynthetic activity, assimilation and accumulation of more photosynthates into plant system and hence they produce more seed yield with best quality traits [1, 7]. Lablab bean crop have excessive shoot growth habit which leads to lower the seed yield. PBZ is a cell elongation and internode extension inhibitor that retards plant growth by inhibition of gibberellins biosynthesis. The application of plant

growth regulator such as paclobutrazol give a great promise for controlling excessive shoot growth in number of plant species.

MATERIAL AND METHODS

The field experiment on Lablab bean (*Lablab purpureus* L.) was conducted during *rabi* season of 2014 at the Agronomy Farm, College of Agriculture, Dapoli, Dist. Ratnagiri (M.S.). The soil of experimental plot was sandy clay loam in texture and slightly acidic in reaction with medium in organic carbon. It was medium in available nitrogen and low in available phosphorus and moderately high in available potassium. The experiment was laid out in strip plot design with three replications. The horizontal treatments consist of four levels of spacing *i.e.,* 30 x 15 cm (S_1), 30 x 20 cm (S_2), 45 x 20 cm (S_3), 60 x 20 cm (S_4). The vertical treatments comprises four levels of plant growth regulator (PBZ) *i.e.,* Water spray (P_0), 50 ppm (P_1), 100 ppm (P_2), 150 ppm (P_3) at 30 DAS. The gross plot size was 4.2 x 3.6 m^2 and net plot sizes were varying according to the spacing such as 3.90 x 3.00 m^2, 3.80 x 3.00 m^2, 3.80 x 2.70 m^2 and 3.80 x 2.40 m^2. The crop was sown by dibbling and spacing was maintained as per treatments. The recommended full dose of fertilizers was applied to each plot at the time of sowing. Healthy, unbroken and well developed seeds of lablab bean variety Konkan Wal-2 were treated with fungicide and inoculated with biofertilizer (Rhizobium @ 25 g kg^{-1} seeds) before sowing of the seeds.

RESULTS AND DISCUSSION

Effect of spacing on growth attributes of lablab bean:

It could be seen from Table 1 that the closer spacing 30 x 15 cm (S_1) recorded significantly taller plants because plant might have adjusted its canopy in the vertical space for increasing the height while in case of wider spacing of 60 x 20 cm (S_4) under less competition resulted in greater horizontal space which resulted into more number of leaves, branches, spread of plant and dry matter accumulation per plant than other spacing. Similar finding were reported by Rudragouda *et al.* [2].

Table 1. Effect of levels of spacing and plant growth regulator on growth and yield of zero tilled lablab bean at harvest

Treatment	Plant height (cm)	Leaves per plant	Branches per plant	Spread of plant (cm)	Dry matter per plant (g)	Yield (q ha^{-1})	
						Grain	Straw
Spacing (cm)							
S_1- 30 x 15	115.56	17.83	10.74	57.77	26.14	08.87	25.08
S_2- 30 x 20	113.01	17.88	10.95	57.87	27.06	08.99	25.90
S_3- 45 x 20	097.26	24.60	12.49	64.14	29.59	11.20	32.18
S_4- 60 x 20	097.13	25.79	13.47	67.11	30.55	10.88	30.15
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.Em. ±.	1.82	0.36	0.38	1.15	0.33	0.36	0.61
C.D. at 5%	6.30	1.25	1.30	3.97	1.16	1.26	2.11
Plant growth regulator							
P_0- Water spray	118.53	18.48	11.55	65.25	22.94	09.30	26.74
P_1- 50 ppm	112.65	20.53	11.60	64.15	26.22	09.55	27.21
P_2- 100 ppm	097.81	24.61	12.54	60.13	33.33	10.95	30.56
P_3- 150 ppm	093.97	22.47	11.96	57.36	30.84	10.14	28.80
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
S.Em. ±.	2.53	1.15	0.50	1.07	0.78	0.44	0.96
C.D. at 5%	7.52	3.42	1.49	3.16	2.31	1.30	2.84
Interaction							
F. Test	N.S.	N.S.	N.S.	N.S.	N.S.	NS	NS
S.Em. ±.	8.51	4.82	0.85	4.06	2.44	1.48	2.21
C.D. at 5%	-	-	-	-	-	-	-
General mean	105.74	21.52	11.91	61.72	28.33	09.99	28.33

Table No.2. Effect of levels of spacing and plant growth regulator on economics of zero tilled lablab beans at harvest.

Treatment	Yield (q ha^{-1}) Grain	Yield (q ha^{-1}) Straw	Total cost (₹ ha^{-1})	Gross income (₹ ha^{-1})	Net income (₹ha^{-1})	B:C Ratio
Spacing (cm)						
S_1- 30 x 15	08.87	25.08	52029	74629	22600	1.43
S_2- 30 x 20	08.99	25.90	50971	75851	24880	1.49
S_3- 45 x 20	11.20	32.18	50029	94513	44484	1.89
S_4- 60 x 20	10.88	30.15	49562	91240	41677	1.84
F. Test	Sig.	Sig.	Sig	Sig	Sig	-
S.Em. ±.	0.36	0.61	76.31	2541.63	2582.61	-
C.D. at 5%	1.26	2.11	52029	74629	22600	1.43
Plant growth regulator						
P_0- Water spray	09.30	26.74	50572	78434	27862	1.55
P_1- 50 ppm	09.55	27.21	50612	80457	29845	1.59
P_2- 100 ppm	10.95	30.56	50679	91959	41280	1.82
P_3- 150 ppm	10.14	28.80	50729	85383	34654	1.69
F. Test	Sig.	Sig.	Sig	Sig	Sig	-
S.Em. ±.	0.44	0.96	35.75	3093.29	3102.78	-
C.D. at 5%	1.30	2.84	106.22	9190.64	9218.83	-
Interaction						
F. Test	N.S.	N.S.	NS	NS	NS	-
S.Em. ±.	1.48	2.21	77.54	11033.93	11036.63	-
C.D. at 5%	-	-	-	-	-	-
General mean	09.99	28.33	50648	84058	33410	1.66

Effect of plant growth regulator on growth attributes of lablab bean:

The data presented in Table 1 showed that the reduction in plant height was noticed in response of foliar application of paclobutrazol @ 150 ppm (P_3) while the maximum plant height was observed under water spray (P_0) at 30 DAS. It may be due to slowing down of cell division and reduction in cell expansion. The foliar application of paclobutrazole @ 100 ppm (P_2)recorded maximum number of leaves, branches, spread of plant and dry matter per plant compared to the water spray (P_0) on lablab bean at 30 DAS.This might be due to leaf area which provides more assimilating surface area for photosynthates production and efficient translocation of photosynthates. These results are in line with those reported by Shinde [3].

Effect of spacing on yield of lablab bean :

The spacing of 45 x 20 cm produced maximum and significantly higher grain (11.20 q ha^{-1}) and straw yield (32.18 q ha^{-1}) over the rest of spacing levels except spacing of 60 x 20 cm which was at par with 45 x 20 cm spacing. The grain and straw yield was found to be increased by 24.17 and 28.30 per cent respectively, over spacing S_1 (30 x 15 cm) due to broader spacing S_3 (45 x 20 cm). The increase in yields of wider spacing might be due to more availability of space, light, nutrients and moisture which helps in better partitioning of photosynthesis in yield attributes which finally produced maximum yield contributing parameters in terms of grain. The similar results were reported by Babaeian *et al.* [4] and Joshi and Rahevar [5].

Effect of plant growth regulator on yield of lablab bean

The highest grain (10.95 q ha^{-1}) and straw yield (30.56 q ha^{-1}) of lablab bean when the foliar application of 100 ppm paclobutrazol (P_2) at 30 DAS has done. The yields were found to be at par with the yields obtained due to foliar application of 150 ppm paclobutrazol (P_3).The increased in grain and straw yield by 17.74 and 14.28 per cent respectively, over control due to treatment P_2 i.e. foliar application of 100 ppm paclobutrazol. These results are in line with those reported by Bekheta and Talat [6].

CONCLUSION

From the results of the present investigation it can be concluded that, during *rabi* season (2014-2015) lablab bean should be grown at 45 x 20 cm spacing with the foliar application of 100 ppm paclobutrazol at 30 DAS, to obtain higher yield, better quality, net returns and B: C ratio from zero tilled lablab bean grown on residual soil moisture after harvesting of *Kharif* rice.

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