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EFFECT OF BIOFERTILIZERS ON LEAF NUTRIENTS CONTENT IN BEAN (*Lablab purpureus* L.) COGB14 CULTIVARS

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Abstract

The present study was elucidated to study the effects of bio fertilizers on yield characters of *Lablab purpureus* L. COGB14 variety. The research was conducted during the Rabi season 2017 to 2018. At the field experimental centre, Department of Botany, Arignar Anna arts and Science College, Villupuram, Tamil Nadu. The data were recorded on Nutrient characters based on the mean performance of the treatment (T_4 – AMF + AZOS + AZOTO) was found best treatment for plant growth and yield. Compare to the other treatments and control. The obtained Leaf nutrients contents are N, K, P, Ca, Mg, Zn, Fe, and Mn, Interaction effect of biofertilizers was significant for all characters. Thus it, indicates that the process of biofertilizers, may be better option for the seed growers, to achieve improvement of leaf nutrient components in *Lablab purpureus* L. COGB14 variety.

Key words: *Lablab purpureus*, Nutrients, Biofertilizers and Yield.

1. Introduction

Lablab bean (*Lablab purpureus* L.; Family: Fabaceae) is a species of bean, native to Africa and it is cultivated throughout the tropics for food. It is also called hyacinth bean, dolichos bean, seim bean, Egyptian kidney bean, Indian bean, chicharo and Australian pea. It is the only species in the monotypic genus lablab. The plant is variable due to extensive breeding in cultivation, but in general, they are annual or short-lived perennial vines. The wild species is perennial. The thick stems can reach six meters in length. The leaves are made up of three pointed leaflets each up to 15 cm long. They may be hairy on the undersides. The inflorescence is made up of racemes of many flowers. Some cultivars have white flowers, and others may have purplish or blue. The fruit is a legume pod variable in shape, size, and colour. It is usually several centimetres long and bright purple to pale green. It contains up to four seeds. The seeds are white, brown, red, or black depending on the cultivar, sometimes with a white hilum. Wild plants have mottled seeds. The seed is about a centimetre long.

Dolichos bean or garden bean (*Lablab purpureus* L. Sweet) (syn. *Dolichos lablab* (Roxb.) L. var. *typicus*) is an important leguminous vegetable of India. It occupies a unique position as vegetable among the legume crops due to its high nutritive value (Basu *et al*., 2002). It is rich in protein (1.7 g), calcium (132 mg), thiamine (0.08 mg) and vitamin C (24 mg per 100 g of edible pods). In Tamil Nadu, total bean production (including all types of vegetable beans) was 1.64 lakh tonnes from an area of 0.076 lakh ha with a productivity of 21.45 tonnes ha^{-1} during

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2015 – 2017 (Annon, 2017). However, the productivity of dolichos bean in farmer's field ranges from 7 to 13 t ha^{-1} only. Though, this crop has good demand in market, it is being cultivated in limited area due to its markedly low productivity. Low productivity of this crop is attributed mainly due to inadequate nutrient management practices. Use of chemical fertilizers along with organic manures and biofertilizers may increase productivity of dolichos bean, soil fertility and reduces the costs of production (Gandhi and Sivakumar, 2010). Being a nodule forming crop, it is advantageous of taking useful interaction of microorganisms in the form of consortium. Further, consortium bio fertilizer application was helpful to maintain diversity in agricultural ecosystems which are living in rhizosphere environment and are capable of improving plant nutrition and soil fertility through biological fixation of nitrogen, phosphate solubilization, and enhancement of plant growth (Akram Jafari Fara *et al*., 2014).

Dual inoculation of *Rhizobium* and AMF was suggested to minimize nitrogen and phosphorus fertilizer application for leguminous crops. Application of organic manures like farmyard manure, pressmud and vermicompost proved to be a better alternative to inorganic fertilizers in enhancing growth and yield of the plant (Arora and Maini, 2011; Aleem *et al*., 2014). Integrated approach of using both organic and inorganic nutrient sources along with consortium of biofertilizers seems to be a viable alternative to achieve higher yields in dolichos bean with acceptable quality. Further, integrated nutrient management system has become an accepted strategy to augment the yield and quality of vegetable cops under commercial production. Hence, an experiment was conducted to study the effect of organic and inorganic sources of nutrients in combination with consortium bio fertilizers on growth, yield and quality of dolichos bean and to find out suitable combination of integrated nutrient management package with reduced dose of inorganic nutrients.

2. Materials and Methods

The experiment was conducted in factorial randomized block design with three replications during the year 2017 - 2018 in farmer's field at L. N. Puram village near Panruti, Tamil Nadu, India. The experiment comprised of 5 treatments *viz*., Biofertilizers at three levels (T_1 – AMF; T_2 – AZOS; T_3 – AZOTO; T_4 - AMF + AZOS + AZOTO Compound biofertilizers and T5 - Control). Organic manures were thoroughly incorporated into the soil before 15 days of sowing. The recommended dose of P was applied as basal. Nitrogen was applied in two equal splits as basal and top dressing at 30 days after sowing. Dolichos bean seeds of the cultivar *Lablab purpureus* L. COGB14 was sown at a spacing of 60 × 30 cm. In each replication, five plants were selected randomly for recording observations. The leaf nutrients *viz*., Protein content in leaf was determined as per the procedure of Lowry *et al*. (1951).

3. Results and Discussion

The effect of biofertilizers on leaf nutrients attributes of *Lablab purpureus* (L). has shown in Table – 1 to Table - 9). Among the treatments, the leaf nutrients contents were enhanced in dolichos bean might be due to the pronounced influence of biofertilizers as well as their complementary effect. These results were in accordance with those of Gandhi and Sivakumar (2010) who observed enhancement in growth characters due to application of vermicompost in combination with inorganic nutrients. Vermicompost treatments compensated the reduced level recommended dose of inorganic fertilizers and even excelled 100 per cent RDF. This might be attributed to the fact that vermicompost is a nutritive 'organic fertilizer' rich in NKP, micronutrients, beneficial soil microbes like 'nitrogen-fixing bacteria' and 'mycorrhizal fungi' and are scientifically proving as 'miracle growth promoters and protectors'. Further, addition of consortium biofertilizer might have exerted their strong influences like improving soil biological activity, fixing atmospheric nitrogen by *Rhizobium* besides production of phytohormones and mobilizing of phosphorus by VAM in the

rhizosphere and supplied the required nutrients to plant at optimum levels constantly from the soil solution at all stages of the crop growth (Dash and Gupta, 2011). Increased nutrient uptake, nodulation and biological nitrogen fixation of Rhizobium, colonization of vesicular arbuscular mycorrhizae and supplement of nutrients through vermicompost contributed to enhancement in growth of dolichos bean (Sajitha, *et al.*, 2016).

Rather *et al.* (2018) suggested that the integration of different organic, inorganic sources and biofertilizers exhibited significant increase in yield and its attributing characters of lettuce. This could be due to the balanced C/N ratio, more decomposition, more mineralization and more availability of macro and micro nutrients. Moreover, recent study revealed that the integration of different organic, inorganic sources and biofertilizers exhibited significant increase in yield and its attributing characters of lettuce. This could be due to the balanced C/N ratio, more decomposition, more mineralization and more availability of macro and micro nutrients. Shaharoona *et al*. (2006) reported that the increase of yield attributes of maize due to application of biofetrilizers and showed present investigation. Moreover, Shaukat *et al*. (2006) and Egamberdiyeva (2007) stated that biofertilizers increase maize yield by stimulating processes such as seed germination, resistance of seedlings to stress conditions, nitrogen fixation and production of phytohormone. Recent study of Biraris and Lal (2018) revealed that the application of biofertilizers either single or combination (seed inoculation with soil application) with inorganic fertilizers and zinc caused considerable increase in plant height, number of leaves, days to tasseling and silking, number of per plant, cob length and diameter with and without husk (cm), green cob yield per plot, green fodder yield per plot were increased.

Table - 1: Effect of Biofertilizers on Leaf nutrients (Phosphorus mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.845	1.468	1.805	2.568	2.984
T_2	0.565	0.685	1.040	2.062	3.063
T_3	0.765	0.651	1.041	2.065	3.065
T_4	1.064	2.650	3.250	4.684	4.987
T_5	0.456	0.718	0.986	1.085	1.684

Table – 2: Effect of Biofertilizers on Leaf nutrients (Nitrogen mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.093	0.321	0.435	0.986	1.687
T_2	0.081	0.310	0.396	0.821	1.631
T_3	0.088	0.311	0.430	0.921	1.589
T_4	1.068	2.068	3.114	3.536	3.986
T_5	0.062	0.113	0.321	0.842	0.976

Table – 3: Effect of Biofertilizers on Leaf nutrients (Potassium mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.360	0.719	0.975	2.608	4.657
T_2	0.296	0.658	0.706	1.785	3.950
T_3	0.312	0.515	0.718	1.851	3.890
T_4	0.512	0.951	1.512	3.218	5.445
T_5	0.187	0.405	0.715	1.135	3.837

Table – 4: Effect of Biofertilizers on Calcium (mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.264	0.291	1.271	3.010	4.812
T_2	0.182	0.288	1.265	2.035	4.310
T_3	0.163	0.272	1.082	2.010	4.291
T_4	0.568	0.856	2.691	4.712	6.769
T_5	0.059	0.265	0.717	1.214	2.612

Table – 5: Effect of Biofertilizers on Magnesium (mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.130	0.305	1.264	3.065	4.292
T_2	0.119	0.521	1.161	2.008	4.291
T_3	0.114	0.245	1.084	2.005	4.311
T_4	0.272	0.844	2.645	4.830	6.710
T_5	0.092	0.125	0.719	1.241	2.651

Table – 6: Effect of Biofertilizers on Zinc (mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.012	0.032	0.073	0.112	0.125
T_2	0.007	0.031	0.072	0.094	0.121
T_3	0.008	0.026	0.061	0.092	0.136
T_4	0.018	0.072	0.131	0.186	0.342
T_5	0.005	0.16	0.055	0.087	0.098

Table – 7: Effect of Biofertilizers on Manganese (mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.0340	0.0718	0.1362	0.1852	0.4521
T_2	0.0265	0.0385	0.0872	0.1352	0.3423
T_3	0.0264	0.0383	0.0962	0.1452	0.3521
T_4	0.0672	0.0966	0.2685	0.3712	0.7665
T_5	0.0182	0.0415	0.0872	0.815	0.2650

Table – 8: Effect of Biofertilizers on Iron (mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	0.472	0.712	0.921	0.792	1.670
T_2	0.296	0.331	0.521	0.761	1.010
T_3	0.305	0.421	0.672	0.712	1.021
T_4	0.612	0.892	1.321	1.4231	2.312
T_5	0.212	0.342	0.512	0.612	0.921

Table – 9: Effect of Biofertilizers on Protein (mg g^{-1} fr. wt.)

Treatments	7 DAS	15 DAS	30 DAS	60 DAS	90 DAS
T_1	4.33	5.42	6.45	7.33	2.42
T_2	4.21	5.35	6.45	7.21	2.32
T_3	3.51	4.59	5.68	6.51	2.22
T_4	5.13	6.24	7.36	9.13	3.21
T_5	2.60	3.73	4.86	5.60	2.18

4. Conclusion

On the basis of experiment conducted, it was concluded that the biofertilizers have the effect on enhancement of leaf nutrients parameters in *Lablab purpureus* (L). COGB14 and the treatment T_4 - AMF + AZOS + AZOTO compound biofertilizers has showed better results compare to other treatments.

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