I J T A
© Serials Publications
National Academy of Agricultural Science (NAAS) Rating : 3. 03

Effect of Carrier and Liquid Based Rhizobium and PSB on Growth and Yield of Black gram (*Vigna mungo* L.)

V.R. Dorle*, V.B. Awasarmal*, Mirza I.A.B.* and S.U.Pawar*

Abstract: *The experiment was conducted at Experimental Farm, Department of Agronomy, College of Agriculture, VNMKV, Parbhani (Maharashtra) India, during Kharif July, 2014 regarding effect of carrier and liquid based rhizobium and psb on growth and yield of black gram (vigna mungo l. hepper). Among all the treatments, T_6 i.e. RDF + Rhizobium + PSB (Liquid based) produced higher black gram yield (1209.72 kg ha^{-1}) which was comparable with treatment T_3 i.e. RDF + Rhizobium + PSB (Carrier based). than other treatments.*

Keywords: *Carrier based, Liquid based,* Rhizobium, *psb, growth parameters, yield attributes and seed yield*

INTRODUCTION

India is the 2nd largest country in the world by population, which is increasing day by day. But, increasing in the rate of food grain production is not matching to meet the requirements of this growing population of India. In India most of the land available has been brought under cultivation and there is a little scope to get additional land for cultivation. The only strategy now available to improve the present production level by adopting improved agricultural practices. Amongst evolved agricultural practices; use of biofertilizers proved better in dryland agriculture for increasing production under present circumstances.

Blackgram crop has compensatory behaviour in respect of biofertilizer to economic yield. Biofertilizers are apparently environment friendly, low cost, non-bulky agricultural inputs which could play a significant role in plant nutrition as a supplementary and complementary factor to mineral nutrition. *Rhizobium* population in the soil depends on the presence of legume crops in the field. In absence of legumes, the population decreases. Artificial seed inoculation is often needed to restore the population of effective strain of the *Rhizobium* near the rhizosphere to hasten N-fixation. The strain of *Bradyrhizobium japonicum* species is specific to legume crop (Mondal *et al.*, 2013). Biofertilizers being essential components of organic farming play a vital role in maintaining long term soil fertility and sustainability by fixing atmospheric di-nitrogen, (N = N) mobilizing fixed macro and micro nutrients or convert insoluble P in the soil into forms available to plants, thereby increases their efficiency and availability.

In legume can obtain Nitrogen (N) by atmospheric fixation in their root nodules in symbiosis with soil *rhizobia* and thus has a potential to yield well in nitrogen deficit soils. To reduce the production cost with application of mineral fertilization and provide environment protection, more pulse production can be achieved through seed inoculation with *Rhizobium* biofertilizer. They are known to influence nodulation, symbiotic nitrogen fixation and growth and yield of pulses (Vijayalakshmi and Swarajyalakshmi, 2005). Under *Rhizobium* inoculation, plants synthesize more photosynthates and enhances the protein content in grain and nodulation in plants. Increase nodulation in legumes, helps in promoting free-living nitrogen fixing bacteria. The use of phosphate solubilizing bacteria (PSB) as inoculants simultaneously increases

* Department of Agronomy,Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.) 431 402.

P uptake by the plant and crop yield. Strains from the genera *Pseudomonas*, *Bacillus* and *Rhizobium* are among the most powerful phosphate solubilizers. This investigation was planned to study the comparative performance of liquid and carrier based bio fertilizers in Black garm.

MATERIALS AND METHODS

The field experiment was conducted at Experimental farm, Department of Agronomy, VNMKV, Parbhani (M.S.) during *Kharif* season 2014. The soil of experimental site was black in colour, clayey in texture, moderate in organic carbon, poor in nitrogen and medium in available phosphorus and high in potash and slightly alkaline (pH 7.8) in chemical reaction. The experiment was laid out in a Randomized Block Design with 7 treatment combinations. The treatments are RDF + *Rhizobium* (CB) (T_1), RDF + PSB (CB) (T_2), RDF + *Rhizobium* (CB) + PSB (CB) (T_3), RDF + *Rhizobium* (L) (T_4), RDF + PSB (LB) (T_5), RDF + *Rhizobium* (LB) + PSB (LB) (T_6) and RDF Only (25:50:00 NPK kg ha^{-1}) (T_7). Sowing was done on 14th July, 2014 by drilling two to three seeds at each hill at a recommended spacing of 30 cm × 10 cm. Recommended dose of fertilizer for black gram is 25:50:00 N P K kg ha^{-1}. Fertilizer *viz.*, nitrogen, phosphorus were applied in respective plots as per the recommendation by using the urea and SSP.

RESULT AND DISCUSSION

Growth Attributes

Application of RDF + *Rhizobium* (LB) + PSB (LB) recorded higher plant height of blackgram which was at par with RDF + *Rhizobium* (CB) + PSB (CB) and RDF + *Rhizobium* (LB) + PSB. It was significantly higher over rest of the treatments. The increase in plant height may be due to the dual inoculation of *Rhizobium* and phosphobacteria which help better uptake and translocation of plant nutrients to growing plants. Similar trend of observations were recorded by Balachandarn and Nagarajan (2002).

Significantly maximum number of functional leaves $plant^{-1}$ was recorded in treatment *i.e.* RDF + *Rhizobium* (LB) + PSB (LB) over rest of the treatments but which was at par with RDF + *Rhizobium* (CB) + PSB (CB) and RDF + *Rhizobium* (LB) It might be due to the combination of Rhizobium + PSB inoculation which result vigorous growth, number of leaves and finally leaf area. These results were in conformity with the result of Ravikumar (2012).

Maximum total dry matter accumulation (g) $plant^{-1}$ was recorded with the application of RDF + *Rhizobium* (LB) + PSB (LB) which was at par with RDF + *Rhizobium* (CB) + PSB (CB) and RDF + *Rhizobium* (LB) It was significantly higher over rest of the treatments. More availability of nutrients resulted in increasing growth parameters which ultimately turn into increased dry matter accumulation $plant^{-1}$. This results were correlated with the findings of Kumar and Elamathi (2007).

Table 1
Growth of Black gram as influenced by various treatments.

Treatments	*Mean plant height at harvest*	*No. of Leaves at harvest*	*Total Dry matter at harvest (g.)*
T_1-RDF + *Rhizobium* (CB)	38.87	3.07	12.25
T_2-RDF + PSB (CB)	37.60	3.05	9.58
T_3-RDF + *Rhizobium* (CB) + PSB (CB)	42.67	3.36	13.90
T_4-RDF + *Rhizobium* (LB)	40.33	3.23	13.58
T_5-RDF + PSB (LB)	37.67	3.08	11.50
T_6-RDF + *Rhizobium* (LB) + PSB (LB)	44.20	3.80	14.50
T_7-RDF Only	35.07	2.47	7.41
SE ±	1.6	20.2	10.74
C.D. at 5%	4.88	0.64	2.22
General Mean	39.49	3.15	11.82

Yield Studies

Seed yield (kg ha^{-1}) as influenced by different treatments. Significantly higher mean seed yield was recorded with the application of RDF + *Rhizobium* (LB) + PSB (LB) than rest of the treatments but it was found at par with the application of RDF + *Rhizobium* (CB) + PSB (CB) and RDF + *Rhizobium* (LB). Similar trend was observed in respect of biological yield (kg ha^{-1}). This might to be combination of biofertilizers which result in the cumulative effect in increasing growth contributing characters *i.e* plant height (cm), leaf number and leaf area (dm^2) which have been contributed to increased yield *i.e* seed, straw and biological yield (kg ha^{-1}). Similar trend of results was reported by Vijayalakshmi and Swarajyalakshmi (2005). Also Selvakumar *et al*., (2009) who stated that combined inoculation of phosphobacteria and *Rhizobium* overcome the single inoculation.

Different bio fertilizer treatments had profound effect on Straw yield (kg ha^{-1}) of black gram crop

production. The application of RDF + *Rhizobium* (LB) + PSB (LB) recorded significantly higher mean straw yield (kg ha^{-1}) followed by the application of RDF + *Rhizobium* (CB) + PSB (CB), RDF + *Rhizobium* (LB) and RDF + *Rhizobium* (CB).

Table 2
Seed, straw yield and biological yield (kg ha^{-1}) of Black gram as influenced by various treatments.

Treatments	*Seed yield (kg ha^{-1})*	*Straw yield (kg ha^{-1})*	*Biological yield (kg ha^{-1})*
T_1-RDF + *Rhizobium* (CB)	979.48	2084.10	3063.58
T_2-RDF + PSB (CB)	934.01	1928.67	2862.68
T_3-RDF + *Rhizobium* (CB) + PSB (CB)	1079.09	2131.64	3210.73
T_4-RDF + *Rhizobium* (LB)	1034.74	2116.51	3151.25
T_5-RDF + PSB (LB)	952.05	1962.63	2914.68
T_6-RDF + *Rhizobium* (LB) + PSB (LB)	1209.72	2248.13	3457.84
T_7-RDF Only (25:50:00 NPK kg ha^{-1})	781.15	1774.71	2555.87
SE ±	73.71	87.21	118.90
C.D. at 5%	222.55	263.31	358.97
General Mean	995.75	2035.20	3030.95

REFERENCES

Balachandar, D. and P. Nagarajan (2002). Dual inoculation of *Rhizobium* and phosphobacteria with phosphorus on blackgram. *Madras Agric. J.*, **89**(10-12): 691-693.

Kumar, A., and S. Elamathi (2007). Effect of nitrogen levels and *Rhizobium* application methods on yield attributes, yield and economics of blackgram (*Vigna mungo* L.). *Internat. J. Agric. Sci.*, **3**(1): 179-180.

Ravikumar, R., (2012). Growth effects of *Rhizobium* inoculation in some legume plants. *Int. J. Curr. Sci.,* 1-6, *ISSN*: 2250-1770.

Selvakumar, G., L. Lenin, P. Thamizhiniyan and T. Ravimycin (2009). Response of biofertilizer on growth and yield of blackgram (*Vigna mungo*). *Recent Res. in Sci. and Tech.*, **1**(4): 169-175, *ISSN*: 2076-5061.

Vijayalakshmi, B. and G. Swarajyalakshmi (2005). Growth and yield of *Rhizobium* inoculated blackgram and greengram as influenced by phosphorus and molybdenum fertilizers. *Madras Agric. J.*, **92**(10-12): 684-687.

■■■