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A Comparative Study of Effect of Rhizobium and PGPR Alongwith Sulphur and Micronutrients on the Protein Content of Blackgram and Lentil Respectively

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Abstract – A field experiment was conducted at the research farm of J. V. College Baraut, Baghpat, blackgram seeds were first inoculated with Rhizobium and that of lentil with PGPR. Sulphur was used in the form of gypsum (60 kg/ha), Zn in the form of zinc sulphate (4 kg/ha), Mo as sodium molybdate (0.1 kg/ha), B. as borax (0.6 kg/ha) and Mn as manganese sulphate (0.5kg/ha) in different basal dosage with different combinations. Combined treatment of Rhizobium with sulphur and micronutrients significantly increased the protein content in black gram over any other treatment. Likewise combined treatment of PGPR with sulphur and micronutrients significantly increased the protein content in lentil over any other treatment. comparatively both Rhizobium and PGPR with sulphur and micronutrients have almost equal effect on protein content of both the crop but effect of Rhizobium in blackgram was more pronounced than that of PGPR in lentil (in term of increase in protein content).

Keyword: Blackgram, Lentil, Rhizobium, PGPR, Sulphur, Micronutrients

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I. INTRODUCTION

Every pulse plant is in itself a mini-fertilizer factory by contributing nitrogen substantially to the enrichment of the soil. The importance of pulses crop can be well realized in term of both nutritive values for human being and improving soil health as well. The potential of pulses to help address future global security, nutrition and environmental sustainability needs has been acknowledged through the UN declaration of 2016 international year of pulses (Chand *etal*, 2017). Non-availability of proper *Rhizobium and PGPR* culture and inadequate use of macro and micronutrients are some of the important factors responsible for low quality, yield and growth of blackgram and lentil.

Presence of efficient and specific strain of *Rhizobium* in the rhizosphere is one of the most important requirements for proper growth and development of grain legumes plants (Subba Rao and Tilak, 1977). Protein content together with plant yield and seed weight is an integral part of food and fodder, therefore we should look at protein content in legumes and the possibilities to increase it by using biological agents like Rhizobium and PGPR (Senberga, 2017). Free-living PGPR have shown promise as biofertilizers. Many studies and reviews have reported plant growth promotion, increased yield, solubilization of P (phosphorus) or K (potassium), uptake of N (nitrogen) and some other elements through inoculation with PGPR. In addition, studies have shown that inoculation with PGPR enhances root growth, leading to a root system with large surface area and increased number of root hairs (Singh 2013).

The lower biological value of blackgram and lentil is due to the deficiency of S-containing amino acids. So sulphur is an important nutrient which affects nutritional quality of both the pulses. During the recent year, due to intensive agriculture and use of sulphur free high analysis fertilizer there has been a steady decline in the sulphur status of the soil leading to its deficiency (Rajgopalan, 1985). Zn, Mo, Mn and B also positively affect various quality aspects in blackgram and lentil.

II. MATERIAL AND METHOD

A field experiment was conducted during the rabi session of 2002-03 and 2008-09 at the research farm of J V college, Baraut Distt- Baghpat. Two cultivars of blackgram (PU-19 and PDU-1) and two cultivars of lentil (L-4076 and L-406) were selected

and sown with *Rhizobium,* PGPR, Sulphur and micronutrients. *Rhizobium* inoculation was added with the seed of blackgram and PGPR was inoculated with seed of lentil. The uniform basal dosage of nitrogen in the form of urea (20 kg/ha) and potassium in the form of potash (40 kg/ha) were applied before sowing. S, Zn, Mo, Mn and B were used at the time of sowing of seed. Sulphur was used in the form of gypsum (60 kg/ha), Zn in the form of zinc sulphate (4 kg/ha), Mo as sodium molybdate (0.1 kg/ha), B as borax (0.6 kg/ha) and Mn as manganese sulphate (0.5kg/ha) in different basal dosage with different combinations (Rathi *etal* 2009 and Kumar *etal* 2015). Determination of nitrogen content for Protein estimation was carried out by using Kjeldahl method.

III. RESULT AND DISCUSSION

Inoculation of *Rhizobium* and PGPR in blackgram and lentil respectively found to be beneficial in term of quality improvement, both helped the blackgram and lentil by fixing atmospheric nitrogen more effectively, as a result the nitrogen content in seeds of both the crop was increased substantially with subsequent increased in protein content (Kumar *etal* 2015). Since sulphur is a constituent of sulphur-containing amino acid like methionine, cystine and cysteine, so application of sulphur increased the amount of these amino acid and protein in blackgram grains.

Zinc application also increased seed protein. The increase may be expected as zinc plays an important role in the biosynthesis of indole acetic acid, a growth hormone and tryptophan a precursor of auxin, which ultimately affects the seed protein of blackgram. Application of Mo increased the methionine content. It also found to increased arginine, lysine, phenylalanine and tryptophan in blackgram (Dwivedi *et al.* 1993). Like Mo and Zn, boron (B) and manganese (Mn) also help in protein synthesis.

Table- 1: Protein Content (%) in Blackgram and Lentil

Protein content (%) in Blackgram							Protein content (%) in Lentil						
Treatments	2002			2003			Treatments	2008			2009		
	V_1	V_2	Mean	V_1	V_2	Mean		V_1	V_2	Mean	V_1	V_2	Mean
Control	19.52	18.75	19.13	19.70	18.92	19.31	Control	24.26	23.75	24.01	24.71	23.95	24.33
Rhizobium	20.05	19.20	19.62	20.37	19.34	19.85	PGPR	24.41	23.81	24.11	24.86	24.11	24.48
R + Mo + B	20.23	19.71	19.97	20.72	19.86	20.29	PGPR + Mn +Mo	24.67	23.92	24.29	24.97	24.24	24.61
R + Zn + Mo	20.41	19.93	20.17	20.93	20.10	20.51	PGPR + Zn +Mn	24.84	24.15	24.49	25.41	24.41	24.91
R + Zn + B	20.80	20.19	20.49	21.12	20.43	20.77	PGPR + Zn + Mo	24.95	24.24	24.59	25.51	24.61	25.06
R + Zn + Mo + B	20.96	20.47	20.71	21.23	20.68	20.95	PGPR + Mn + Mo +Zn	25.32	24.45	24.89	25.79	24.72	25.25
R + S	21.12	20.84	20.98	21.40	20.95	21.17	PGPR +S	25.49	24.67	25.08	25.93	24.79	25.36
R + S + Mo	21.27	21.02	21.14	21.64	21.08	21.36	PGPR + S + Mo	25.75	24.78	25.27	25.99	24.99	25.49
R + S + B	21.58	21.20	21.39	21.96	21.31	21.63	PGPR + S + Mn	25.91	24.97	25.44	26.11	25.21	25.65
R + S + Zn	21.84	21.59	21.71	22.15	21.73	21.94	PGPR + S + Zn	26.09	25.15	25.62	26.51	25.64	26.07
R + S + Mo + B	21.99	21.82	21.90	22.34	21.97	22.15	PGPR + S + Mo+ Mn	26.47	25.62	26.05	26.94	25.96	26.45
R + S + Zn + Mo	22.32	22.06	22.19	22.73	22.14	22.43	PGPR + S + Zn+ Mn	26.91	25.94	26.43	27.12	26.34	26.73
R + S + Zn + B	22.71	22.21	22.46	23.11	22.48	22.79	PGPR + S + Mo+ Zn	27.02	26.32	26.67	27.28	26.53	26.91
R + S + Zn + Mo + B	22.93	22.44	22.68	23.32	22.72	23.02	PGPR + S + Mo+ Mn+ Zn	27.26	26.51	26.89	27.32	26.61	26.96
Mean	21.27	20.82	-	21.62	20.98	-	Mean	25.67	24.88	-	26.03	25.15	-
CD @ 5%P Variety	0.258			0.430					0.558			0.588	
Treatment	0.682			1.139					0.014			1.478	
V x T	0.964			1.610					0.019			2.084	

Inoculation of seeds with *Rhizobium* and PGPR significantly increase protein content in both the crop over uninoculated control but highest protein content can be achieved if *Rhizobium* and PGPR was supplemented with sulphur and micronutrients (Table-1). So comparatively both *Rhizobium* and PGPR with sulphur and micronutrients have almost equal effect on protein content of both the crop but as shown in Table-1, effect of *Rhizobium* in blackgram was more pronounced than that of PGPR in lentil (in term of increase in protein content). The differences in increase in protein content may also be due to cultivars used, soil condition and prevailing weather at a particular time.

IV. REFERENCE

Chand Prem, Pal Suresh, Kumar Sant (2017). Recent strategies and policies for enhancing pulses production in India, Employment News, **Vol. 28**.

Dwivedi, M., Upadhayay, R.M. and Dwivedi, G.K. (1993). Effect of inorganic, organic and biofertilizers on yield and nutritional quality of blackgram and wheat grown in sequence. *Indian J. Agril. Chem*., **26(2&3)**: pp. 111-122.

Kumar Anuj, Rathi Brijesh and Sudhir Kumar (2015). Effects of PGPR, sulphur and some micronutrients on Protein, Carbohydrate and Fat contents in lentil (Lens Culinaris). Legume Research, **38 (5)**: pp. 707-709.

Rajagopalan, V. (1985). Nutrient sulphur. *Proc. National Seminar on Sulphur in Agriculture*. *Oct. 18-19, TNAU, Coimbatore,* pp. 1-4.

Rathi Brijesh Kumar, Jain Amit Kumar and Sudhir Kumar (2009). Influence of Rhizobium leguminosarum inoculation alongwith sulphur and micronutrients on quality aspect of Blackgram. J.Indian bot. Soc., **Vol. 88(1&2)**: pp. 67-69.

Senberga Alice (2017). Rhizobium sp.- a potential tool for improving protein content in peas and faba beans, Rural Sustainability Research: **37(332**): pp. 1-9.

Singh J S (2013) Plant Growth Promoting Rhizobacteria Potential Microbes for Sustainable Agriculture, RESONANCE, pp. 275-281.

Subba Rao, N.S. and Tilak, K.U.B.R. (1977). *Rhizobium* culture. Their role in pulse production. *Souvenier Bell Directorate of Pulses, Department of Agriculture, Gov. of India, Lucknow,* pp. 31-34.

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