

RESPONSE OF RICE BEAN GENOTYPES TO VARIED LEVELS OF PHOSPHORUS UNDER RAINFED CONDITION OF JHARKHAND

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Abstract: A field experiment was conducted under AICRP on Forage Crops with the collaboration of Agrostologist of the Ranchi Veterinary College under Birsa Agricultural University, Ranchi during *Kharif* season two consecutive years. Growth, yield and quality of rice bean genotypes influenced by Phosphorus levels. The national check Bidhan Rice bean produced more plant length (126 cm), Green fodder yield (265.55 q/ha), Dry fodder yield (58.42 q/ha) Crude protein content (13.11 %) and crude protein yield (7.66 q/ha) over the tested genotype of rice bean JRBJ-05-4. Leaf: stem ratio under JRBJ-05-4 was significantly higher than the national check. Response of Phosphorus were recorded on plant length, GFY, DFY and CPY up to 90 kg P₂O₅/ ha while CP % under both the genotypes significant up to 60 P₂O₅/ha.

Keywords: Rice bean, Genotypes, P- levels and Rain fed.

Introduction

India top in rank of ten milk producing countries in the world and produced 146.31 million tones of milk in 2014-15 (Ethical Indian 2016) not due to productivity of milch animal but due to contribution of very large population of livestock with low milking ability compared to other many western countries in the world. Malnutrition, under-nutrition or both, beside the low genetic potential of the animals is also prime factor for low productivity. The adequate supply of nutritive fodder and feed is a crucial factor impacting the productivity and performance of the animals (Karki, Uma. 1985). The main reasons for low productivity is insufficient and low quality fodder and feed including grazing facilities (Deb Roy, 1993). The country is highly deficient in respect of availability of green fodder, dry fodder and concentrates. Future development and growth of livestock are highly associated with the scope of availability of fodder from cultivable land, forest, pastures and grazing lands. As among the different annual and perennial fodder Rice bean (*Vigna umbellata*) is most important annual leguminous fodder suitable for *Kharif* as well as summer season in Jharkhand. It has wide range of adoptability, quick growing habit and high yielding,

proteineous as well as palatable and like by different animal. Being leguminous it provides protein and mineral rich and less fiber and also improves the soil fertility. Phosphorus deficiency is one of the major limiting factors in crop production. Role of phosphorus in nodulation and other enzymatic activity and also acts as yield limiting nutrient next to Nitrogen. Even though, soil possess medium to high in Phosphorus level but its availability is very less, due to its slow mobility and fixed in soil which identify the way and means of its judicious use for maximizing the quality herbage production. Keeping the facts in view present study was under taken to optimize the Phosphorus levels for sustaining yield of Rice bean under sandy loam soil of Jharkhand.

Materials and Methods

The present field investigation was carried out during Kharif 2012 and 2013 at the Agrostology field situated at Ranchi Veterinary College, campus Kanke under Birsa Agricultural University, Ranchi. The soil of field was sandy loam in texture having sand (54.2%, silt (29.7%), clay (16.1%) and water holding capacity (40.89 %) with pH (6.6), Organic carbon (3.94 g/kg) with available nitrogen (256 kg/ha), available phosphorus (27.45 kg/ha) and available potassium (161.41 kg/ha). The experiment was laid out in FRBD with two rice bean genotypes (JRBJ-05-4 and Bidhan Rice bean) and four phosphorus levels (0,30,60 and 90 kg/ha) which comprises total eight treatments. The crop was sown during first fortnight of July in both the year at row spacing of 30 cm apart. The recommended dose of Nitrogen 25 kg/ha and Potassium 30 kg/ha were applied in the form of Urea and Muriat of Potash while, Phosphorus was applied as per treatments through Single super phosphate. Full dose of fertilizer was applied at the time of sowing. Cultural as well as other Agronomical production practices as per the recommendation. Observations were taken at 15 (for germination and population) days and growth, yield and quality parameter were taken at 50 % flowering stage. The data of two year was pooled and analyzed statistically under slandered format of the design and presented below in tabular form for its interpretation.

Result and Discussion

Genotypes Response

Genotypes of Rice bean were significantly influenced by phosphorus levels with respect to plant length, leaf: stem ratio in green and dry condition, green fodder yield, dry fodder yield, crude protein content and crude protein yield. Bidhan rice bean produced plant length (126.0cm), Green forage yield (265.55 q/ha), Dry fodder yield (58.42q/ha), Crude protein content (13.11%) and Crude protein yield (7.66 q/ha) which were significantly superior over

tested genotype of rice bean JRBJ-05-4 whose respective plant length (119 cm), Green forage yield (244.12 q/ha), Dry fodder yield (55.82q/ha), Crude protein content (12.81 %) and Crude protein yield (7.18 q/ha) (Table 1). Besides it genotype JRBJ-05-4 produced more leaf: Stem ratio in green condition (0.71) and dry condition (0.69) over national check Bidhan rice bean. At higher levels of Phosphorus the availability of nitrogen and potash along with Phosphorus nutrient also increased resulted into better plant stand which reflected into more growth and finely resulted into higher yield and improvement in quality with regards to crude protein content.

Phosphorus response

In other hand significant response of P_2O_5 were recorded up to 90 kg/ha. The maximum plant length (139.9 cm), leaf: stem ratio (0.75) in green condition and (0.63) in dry condition, Green forage yield (274.60 q/ha), Dry fodder yield (68.35q/ha) and Crude protein yield (9.0 q /ha). The high capacity of the soil to fix P in form largely unavailable to plant caused reduction in yield, thus its response up to 90 kg/ha for higher herbage yield were advocated by Fageria *et, al.* 1998)

Interaction

Interaction of Genotypes and Phosphorus have no interaction effect on plant length, GFY, DFY and CPY, while L:S ratio under dry condition and Crude protein content were significantly affected by the same (Table 2 and 3). As L: S ratio in dry condition under both the genotypes increased with increased levels of Phosphorus up to 90 kg/ha. The maximum L:S ratio under genotype JRBJ-05-4 (0.75) at 90 kg P_2O_5 /ha was significantly superior overall other treatment combinations. The response of Phosphorus was significant up to 60 kg/ha and maximum crude protein content was under Bidhan Rice bean (13.44 %) which was nearly 8.85% more than the lowest under JRBJ-05-4 at control (0 kg P_2O_5 /ha).

References

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Table: 1. Effect of phosphorus levels on growth, yield and quality of Rice bean (pooled of 2012 and 2013).

Treatments	Plant population/ m ²	Plant length(cm)	Leaf: stem ratio		Fodder yield(q/ha)		Crude protein (%)	Crude protein yield (q/ha)
			Green	Dry	Green	Dry		
A .Entries (E)								
Bidhan Rice bean (NC)	35.33	126	0.57	0.51	265.55	58.42	13.11	7.66
JRBJ-05-4	35.16	119	0.71	0.69	244.12	55.82	12.81	7.18
S Em ±	0.67	0.94	0.054	0.02	2.35	0.75	0.04	0.11
CD at 5%	NS	2.8	0.16	0.06	7.19	2.29	0.13	0.33
B. P-level (kg P₂O₅ /ha)								
P1 : 0	35.16	102.3	0.54	0.51	231.50	50.25	12.60	6.30
P2 : 30	34.01	116.5	0.63	0.59	247.65	53.94	12.84	6.96
P3 : 60	35.66	132.0	0.66	0.62	265.20	56.54	13.16	7.44
P4 : 90	36.16	139.0	0.73	0.63	274.60	68.35	13.24	9.00
S Em ±	0.95	1.0	0.01	0.01	1.67	1.06	0.06	0.16
CD at 5%	NS	3.12	0.03	0.03	5.21	3.31	0.20	0.50
Entries X P-Levels								
S Em ±	1.34	1.53	0.01	0.015	2.36	1.50	0.1	0.23
CD at 5%	NS	NS	NS	0.047	NS	NS	0.30	NS
CV%	6.57	2.33	3.45	4.12	1.67	4.53	1.37	5.40

Table 2. Effect of phosphorous levels on leaf: stem ratio (dry condition) of promising genotype of Rice bean (pooled of 2012 and 2013)

Entries	P-Levels (kg/ha)				Mean
	P1:0	P2: 30	P3:60	P4:90	
Bidhan Rice bean-1 (NC)	0.50	0.50	0.51	0.53	0.51
JRBJ-05-4	0.51	0.67	0.73	0.75	0.69
Mean	0.51	0.59	0.62	0.64	
	Entries	P-Levels		Entries X P-Levels	
S. Em ±	0.0078	0.01		0.015	
CD at 5%	0.023	0.03		0.047	

Table 3. Effect of phosphorous levels on crude protein (%) of promising genotype of Rice bean (pooled of 2012 and 2013)

Entries	P-Levels (kg/ha)				Mean
	P1:0	P2: 30	P3:60	P4:90	
Bidhan Rice bean-a(NC)	12.85	13.16	13.44	13.00	13.11
JRBJ-05-4	12.35	12.52	12.88	13.48	12.81
Mean	12.60	12.84	13.16	13.24	
	Entries	P-Levels		Entries X P-Levels	
S. Em ±	0.045	0.064		0.091	
CD at 5%	0.139	0.196		0.27	