International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; 9(1): 2503-2506

Received: 07-11-2020
Accepted: 17-12-2020

Pratima Ningaraddi Morab
M.Sc. Agriculture, Department of Agronomy, UAS, GKVK, Bangalore, Karnataka, India

Dr. G Gangadhar Eswar Rao
Professor and Coordinator, RIOF, UAS, GKVK, Bangalore, Karnataka, India

Dr. TS Sukanya
Principle, Investigator, ICAR, AICRP on Small Millets UAS, GKVK, Bangalore, Karnataka, India

Shrinivas Neelappagoudra
M.Sc. Agriculture, Department of Soil Science, MPKV, Rahuri Maharashtra, India

Corresponding Author:
Pratima Ningaraddi Morab
M.Sc. Agriculture, Department of Agronomy, UAS, GKVK, Bangalore, Karnataka, India

Effect of different sources of organic manures and seed bio-priming on yield and economics of Rice bean (*Vigna umbellate*)

Pratima Ningaraddi Morab, Dr. G Gangadhar Eswar Rao, Dr. TS Sukanya and Shrinivas Neelappagoudra

DOI: https://doi.org/10.22271/chemi.2021.v9.i1ai.11605

Abstract
A field experiment was conducted during *kharif*-2019 at Research Institute of Organic Farming field unit, UAS, GKVK, Bengaluru to study the Effect of different sources of organic manure and seed bio-priming on growth and yield of rice bean (*Vigna umbellate)* laid out in Factorial Randomized Complete Block Design with 10 treatments replicated thrice and the variety used was KBR-1. Results of the experiment revealed that seed bio priming with *Rhizobium* and *Trichoderma* recorded significantly higher seed yield (1184.87 kg ha-1) and stover yield (3052.56 kg ha-1), yield attributes like number of pods per plant (59.87), pod length (8.69 cm) seed yield per plant (11.37 g) and 100% N equivalent through vermicompost resulted in significantly higher seed yield (1789.50 kg ha-1) and stover yield (3504.47 kg ha-1), yield attributes like number of pods per plant (69.67), pod length (9.92 cm), number of seeds per pod (9.17) seed yield per plant (12.83 g). Lower seed yield (237.3 kg ha-1) and stover yield (1985.2 kg ha-1) recorded T_1 (without seed bio-priming). Whereas, higher B:C ratio (2.96) was recorded with 100% N equivalent through neemcake + seed bio-priming.

Keywords: Rice bean, bio-priming

Introduction
Rice bean (*Vigna umbellate*), a member of the leguminosae (Fabaceae) family, is an annual underutilized grain legume or pulse is native of south East Asia. It is newly introduced crop in Karnataka and is commonly known as red bean, Mambi bean, climbing mountain bean, Japanese rice bean, bamboo bean and oriental bean and considered as a potential grain legume because of its high protein content. In India, Rice bean is used for both food and fodder. Legumes in general are scarce, costly and defective in their nutritional and cooking qualities but rice bean seed protein is varies from 15-25 per cent. Rice bean has drawn special attention due to its high seed yield (22-25 q ha^{-1}). It is fairly drought tolerant and grows well on relatively poor soils. It has wider adoptability to different agro-ecologies and is highly resistant to viral diseases. Varieties and land races grow profusely, spreading and twinning type, with immediate growth. It is very sensitive to day length. Flowering and pod setting are initiated with the onset of short days (Singh and Tomer, 1989) [5].
Bio-priming is a new promising technique of seed treatment that integrates biological and physiological method of improving plant growth and controlling disease. It is recently used as an alternative method for controlling many seed and soil borne pathogens. Thus, considered as an advanced technique of seed treatment which includes of application of beneficial microorganism on seed surface and seed hydration (Singh *et al*., 2016) [6].

Materials and Methods
A field experiment was conducted during *kharif* 2019 at organic farming research and demonstration field unit (J block) of Research Institute on Organic Farming (RIOF), Gandhi Krishi Vignan Kendra (GKVK), University of Agricultural Sciences, Bengaluru, to study the Effect of different organic manures and seed bio-priming on growth and yield of rice bean consisted of ten treatments replicated thrice in FRCBD. The soil was red sandy clay loam and the treatments tested where T_1: without seed biopriming, T_2: with seed biopriming, T_3:100% N

equivalent through FYM+ seed biopriming, T_4: 100% N equivalent through Vermicompost + seed bio priming, T_5: 100% N equivalent through Neemcake + seed biopriming, T_6:100% N equivalent through biodiegester liquid organic manure + seed biopriming, T_7: 100% N equivalent through FYM +without seed biopriming, T_8: 100% N equivalent through Vermicompost + without seed biopriming, T_9: 100% N equivalent through Neemcake + without seed biopriming, T_{10}: 100% N equivalent through biodigester liquid organic manure + without seed bioprimming. RDF: 40:20:20, basal dose application of FYM @10 t ha^{-1} to all treatments except T_1 and T_2. Variety KBR-1 was sown at a spacing of 45 cm x 10 cm, gross and net plots size was 4.5 m x 3.5 m and 2.7 m x 3.1 m respectively.

Seed bio-priming (seed treatment)

Pre-soaked the seeds in water for 12 hrs then mixed the formulated product of bio-agents (*Rhizobium* and *Trichoderma*) with pre-soaked seeds at the rate of 10 g per kg of seeds with adhesive material castor oil (100 ml per kg seeds) and put the treated seeds as a heap then covered the heap with moist jute sack to maintain high humidity. Then kept for incubation under high humidity for about 48 hrs approximately 25-32 per cent. Bio-agents adhered to the seed grows on the seed surface under moist condition to form a protective layer all around the seed coat. Data on rice bean grain and stover yield collected after harvest of the crop and averaged over three replications. The data collected on different trait was statistically analysed using standard procedure and the results were tested at the five percent level of significance as given by Gomez and Gomez (1984) [4].

Gross returns (Rs. ha^{-1})

The gross return per hectare was calculated by multiplying prevailing market price into total yield obtained per hectare. (Market price/unit quantity × grain yield + market price of straw × straw yield).

Net returns: Net returns were calculated by deducting the cost of cultivation from gross returns.

Net return = Gross return – Total cost of cultivation

Benefit cost ratio

The benefit cost ratio was calculated by using the following formula

$$\text{Benefit cost ratio} = \frac{\text{Gross returns}}{\text{Cost of cultivation}}$$

Result and Discussion

Yield parameters of rice bean like number of pods per plant (69.67), pod length (9.92 cm), number of seeds per pod (9.17) seed yield per plant (12.83 g), seed yield (1184. 87 kg ha^{-1}), stover yield (3052.56 kg ha^{-1}) and harvest index (0.27) were recorded significantly higher due to seed bio-priming with *Rhizobium* and *Trichoderma*. The reason might be due to the *Trichoderma* which helps to solubalize the tricalcium phosphate into the more available form, mineralization of other nutrients and also the production of hormones like indole acetic acid (IAA), gibberellic acid and cytokinin through microbial action (Argaw 2012; Elkoca *et al*., 2008) [1, 3].

Yield parameters of rice bean like number of pods per plant (69.67), pod length (9.92 cm), number of seeds per pod (9.17) seed yield per plant (12.83 g), seed yield (1789.50 kg ha^{-1}), stover yield (3504.47kg ha^{-1}) and harvest index (0.33) were recorded significantly higher with T_4:100% N equivalent through vermicompost this is because humic and fulvic acids and other organic acids found in vermicompost as well as the frequency of nutrients, especially N which will stimulate the growth and increase number of pods (Bajracharya *et al.*, 2009) [2].

Economics

This is the ultimate criteria for acceptance or rejection and wider adoption of any technology. Among the various treatments 100% N equivalent through neemcake + seed bio-priming recorded higher net returns and higher C:B ratio (2.96) compared to other treatments. This was attributed to neem cake contains more nutrients (N, P and K) per unit quantity of manure so less quantity is required to meet the crop requirements because of these reasons cost of cultivation will be comparatively less so net profit will be higher.

Table 1: Yield attributes of rice bean at harvest as influenced by different sources of organic manures and seed bio-priming

Treatment	No of pods $plant^{-1}$	Pod length (cm)	No. of seeds per pod	Seed yield $plant^{-1}$ (g)	1000 seed weight (g)
A. Seed bio-priming					
W_1 (With seed bio-priming)	59.87	8.69	7.53	11.37	19.89
W_2 (Without seed bio-priming)	55.93	7.77	7.47	9.93	18.89
F- test	*	*	NS	*	*
S.Em±	1.42	0.19	0.24	0.22	0.12
CD (p=0.05)	4.22	0.56	-	0.66	0.37
B. organic sources					
S_1 – control	17.00	7.28	5.83	4.42	16.97
S_2 –FYM	60.70	8.22	7.17	10.55	18.88
S_3 –Vermicompost	69.00	9.92	9.17	12.83	21.22
S_4- Neem cake	62.67	8.25	7.77	11.33	20.22
S_5 – BDLM	60.17	7.50	7.67	10.08	19.67
F- test	*	*	*	*	NS
S. Em±	2.250	0.30	0.39	0.35	0.20
CD (p=0.05)	6.68	0.90	1.34	1.06	-
C. Interaction					
T_2 (W_1 S_1)	22.3	7.5	7.0	9.3	17.1
T_3 (W_1 S_2)	62.7	8.2	7.3	10.8	18.7
T_4 (W_1 S_3)	71.3	10.5	8.3	14.0	22.0
T_5 (W_1 S_4)	62.7	8.8	7.7	11.3	21.0
T_6 (W_1 S_5)	60.3	8.5	7.3	10.6	20.6

T_1 (W_2 S_1)	31.7	7.1	6.7	4.5	16.8
T_7 (W_2 S_2)	62.7	7.9	7.0	9.8	19.1
T_8 (W_2 S_3)	66.3	8.3	8.0	10.8	20.4
T_9 (W_2 S_4)	60.0	8.3	8.0	10.1	19.4
T_{10} (W_2 S_5)	59.0	7.2	7.7	9.6	18.7
F- test	NS	NS	NS	NS	NS
S.Em±	3.18	0.42	0.55	0.50	0.28
CD (p=0.05)	-	-	-	-	-

Table 2: Seed yield, stover yield and harvest index as influenced by different sources of organic manures and seed bio-priming

Treatment	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index
A. Seed bio-priming			
W_1 (With seed bio-priming)	1184.87	3052.56	0.27
W_2 (Without seed bio-priming)	1116.47	2678.04	0.26
F- test	*	*	NS
S.Em±	31.680	66.780	0.006
CD (p=0.05)	94.126	198.414	-
B. Organic sources			
S_1 – control	247.67	2116.15	0.10
S_2 –FYM	1253.17	2692.09	0.31
S_3 –Vermicompost	1789.50	3504.47	0.33
S_4- Neem cake	1279.33	3065.51	0.29
S_5 – BDLM	1183.67	2948.20	0.28
F- test	*	*	*
S.Em±	50.090	105.589	0.009
CD (p=0.05)	151.83	313.72	0.03
C. Interaction			
T_2 (W_1 S_1)	258.0	2247.1	0.10
T_3 (W_1 S_2)	1258.0	2982.5	0.29
T_4 (W_1 S_3)	1944.0	3799.9	0.33
T_5 (W_1 S_4)	1285.3	3262.9	0.28
T_6 (W_1 S_5)	1182.0	2970.5	0.28
T_1 (W_2 S_1)	237.3	1985.2	0.10
T_7 (W_2 S_2)	1248.3	2401.7	0.34
T_8 (W_2 S_3)	1635.0	3209.1	0.33
T_9 (W_2 S_4)	1270.0	2925.8	0.30
T_{10} (W_2 S_5)	1176.7	2868.5	0.29
F- test	NS	NS	NS
S.Em±	70.83	149.32	0.01
CD (p=0.05)	-	-	-

Table 3: Economics of rice bean as influenced by different sources of organic manures and seed bio-priming

Treatment No.	Treatment details	Cost of cultivation (Rs ha^{-1})	Gross returns (Rs ha^{-1})	Net returns (Rs ha^{-1})	C:B Ratio
T_1	Without seed bio-priming	9200	16590	7390	1.80
T_2	With seed bio-priming	9500	18060	8560	1.90
T_3	100% N equivalent through FYM+ seed bio-priming	40700	87500	46800	2.14
T_4	100% N equivalent through vermicompost + seed bio-priming	50700	135000	84300	2.18
T_5	100% N equivalent through Neemcake + seed bio-priming	30200	89600	59750	2.96
T_6	100% N equivalent through biodiegester liquid organic manure + seed bio-priming	36700	82950	46250	2.26
T_7	100% N equivalent through FYM + without seed bio-priming	40400	87360	46960	2.44
T_8	100% N equivalent through Vermicompost + without seed bio-priming	50400	114100	63700	2.26
T_9	100% N equivalent through Neemcake + without seed bio-priming	29900	87900	59000	2.93
T_{10}	100% N equivalent through biodigester liquid organic manure + without seed bio-priming ha^{-1}	40100	82040	41940	2.04

Conclusion

Seed bio-priming with *Rhizobium* and *Trichoderma* and 100% N equivalent through vermicompost gives better seed yield, stover yield and higher net profit compared to other treatments.

Reference

1. Argaw A. Evalution of Co-inoculation of *Bradirhizobium japonicum* and phosphate solubilizing *Pseudomonas* spp. effect on soybean [*Glycine max* (L.) Merril] in Assosaarea. J Agric. Sci. and Technol 2012;4:213-224.
2. Bajracharya SK, Sherchan DP, Bhattarai S. Effect of vermicompost in combination with bacterial and mineral fertilizers on the yield of vegetable soybean. Korean J Crop Sci 2009;52(1):100-103.
3. Elkoca E, Kantar F, Sahin F. Influence of nitrogen fixing and phosphorus solubilizing bacteria on the nodulation, plant growth, and yield of chickpea. J Plant Nutr 2008;31:157-171.
4. Gomez KA, Gomez AA. Statistical procedures agricultural research, an international rice research

institute book, A Willey Inter Science Publication, John Willey and Sons, New York 1984.
5. Singh VP, Tomer YS. Breeding of neglected and underutilized crops, spices and herbs. J of legume Res 1989;12(1):47.
6. Singh V, Upadhyay RS, Sarma BK, Singh HB. Seed bio-priming with *Trichoderma asperellum* effectively modulate plant growth promotion in pea. Int. J Agri. Environ. Biotechnol 2016;9:361-365.