



International Journal of Research in Agronomy

E-ISSN: 2618-0618

P-ISSN: 2618-060X

© Agronomy

www.agronomyjournals.com

2024; 7(8): 802-804

Received: 13-05-2024

Accepted: 19-06-2024

Pawar Prashant P

Associate Professor, Department of
Agronomy, College of Agriculture,
Dhule, MPKV, Rahuri,
Maharashtra, India

Deore Amruta

M.Sc. Scholar, Department of
Agronomy, College of Agriculture,
Dhule, MPKV, Rahuri,
Maharashtra, India

Wadile SC

Associate Professor, Department of
Agronomy, College of Agriculture,
Dhule, MPKV, Rahuri,
Maharashtra, India

Kathepuri JV

SMS, Department of Agronomy,
Krishi Vigyan Kendra, College of
Agriculture, Dhule, Maharashtra,
India

Kawale BS

M.Sc. Scholar, Department of
Agronomy, College of Agriculture,
Dhule, MPKV, Rahuri,
Maharashtra, India

Corresponding Author:

Pawar Prashant P

Associate Professor, Department of
Agronomy, College of Agriculture,
Dhule, MPKV, Rahuri,
Maharashtra, India

Effect of consortia liquid bio-fertilizer on yield, quality and economics of *kharif* soybean (*Glycine max* L.)

Pawar Prashant P, Deore Amruta, Wadile SC, Kathepuri JV and Kawale BS

DOI: <https://doi.org/10.33545/2618060X.2024.v7.i8k.1381>

Abstract

An experiment entitled “Effect of consortia liquid bio-fertilizer on growth, yield and quality of *kharif* soybean (*Glycine max* L.)” was conducted during *kharif* 2022 at Post Graduate Research Farm, Agronomy Section, College of Agriculture, Dhule. Experiment consisted of eleven treatments laid out in randomized block design with three replications. Concerning the yield characters, yield, quality and economics of soybean among various treatments used in the experiment application of 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment should be adopted for higher growth and yield of soybean than other seed inoculation treatments.

Keywords: Soybean, consortia, liquid bio-fertilizer, quality, yield and economics

Introduction

Soybean [*Glycine max* (L.) Merrill] is an important pulse as well as oil-seed crop. Due to its ability to fix nitrogen within the soil, its referred as the “Golden Bean” or “Gold of Soil” because of its beneficial influence on subsequent crops. Consortia of liquid bio-fertilizer have higher efficiency in nitrogen, phosphorus and potassium fixing and have the ability to drive atmospheric nitrogen and provide it to plants. The benefits of the use of *rhizobium* inoculants show that quite good deal of money can be saved by marginal farmers by using quality tested inoculants on the farm (Zarrin *et. al.*, 2006) [6]. It encourages early root development and produces organic acids like malice, succinic, fumaric, citric, tartaric and alpha ketoglutaric acid, which hastens the maturity and therefore increases the ratio of grain to straw as well as the total yield. The application of consortia liquid bio-fertilizer seed treatments on soybean enhanced that nodule number, fresh weight, dry weight of nodules, yield components and grain yield in comparison to conventional farmer’s fertilizer level.

Materials and Methods

The field experiment was conducted in the *kharif* season of year 2022. Experiment consisted of eleven treatments laid out in randomized block design with three replications. The treatments consisted of Control (no seed treatment) (T₁), 100% RDF + (Rhizobium + PSB) 25 gm kg⁻¹ seed treatment (T₂), 75% RDF + (Rhizobium + PSB) 25 gm kg⁻¹ seed treatment (T₃), 100% RDF + 5 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₄), 100% RDF + 10 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₅), 100% RDF + 15 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₆), 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇), 75% RDF + 5 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₈), 75% RDF + 10 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₉), 75% RDF + 15 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₁₀), 75% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₁₁), were used in this experiment. The seed of soybean variety Phule Sangam was sown on 22nd July 2022 at spacing of 45 x 5 cm².

Results and Discussion

Effect of seed inoculation treatments on yield, quality and economics of soybean

Yield attributes and yield

The important yield contributing characters like the number of pods plant⁻¹, number of seeds of pods⁻¹, weight of seeds plant⁻¹, test weight (g) were significantly more under 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇) than other seed inoculation treatments. The grain and straw yield of soybean (qt ha⁻¹) was found to be significantly higher (25.87 and 37.90 qt ha⁻¹, respectively) in 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment weed-free treatment (T₇). The lowest grain and straw yield are under seed inoculation treatment (T₃).

Increase in yield under treatment with the application of 100% RDF + 20 ml consortia liquid bio-fertilizer kg seed treatment (T₇) exhibited healthy crop growth may be due to the sufficient availability of nutrients and its efficient utilization by soybean crop because of fixation of atmospheric nitrogen symbiotically which results in higher growth and yield attributes as chlorophyll metabolism and more photosynthesis is facilitated due more nutrients. Thus, there was cumulative effect in the production of higher grain and straw yield of soybean than other seed inoculation treatments. Similar results were in agreement with Oad *et al.*, (2000) [4], Pabitra *et al.*, (2007) [5] and Mandale *et al.*, (2020) [3].

Quality studies

Observations regarding the quality parameters viz., protein yield and oil yield were significantly influenced by different seed inoculation treatments. The protein yield and oil yield were

observed significantly higher under 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇) than in the rest of the seed inoculation treatments in the study, while it was recorded significantly lowest in 75% RDF + (Rhizobium + PSB) 25 gm kg⁻¹ seed treatment (T₃). Among the different seed inoculation treatments, the highest protein yield and oil yield was recorded with the application of 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇) (1021.66 and 587.74 kg ha⁻¹) which was statistically at par with the application of 100% RDF + 15 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₆) (949.97 and 474.72 kg ha⁻¹). The application of 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇) has produced higher grain yield and as protein yield is product of protein content and grain yield and oil yield is product of grain yield and oil content thus present reflection was noticed. Similar results were in agreement with Jaga *et al.*, (2015) [1].

Economics

The data recorded in Table 3 showed that the among different seed inoculation treatments, the application of 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇) recorded numerically maximum gross monetary returns of Rs. 114864 ha⁻¹ and net monetary returns of Rs. 73623 ha⁻¹ during *kharif* 2022 as compared to other seed inoculation treatments. The maximum cost of cultivation and benefit cost ratio of soybean was recorded in treatment 100% RDF + 20 ml consortia liquid bio-fertilizer kg⁻¹ seed treatment (T₇) was found superior (2.78) than rest of seed inoculation treatments. These confirm with findings Oad *et al.*, (2000) [4], Daravath and Takankhar (2018) [2] and Mandale *et al.*, (2020) [3].

Table 1: Effect of seed inoculation treatments on yield contributing characters and yield of soybean.

Treatment Details	Number of pods plant ⁻¹	Number of grain plant ⁻¹	Weight of grain plant ⁻¹ (g)	Test weight (g)	Grain yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)
T ₁ Control 100% RDF (No seed treatment)	37.13	2.40	14.53	17.42	17.78	25.51
T ₂ 100% RDF + (Rhizobium + PSB) 25 gm kg ⁻¹ seed treatment	42.80	2.57	19.73	16.31	20.87	29.79
T ₃ 75% RDF + (Rhizobium + PSB) 25 gm kg ⁻¹ seed treatment	33.66	2.27	12.53	16.17	15.59	22.26
T ₄ 100% RDF + 5 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	45.70	2.60	20.60	17.19	21.81	31.21
T ₅ 100% RDF + 10 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	46.97	2.73	23.60	17.50	23.83	34.10
T ₆ 100% RDF + 15 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	47.90	2.87	24.67	18.02	24.79	35.51
T ₇ 100% RDF + 20 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	50.97	3.03	26.03	18.50	25.87	37.90
T ₈ 75% RDF + 5 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	38.00	2.38	13.70	17.10	16.00	24.94
T ₉ 75% RDF + 10 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	43.05	2.76	17.83	17.10	17.59	25.76
T ₁₀ 75% RDF + 15 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	44.78	2.77	21.50	17.21	19.15	28.03
T ₁₁ 75% RDF + 20 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	46.57	2.89	22.73	17.70	19.55	29.30
SE(m)	1.08	0.08	0.76	0.44	0.47	0.89
C. D. @ 5%	3.19	0.25	2.27	NS	1.40	2.64
General mean	43.41	2.66	19.76	17.29	20.25	29.48

Table 2: Quality parameters and economics of soybean as influenced by different treatments

Treatment Details	Protein Content (%)	Protein yield (kg ha ⁻¹)	Oil content (%)	Oil Yield (kg ha ⁻¹)	Total cost of cultivation (Rs ha ⁻¹)	Gross returns (Rs ha ⁻¹)	Net returns (Rs. ha ⁻¹)	B: C ratio
T ₁ Control 100% RDF (No seed treatment)	37.13	660.17	18.06	41000	41000	78786	33721	2.05
T ₂ 100% RDF + (Rhizobium + PSB) 25 gm kg ⁻¹ seed treatment	37.50	683.09	18.83	41300	41300	92429	51128	2.23
T ₃ 75% RDF + (Rhizobium + PSB) 25 gm kg ⁻¹ seed treatment	36.40	549.94	18.17	39926	39926	69025	29098	1.72

T ₄	100% RDF + 5 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	37.83	823.22	18.26	41060	41060	96589	55544	2.35
T ₅	100% RDF + 10 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	37.78	900.39	18.49	41120	41120	105538	64417	2.56
T ₆	100% RDF + 15 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	38.33	949.97	19.15	41180	41180	109799	68618	2.66
T ₇	100% RDF + 20 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	39.49	1021.66	19.36	41240	41240	114864	73623	2.78
T ₈	75% RDF + 5 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	36.03	599.60	18.09	39686	39686	73988	34300	1.73
T ₉	75% RDF + 10 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	36.89	646.17	18.38	39746	39746	78102	38355	1.96
T ₁₀	75% RDF + 15 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	37.30	713.82	18.66	39806	39806	84943	44136	2.15
T ₁₁	75% RDF + 20 ml consortia liquid biofertilizer kg ⁻¹ seed treatment	37.49	732.19	18.55	39866	39866	86933	47066	2.16
SE(m)		0.72	41.76	0.77	-	-	1953.53	1823.30	-
C. D. @ 5%		NS	123.28	NS	-	-	5763	5593.40	-
General mean		37.44	756.93	18.23	382.15	40539	90091	49091	2.18

Conclusion

Based on the results of the investigation, it could be concluded that among the different seed inoculation treatments used in the experiment application of 100% RDF + 20 ml consortia liquid biofertilizer kg⁻¹ seed treatment should be adopted for higher growth and yield of soybean than other seed inoculation treatments.

References

1. Jaga PK, Sharma S. Effect of bio-fertilizer and fertilizers on productivity of soybean. *Annals of Plant and Soil Research*. 2015;17(2):171-174.
2. Daravath R, Takankhar VG. Response of liquid bio-fertilizers (*Bradyrhizobium* and PSB) on nutrient content in soybean (*Glycine max* L.) *International Journal of Current Microbiology and Applied Sciences*. 2018;7(5):2319-7706.
3. Mandale AF, Mahajan PD, Patil SA, Mane JT, Desai DD. Effect of liquid formulations of *Rhizobium* inoculation on growth and yield of mung bean. *Journal of Pharmacognosy and Phyto chemistry*. 2020;10(1):1276-1292.
4. Oad FC, Kumar L, Biswas JK. Effect of *Rhizobium japonicum* inoculum doses (liquid culture) on the growth and seed yield of soybean crop. *Asian journal of Plant Sciences*. 2002;1(4):340-342.
5. Pabitra BK, Malay KB. Effect of liquid and carrier based *Rhizobium* inoculants on growth, nodulation and seed yield of urdbean. *Journal of crop and weed*. 2007;3(2):7-9.
6. Zarrin FZ, Zia M, Chaudhary MF. Effect of rhizobium strains and phosphorus on growth of soybean (*Glycine max*) and survival of rhizobium and P solubilizing bacteria. *Pakistan journal of Bot*. 2006;38(2):459-464.