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EFFECT OF JEEWAMRIT FORTIFIED WITH BANANA PEEL, SLACKED LIME AND BIOFERTILIZERS ON YIELD, ECONOMICS AND MICROBIAL ACTIVITIES UNDER SOYBEAN CROPPING IN VERTISOL.

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ABSTRACT

A field experiment was conducted during kharif season of 2018 and 2019 at the Research Farm, RAK College of Agriculture, Sehore (M.P.) India to study the effect of jeewamrit fortified with slacked lime and biofertilizers on yield, economics and microbial activities under soybean cropping. The treatment T_7 (50 % RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} soil + application + Jeewamrit @ 500 liter ha 30 DAS + Slacked lime @ 25 kg ha^{-1} exerted the maximum seed yield (13.09 q/ha) of soybean which was found at par with the treatment T_6 (12.38) and then T_5 (11.98 q/ha). The application of 50 % RDF + Rhizobium + PSB @ 4 kg/ha + Jeewamrit @ 500 liter/ha + Slacked lime @ 25 kg/ha 26702/ha) with 2.14 B:C ratio. It was followed by the application of 50 % RDF + Jeewamrit @ 500 liter ha^{-1} + Slacked lime @ 25 kg ha^{-1} (T_6) Rs. (24393 /ha with 2.06 B:C ratio and then T_5 (50 % RDF + Rhizobium + PSB @ 4 kg ha^{-1} + Slacked lime @ 25 kg ha^{-1}) Rs. 32458 /ha with 2.05 BC ratio. The highest population of Bacteria (8.55 CFU x 10^6 gm^{-1} soil) and fungi (6.45 CFU x 10^4 gm^{-1} soil) were observed under treatment T_7, followed by T_6 and then T_5 treatments. The significant and highest f DH activity (78.0 TPE μg 24 hr^{-1} g^{-1}) was found under treatment T_7, followed by treatment T_6 (75.33 TPF μg 24 hr^{-1} g^{-1}) and then T_5 (71.60 TPF μg 24 hr^{-1} g^{-1}). The minimum DH activity was in T_1 (59.33 TPF μg 24 hr^{-1} g^{-1}).

Key words: Jeewamrit, slacked lime, biofertilizers, soybean

INTRODUCTION

Indiscriminate use of inorganic fertilizers is believed to cause deterioration of soil texture, structure, hindrance of microbial activities, ground water pollution and finally decreased soil fertility and production. On the other hand, the use of organic manures biofertilizers and recently available growth promoters like Jeewamrit improve soil texture, structure, humus, colour, aeration, water holding capacity, microbial activities, nutrient use efficiency and thereby increase production and reduce environmental hazards (Birathar *et al*. 2017, Jangir *et al*. 2017, Jain and Singh, 2019). Soil organic matter is generally one of the most important criteria of soil quality. Soil organic matter has an influence on the processes occurring in the soil and many soil properties (Gulser and Candemir, 2012; Cercioglu *et al.*, 2014). The indicators of soil quality can be categorized in to four general group; visual, physical, chemical and biological properties that can be measured by monitoring changes in the soil. Biological indicators include measurement of micro and macro organisms and their activities. Some parameters of biological indicators for screening of soil quality are soil organic carbon, dehydrogenase activity, microbial biomass, carbon and nitrogen (Srivastava *et al*., 2015).

Jeewamrit is a plant growth promoting substances containing beneficial microorganisms which stimulate growth and yield of soybean (Bhosale *et al*., 2017; Singh and Jain, 2019; Parmar and Vyas, 2019).

Biofertilizers like *Rhizobium* and PSB play an important role in increasing the yield through the natural processes of N-fixation, phosphate-solubilization and stimulating plant growth through the synthesis of growth promoting substances, improvement in soil structure and texture, soil pH and other properties of soil. In symbiotic association with *R. japonicum*, soybean plants can fix up to 200 kg N ha^{-1} per year (Javaid and Mahmood, 2010) reducing the need for expensive nitrogenous chemical fertilizer. In view of the above facts, the present research was taken up under the agro climatic conditions of Sehore (M.P.).

MATERIALS AND METHODS

The field experiment was conducted during *kharif* season 2018 and 2019 at the Research Farm, RAK College of Agriculture, Sehore (M.P.), India. The soil of the experimental field was medium black (Vertisol) having clay loam texture, low in available

nitrogen (202.24 N kg/ha), medium in available phosphorus (12.16 P kg/ha), high in available potassium (425.25 kg k/ha) and normal in available sulphur (8.87 ppm) and available Zn (0.39 ppm) with pH of 7.55. The experiment consisted of 7 treatments laid out in randomized block design keeping 3 replications. The treatment included absolute control (T_1), 50% RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} as soil application (T_2), 50 % RDF + Jeewamrit @ 500 lit ha^{-1} 30 DAS (T_3), 50 % RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} soil application + Jeewamrit @ 500 lit ha^{-1} 30 DAS (T_4), 50 % RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} + Slacked lime @ 25 kg ha^{-1} (T_5), 50 % RDF + Jeewamrit @ 500 lit ha^{-1} 30 DAS + Slacked lime @ 25 kg ha^{-1} (T_6), 50% RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} as soil application + Jeewamrit 500 lit ha^{-1} 30 DAS + Slacked lime @ 25 kh ha^{-1} (T_7). The soybean var. RVS-24 was sown on 7th and 3rd July in 2018 and 2019, respectively. The Jeewamrit is composed of 5 kg of cow dung+ 5 Liters of Cow Urine+2 kg of Banana Peel+ 1 kg Jaggery + 1 kg Chickpea flour+ 01 kg Soil found under the banyan tree+5 Liters of water which was kept for decomposition for 7 days in a 200 Liter's capacity drum by mixing the material every day after which it was sieved through 2 mm sieve and 5 percent of this jeewamrit solution used to make desired dose of jeewamrit application. The farm made Jeewamrit contain Nitrogen content (0.92 percent) , Phosphorus content (0.11 percent), Potassium content (0.78 percent) Sulphur content (0.79 percent), Magnesium (0.94 percent), Zinc (40 ppm), Iron (50 ppm). More over to this the Jeewamrit also contain the microbial population in CFU per ml on nutrient Agar at 28 degrees Celsius for 48 hours respectively of bacteria (24 X 10^5), fungi (15.8 X 10^5) and Actinomycetes (6.4 X 10^5). The 50 percent recommended doses of fertilizers were applied as per package of practices of soybean @ 20:60:20:20 kg/ha N, P_2O_5, K_2O and S respectively. The crop was harvested on 3rd October, 2018 and 17th October, 2019.

RESULTS AND DISCUSSION

Productivity parameters

Grain yield is a complex process which depends on the different yield attributing characters such as number of pods/plant, number of seeds/pod, seed index. The treatment T_7 (50 % RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} soil + application + Jeewamrit @ 500 liter ha 30 DAS + Slacked lime @ 25 kg ha^{-1} exerted the maximum seed yield (13.09 q/ha) of soybean which was found at par with the treatment T_6 (12.38) and then T_5 (11.98 q/ha). The straw yield was 16.00, 15.42 and 14.93 q/ha, respectively (Table 1).

The increment in the supply of essential elements through NPK with Jeewamrit slacked line with dual biofertilizers could be the concomitant mineralization, their availability,

mobilization and influx into the plant tissues increased and thus improved growth, yield components and finally the grain yield of soybean. The physiological phenomenon and plant growth pattern of soybean form an essential basis in crop management, sustained productivity, maintenance of proper soil moisture and reduction of crop-weed competition. These results corroborate with the findings of Vasumathi and Jayanthi (2014), Kumbar *et al.* (2015), Yoganada *et al*. (2015), and Birathar *et al*. (2017).

Economics

Net return is the actual profit gained under a particular combined treatment by subtracting the cost of cultivation from the gross return under the same treatment. The maximum net return was obtained with the application of 50 % RDF + Rhizobium + PSB @ 4 kg/ha + Jeewamrit @ 500 liter/ha + Slacked lime @ 25 kg/ha 26702/ha) with 2.14 B:C ratio. It was followed by the application of 50 % RDF + Jeewamrit @ 500 liter ha^{-1} + Slacked lime @ 25 kg ha^{-1} (T_6) Rs. (24393 /ha with 2.06 B:C ratio and then T_5 (50 % RDF + Rhizobium + PSB @ 4 kg ha^{-1} + Slacked lime @ 25 kg ha^{-1}) Rs. 32458 /ha with 2.05 BC ratio.

Bacterial and Fungal counts

The highest population of Bacteria (8.55 CFU x 10^6 gm^{-1} soil) and fungi (6.45 CFU x 10^4 gm^{-1} soil) were observed under treatment T_7, followed by T_6 and then T_5 treatments. The similar findings have also been reported by Shwetha (2008), and Birathar *et al*. (2017).

Dehydrogenase activity

The significant and highest f DH activity (78.0 TPE μg 24 hr^{-1} g^{-1}) was found under treatment T_7, followed by treatment T_6 (75.33 TPF μg 24 hr^{-1} g^{-1}) and then T_5 (71.60 TPF μg 24 hr^{-1} g^{-1}). The minimum DH activity was in T_1 (59.33 TPF μg 24 hr^{-1} g^{-1}). The acceleration in dehydrogenase activity could be attributed due to enhanced microbial activities in the rhizosphere due to combined application of jeewamrit and slacked lime with, *Rhizobium* japonicum and 50 % RDF. The similar findings have also been reported by Shwetha (2008), Birather *et al.* (2017), Jain and Singh (2019). The findings established that the combined application of 50 % RDF + *Rhizobium* + PSB @ 4 kg ha^{-1} + Jeewamrit @ 500 liter ha^{-1} + Slacked lime @ 25 kg ha^{-1} (T_7) proved most beneficial in enhancing the yield economics, microbial population and dehydrogenase activity under soybean cropping.

REFERENCES

Cercioglu, M., Okur, B., Delibacak, S., Ongun, A.R., (2014). Changes in physical conditions of a coarse textured soil by addition of organic wastes. *Eurasian Journal of Soil Science* **3**:7-12.

Culser, C., Candemir, F., (2012). Changes in penetration resistance of a clay field with organic waste applications. *Eurasian Journal of Soil Science* **1**: 16-21.

Srivastava, L.K., Mishra, V.N. and Bachkaiya, V. (2015). Regression models for some soil quality parameters under integrated use of nutrients in *Vertsols* of Chhattisgarh. *Annals of Plant and Soil Research* 17 (4):381-384.

Biradar N, Murali K, Devakumar N and Lavanya G. (2017) Influence of organic liquid formulations on soil beneficial microbial population of organic frenchbean (*Phaseolus vulgaris* L.). In: Proceedings of Scientific Track "Innovative Research for Organic Agriculture 3.0", 19th Organic World Congress, November 9-11, New Delhi, India. **p** 467-471.

Shwetha, B. N., (2008) Effect of nutrient managent through organics in soybean -wheat cropping system. M. Sc. Thesis (Unpub.), Univ. *Agric. Sci*., Dharwad.

Jain,R.C. and Singh S. B. P. (2019). Response of soybean (*Glycine max* (L.) Merrill) to biofertilizer and Jeevamrit fortified with slacked lime in vertisol. M.sc. (Agriculture) thesis, Department of Soil Science and Agriculture Chemistry.R.A.K. college of Agriculture Sehore (RVSKVV) M. P.

Yoganandar, S.B., Devkumar, N., Shruti K. and Niingaraju, (2015).Growth and yield of cowpea as influenced by different sources of organic manures, National Symp. Organic Agriculture for Sustainable Food Security: Challenges and Opportunities, Tamil Nadu, India, p. 113.

Kumbar B and Devakumar N. (2017) Influence of different levels of *jeevamrit* and *panchagavya* on yield and quality parameters of organic frenchbean (*Phaseolus vulgaris* L.). In: Proceedings of Scientific Track "*Innovative Research for Organic Agriculture* 3.0", 19th Organic World Congress, November 9-11, New Delhi, India. ***p*** 459 – 462.

Vasumathi, S. and Jayanthi, M.(2014) Co-Inoculation of salt tolerant *Bradyrhizobiumjaponicum* and phosphate solubilizing bacteria for the maximization of growth and yield of soybean. *International Journal of Advanced Research in Biological Sciences* **1**(9): 01-07.

Parmar, R. and Vyas M.D. (2019).Effect of organic liquid manure *(jeeva*mrit) on growth and yield of soybean [*Glycine max* L. Merrill] in black soil; M.sc.(Ag) Agronomy Thesis *RVSKVV Gwalior*.

Bhosale, prerana.;Gaikwad, D.D.; Getbe, R.M and Anarse, S.A (2017).Effect of organic sources of nutrients on grain straw and soil fertility status after harvest of chickpea (*Cicer aritinum*).*Contemporary Research in India.* **7**(3): 2231-2237.

Klein, D.A., Loh, T.C. and Goulding, R.L. (1971).A rapid procedure to evaluate the dehydrogenase activity of soils low in organic matter.*Soil Biol. Biochem*. **3**: 385-387.

Chhonkar, P.K., Bhandraray, S., Patra, A.K. and Purakayastha, T.J. (2007). Experiments in Soil Biology and Biochemistry, 182p.Westibille Publishing House, New Delhi.

Jangir C.K, Singh D.P, Meena R.H and Yadav M. (2017) Effect of fertility levels and biofertilizers on physical and chemical properties of soil under blackgram (*Vignamungo* L.).*International Journal of Current Microbiology and Applied Sciences.***6** (3):223-228.

Table 1. Yield, economics and microbial activities under soybean cropping as influenced by Jeewamrit and biofertilizers (Pooled for 2 years)

Treatments	Grain yield/ (q/ha)	Straw yield (q/ha)	Net income (Rs/ha)	B:C ratio	Bacteria (CFU x 10^6 gm^{-1} soil (Population)	Fungi (CFU x 10^4 gm^{-1} soil Population)	Dehydrogenase activity (TPF µg 24 hr^{-1} g^{-1})
T_1	8.95	12.74	14754	1.75	6.16	4.65	59.33
T_2	10.03	13.37	16613	1.77	6.48	4.98	62.33
T_3	10.78	13.97	18822	1.84	6.97	5.37	64.33
T_4	11.40	14.26	20817	1.91	7.51	5.69	68.30
T_5	11.98	14.93	23458	2.05	7.97	6.03	71.60
T_6	12.38	15.42	24393	2.06	8.17	6.32	75.33
T_7	13.09	16.00	26702	2.14	8.55	6.45	78.00
S.Em±	0.42	**0.49**	**-**	**-**	**0.11**	**-**	**0.91**
C.D. (P=0.05)	1.30	**1.53**	**-**	**-**	**0.35**	**-**	**2.82**