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Effect of Solid and Liquid Organic Manures on Growth and Yield of Summer Mung Bean

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ABSTRACT: A field experiment was conducted at the Research farm of Department of Agronomy, Naini Agricultural Institute at Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Prayagraj (U.P.) during *Kharif* season of 2023. The experiment was laid out in Randomized Block Design (RBD) consisting of 10 treatments combination [50 % N through FYM + 50 % N through Vermicompost + Panchagavya (3%) at flowering and 15 DAS, 50 % N through FYM + 50 % N through Vermicompost + Jeevamrit (10%) at flowering and 30 DAS, 50 % N through FYM + 50 % N through Vermicompost + Control, 50 % N through Vermicompost + 50 % N through Neemcake + Panchagavya (3%) at flowering and 15 DAS, 50 % N through Vermicompost + 50 % N through Neemcake + Jeevamrit (10%)at flowering and 30 DAS, 50 % N through Vermicompost + 50 % N through Neemcake + Control, 50 % N through FYM + 50 % N through Neemcake + Panchagavya (3%) at flowering and 15 DAS, 50 % N through FYM + 50 % N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS, 50 % N through FYM + 50 % N through Neemcake + Control, Control (100 % RDF)] with 3 replications. The results showed that application of 50 % N through Vermicompost + 50 % N through Neemcake + Control recorded the significantly higher growth parameters *viz.,* Plant height (62.02 cm), No. of nodules/plant (16.21), Dry weight (24.17g), Crop Growth Rate (3.88g/m^2/day), and Relative Growth Rate (0.04g/g/day) and yield attributes *viz.,* pods per plant (33.90), seeds per pod (8.82), test weight (35.49g), seed yield (8.74q/ha), haulm yield (22.95q/ha), harvest index (37.89 %), as compare to other treatment combinations.

Keywords: Mung bean, Neemcake, Jeevamrit, Panchagavya, *Kharif.*

INTRODUCTION

Mung bean is grown almost everywhere in India, including Orissa, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Bihar. India is the world's top producer of mung bean. It is grown on about 4.5 million hectares and contributes 10% of the world's production of pulses, producing 2.5 million tonnes at a productivity of 548 kg/ha. In 2020–21, 2.64 million tonnes of mung bean are anticipated to be produced, according to the third advance predictions of the Indian government (Anonymous, 2021). Being a legume, mung bean obtains a greater amount of nitrogen through biological nitrogen fixation, which can be facilitated by maintaining favorable physical and chemical conditions in the soil. In addition, they have high nutritional content, however mung bean appears to have an unbalanced nutritional profile. So, combining solid and liquid organic manure might improve the outcomes. Mung bean (*Vigna radiata* L.), also referred to as green gram and one of the most significant pulse crops, is a fantastic source of high-quality protein. As salads, vegetables and Indian dishes like curries, sevpuri and panipuri also use it. In addition to enhancing soil health, the combined application of organic manures, FYM, vermicompost and gliricidia green leaf manure, increased yield (Babalad *et al*., 2009). Additionally, the liquid organic manures under organic production systems repair deficiencies as they are identified and meet the nutrient needs of crops with higher nutrient usage efficiency (Shwetha *et al*., 2009). Panchagavya, liquid organic manure, has the ability to support growth and offer resistance in the plant system. The five items that make up Panchagavya—cow dung, urine, milk, curd and ghee—are extensively employed in agricultural crops. Intense biological activity in the soil is encouraged by jeevamruth, making the nutrients available to the crop. According to reports, Jeevamruth has a very big population of organisms that fix nitrogen, solubilize phosphate and create siderophores (Pathak and Ram 2013). Studies have demonstrated that an organic production system can increase and maintain the productivity of legume crops. In addition to generating environmental contamination, the indiscriminate and ongoing use of chemical fertilizers has also been demonstrated to have a negative impact on the physical, chemical and biological aspects of soil (Virmani, 1994). Consequently, a study was planned to determine the impact of various solid and liquid organic manures on mung bean growth and productivity.

MATERIAL AND METHODS

A field experiment was carried out at the Research farm of Department of Agronomy, Naini Agricultural

Institute at Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Prayagraj (U.P.) during *Kharif* season of 2023, Located at, 25° 24′30″N latitude, 81° 51′10″E longitude, and 98m above sea level. The experimental soil exhibited a sandy loam texture, slightly alkaline pH (8.07), low organic carbon content (0.39%), and available nitrogen (186.52 kg/ha), medium levels of available phosphorus (17.37 kg/ha), and high availability of potassium (192.67 kg/ha).The experiment was conducted in Randomized Block Design (RBD) consisting of10 treatments combination consisting [50 % N through FYM + 50 % N through Vermicompost + Panchagavya (3%) at flowering and 15 DAS, 50 % N through FYM + 50 % N through Vermicompost + Jeevamrit (10%) at flowering and 30 DAS, 50 % N through FYM + 50 % N through Vermicompost + Control, 50 % N through Vermicompost + 50 % N through Neemcake + Panchagavya (3%) at flowering and 15 DAS, 50 % N through Vermicompost + 50 % N through Neemcake + Jeevamrit (10%)at flowering and 30 DAS, 50 % N through Vermicompost + 50 % N through Neemcake + Control, 50 % N through FYM + 50 % N through Neemcake + Panchagavya (3%) at flowering and 15 DAS, 50 % N through FYM + 50 % N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS, 50 % N through FYM + 50 % N through Neemcake + Control, Control (100 % RDF)] with 3 replications. The organic manures were systematically mixed into the soil 15 days prior to sowing the crop. Panchagavya was prepared one month before its application, while Jeevamruth was prepared 2-5 days prior to application. Both organic sprays were administered between 10 days after sowing and 10 days before harvest. The growth parameters *viz*., plant height, dry matter accumulation, effective nodules/plant, pods/plant, seeds/pod, 1000-seed weight and yields were measured using standard procedures. Crop growth indices like CGR (crop growth rate) and RGR (relative growth rate) were calculated using standard formulas. Experimental data was statistically analysed by the standard techniques and significance was tested by F-test at 5% level of significance (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

A. Growth parameters

The use of organic manure greatly boosted all growth indices *viz*., plant height, dry matter accumulation, according to the results (Table 1). Application of 50% N through Vermicompost + 50% N through Neemcake + Control at harvest resulted in significantly higher plant height (62.02 cm), dry matter accumulation (24.17 g/plant), crop growth rate (3.89 g/m^2/day), relative growth rate (0.046g/g/day), and number of nodules/plant (16.21). These results were found comparable to treatment combinations application of 50% N through Vermicompost + 50% N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS and treatment 50% N through Vermicompost + 50% N through Neemcake + Panchagavya (3%) at flowering and 15 DAS. The improved nutrient availability from solid and foliar sources of organic manures, as well as the efficient conversion of nutrients from organics like Fe, Mg, and Zn available at the site of photosynthesis, may be the cause of these increased plant development characteristics. Furthermore, the use of liquid organic manures has increased the production of leaf area and captured more solar radiation, which has increased photosynthesis and improved all growth parameters.

Table 1: Effect of different organic manures on growth parameters of mung bean at harvest.

Treatments	Plant height (cm)	Dry weight (g/plant)	Crop growth rate(g/m^2/day)	Relative growth rate (g/g/day)	No. of nodules/plant
50 % N through FYM + 50 % N through Vermicompost + Panchagavya (3%) at flowering and 15 DAS	49.27	19.44	3.091	0.0206	10.41
50 % N through FYM + 50 % N through Vermicompost + Jeevamrit (10%) at flowering and 30 DAS	53.98	21.19	3.385	0.0250	12.55
50 % N through FYM + 50 % N through Vermicompost + Control	56.35	22.07	3.533	0.0314	13.63
50 % N through Vermicompost + 50 % N through Neemcake + Panchagavya (3%) at flowering and 15 DAS	59.62	23.28	3.737	0.0397	15.12
50 % N through Vermicompost + 50 % N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS	60.19	23.49	3.773	0.0413	15.38
50 % N through Vermicompost + 50 % N through Neemcake + Control	62.02	24.17	3.887	0.0463	16.21
50 % N through FYM + 50 % N through Neemcake + Panchagavya (3%) at flowering and 15 DAS	50.22	19.80	3.150	0.0147	10.84
50 % N through FYM + 50 % N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS	50.49	19.89	3.167	0.0156	10.97
50 % N through FYM + 50 % N through Neemcake + Control	53.19	20.89	3.335	0.0229	12.19
Control (100 % RDF)	52.76	20.74	3.308	0.0214	12.00
F-test	S	S	S	NS	S
S.Ed.(±)	1.60	0.59	0.176	0.0034	2.16
CD (P=0.05)	4.74	1.76	0.52	-	10.41

Meena and Ram (2013); Sohu *et al.* (2015); Kiran *et al.* (2016) also reported similar findings. Application of vermicompost and panchagavya 3 percent observed greater number of nodules and effective root nodules which led in manifestation of higher development of moong bean because there is a direct relationship between number of root nodules and higher N fixation. These outcomes concur with those of Makwana *et al.* (2020) ; Seerangan *et al.* (2019).

B. Yield and yield attributes

The application of organic manure greatly boosted yield attributes and yield of green gram, with the exception of the harvest index, according to the results (Table 2). It is abundantly evident that application of vermicompost and neem cake resulted in noticeably more pods per plant (33.90) and seeds per pod (8.82),test weight (35.49 gm), seed yield (8.74q/ha) and haulm yield (22.95q/ha) in comparison to other treatment combinations, which were comparable to the treatment combinations of 50% N through Vermicompost + 50% N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS and treatment 50% N through Vermicompost + 50% N through Neemcake + Panchagavya (3%) at flowering and 15 DAS. A percent increase in yield was also observed by using spray of panchagavya (liquid organic manures). To maintain and retain a greater level of soil fertility and crop nutrient availability, it is crucial to apply liquid and organic manures in combination. The goal is to provide crops with the nutrients they need at the right times, based on demand, so that crop productivity can increase. The pattern of nutrient release in organics varies. Neemcake and vermicompost release nutrients more quickly than FYM. Kiran *et al.* (2016); Sohu *et al.,* (2015) reported that combine application of organic sources produced more productive outcomes than applying them separately.

Jeevamrit (10%) and panchagavya (3%) applied topically as liquid organic manures have been shown to considerably increase in seed production. When combined with panchagavya ingredients, cow dung serves as a medium for the growth of microorganisms that are needed for crop growth, resulting in favorable effects on yield and growth (Patil *et al.,* 2012). Growth, yield, and quality of crops are enhanced by the combined application of liquid organics (Panchagavya, Jeevamrit, etc.) and solid organics (vermicompost, FYM, etc.) that contain microbial count and plant growth promoting compounds (PGPR). Apart from lowering cultivation costs, it also contributes to improving the status of soil organic matter. Many farmers around our nation are using Panchagavya, a promising natural liquid organic manure, in a variety of crops (Patil *et al*., 2012). When applying 3% Panchagavya as a foliar spray on greengram 15 days after seeding, the maximum seed output was seen when compared to other treatments. These outcomes concur with the research conducted by Lal *et al.* (2022).

Table 2: Effect of different organic manures on yield attributes and yield of mung bean.

Treatments	No. of pods/plant	No. of seed/pod	Test weight(g)	Seed yield (q/ha)	Haulm yield (q/ha)	Harvest Index (%)
50% N through FYM+50% N through Vermicompost + Panchagavya (3%) at flowering and 15 DAS	26.33	5.71	34.37	7.01	20.87	33.58
50% N through FYM + 50% N through Vermicompost + Jeevamrit (10%) at flowering and 30 DAS	29.12	6.86	34.37	7.63	21.64	35.28
50% N through FYM + 50% N through Vermicompost + Control	30.53	7.44	34.44	7.95	22.02	36.09
50% N through Vermicompost + 50% N through Neemcake + Panchagavya (3%) at flowering and 15 DAS	32.47	8.24	34.65	8.38	22.56	37.13
50% N through Vermicompost + 50%N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS	32.81	8.38	35.42	8.35	22.45	37.31
50% N through Vermicompost + 50% N through Neemcake + Control	33.90	8.82	35.49	8.74	22.95	37.89
50% N through FYM+50% N through Neemcake + Panchagavya (3%) at flowering and 15DAS	26.89	5.94	35.35	7.13	21.03	33.94
50% N through FYM + 50% N through Neemcake + Jeevamrit (10%) at flowering and 30 DAS	27.05	6.01	35.28	7.17	21.07	34.04
50% N through FYM +50% N through Neemcake + Control	28.65	6.67	34.51	7.53	21.51	35.00
Control (100% RDF)	28.40	6.56	34.58	7.47	21.44	34.85
F-test	S	S	NS	S	S	NS
S.Ed. (±)	0.95	0.39	0.04	0.21	0.26	0.51
CD (P = 0.05)	2.81	1.16	-	0.62	0.77	-

CONCLUSIONS

Based on the experiment results, it can be concluded that in Prayagraj's sub-tropical and semi-arid climate, greengram should be fertilized with 50% N through vermicompost + 50% N through neemcake + control in the summer to maintain soil fertility and increase yield and profit.

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