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Response of Green gram to the Comprehensive Nutrient Management under Temperate conditions of Kashmir Valley

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ABSTRACT: A field experiment was conducted at Agronomy Research Farm, Faculty of Agriculture, SKUAST-Kashmir, Wadura during *Kharif* 2018 to investigate the "Response of Green gram to the Comprehensive Nutrient Management under Temperate Conditions of Kashmir Valley". During the experiment period, green gram variety (Shalimar Mung-1) was grown in Randomized block design and replicated thrice. The investigation consists of ten treatments *viz*., T_2 (2.5 t / ha V.C + BF), T_3 (100 % RDF), T_4 (100% RDF +V.C), T_5 (100 % RDF + BF), T_6 (100% RDF+V.C +BF), T_7 (75% RDF), T_8 (75% RDF +V.C), T_9 (75% RDF +BF), T_{10} (75 % RDF+ V.C+ BF) besides an absolute control (T_1). The soil at the experiment site was neutral in reaction (pH 7.31), normal in electrical conductivity (0.36 dS m^{-1} at 25ºC) and medium in organic carbon (0.88%), available nitrogen (316.47 kg N ha^{-1}), available phosphorus (18.739 kg P ha^{-1}) and available potassium (248.62 kg K ha^{-1}) content in soil. During the study period it can be inferred that the highest growth attributes (plant height, leaf area index, dry matter accumulation, nodule number) as well as Nutrient content in mungbean grain and stover, Protein content (%) in seed and stover yield (q/ha) was obtained with the application of Treatment 6 (100% RDF+V.C +BF) during the experiment.

Keywords: Greengram, Bio-Fertilizer, Vermin-Compost, Growth and Protein Yield.

INTRODUCTION

India is a significant producer of pulse crops, representing approximately one-third of the global area and one-fourth of total world production. Pulse crops have unique characteristics that make them essential. They act as mini fertilizer factories, enriching the soil. They also possess a deep root system that efficiently utilizes limited soil moisture, making them more effective than many other crops (Bansal *et al.*, 2022). In India, pulses, including green gram or mung bean (*Vigna radiata* L. Wilczek), have played a vital role in the human diet as a protein source.

Green gram is highly valued for its short growth period and nutrient-rich grains, containing protein, lysine, tryptophan, fat, fiber, carbohydrates, moisture, minerals, and vitamins. It can be consumed as whole grains or in the form of dal. The sprouted seeds are rich in ascorbic acid, riboflavin, and thiamine (Hussain *et al.*, 2011). Mung beans can serve as a meat substitute in vegetarian dishes due to their fat-free and protein-rich nature. Additionally, they can be used as a green manure crop or as fodder.

In India, mungbean occupy an area of about 3.0 million hectares, with a total production of 1.1 million tonnes and an average productivity of 3.20 q/ha (Verma *et al.*, 2017). Mung beans have potential in crop rotation systems, particularly in drier farmland cultivation areas. They can be grown in various cultivation systems, such as sole cropping, intercropping, multiple cropping, and relay cropping.

However, mungbean productivity is often low due to cultivation on marginal and sub-marginal lands with low soil fertility and insufficient fertilization. Chemical fertilizers have been crucial in meeting crop nutrient requirements but are becoming less affordable to farmers due to escalating energy costs. Therefore, there is a need to reduce the reliance on chemical fertilizers and increase the usage of organic fertilizers. However, organic fertilizers alone may not lead to substantial yield increases due to their low nutrient content. Thus, the integration of organic and inorganic fertilizers, along with biofertilizers, is essential.

Microorganisms and earthworms play vital roles in nutrient cycling and minimizing environmental degradation. Vermicompost, derived from worms and associated microbes, is a sustainable source of nutrients, organic carbon, and growth-promoting substances. Biofertilizers, derived from living microorganisms, aid in nitrogen fixation, phosphorous solubilization, and the stimulation of growth hormones, resulting in improved plant morphology, chlorophyll content, and nutrient uptake. They are cost-effective and eco-friendly alternatives to chemical fertilizers (Srivastava and Ahlawat 1993).

Rhizobium inoculation and phosphate solubilizing bacteria (PSB) can further enhance crop growth and nutrient availability. Rhizobium inoculation saves nitrogen application, while PSB converts organic phosphates into soluble forms, benefiting crop yield (Ram and Ramawatar 2012).

To achieve sustainable and balanced plant nutrition, an integrated nutrient system is necessary, combining the use of chemical fertilizers, organic manures, and biofertilizers. This approach can enhance productivity, maintain soil fertility, and reduce reliance on costly chemical inputs.

MATERIALS AND METHODS

The present field experiment entitled "Response of Green gram to the Comprehensive Nutrient Management under Temperate Conditions of Kashmir Valley" was conducted during *Kharif* 2018 at Agronomy Research Farm, Faculty of Agriculture, SKUAST-Kashmir, Wadura. The experimental farm is situated at 34°.17′N latitude and 74° .33′E longitude at an altitude of 1524 meters above mean sea level. During the crop growth season the weekly mean maximum temperature (T max.) and mean minimum temperatures (T min.) were 28.6 ^{o}C (ranging from 22.7 – 31.9 ^{o}C) and 14.4^{o}C (ranging from 5.4 – 18.7 ^{o}C), respectively. The total rainfall received during the crop period was 340.2 mm, which was about 38% of the mean annual precipitation. The mean relative humidity remained between 55.9% (RH min.) to 80.4% (RH max). The mean sunshine hours (SSH) recorded during the period was 6.8 hours (ranging from 1.2 – 9.7 hours). Shorter periods of the sunshine hours were remained more in the month of July during when more events of rainfall occurred.

Soil of the experimental field was neutral in reaction (pH 7.31), normal in electrical conductivity (0.36 dS m^{-1} at 25^{o}C), medium in organic carbon (0.88%), available nitrogen (316.47 kg N ha^{-1}), available phosphorus (18.739 kg P ha^{-1}) and available potassium (248.62 kg K ha^{-1}). The experiment was laid out in Randomized Block Design with three replications comprised of ten treatments *viz*., T_2 (2.5 t/ha Vermi Compost + Biofertilizer), T_3 (100 % Recommended dose of fertilizer), T_4 (100% Recommended dose of fertilizer + Vermi Compost) T_5 (100 % Recommended dose of fertilizer + Biofertilizer), T_6 (100% Recommended dose of fertilizer + Vermi Compost + Biofertilizer), T_7 (75% Recommended dose of fertilizer), T_8 (75% Recommended dose of fertilizer + Vermi Compost), T_9 (75% Recommended dose of fertilizer + Biofertilizer), T_{10} (75 % Recommended dose of fertilizer + Vermi Compost + Biofertilizer) besides an absolute control (T_1).

Green gram/Mung bean variety (Shalimar Mung-1) was sown manually @ 20 kg seed/ha in rows of 30 cm. Thinning was done manually after 20 DAS. Weed management was done by spraying Pendimethalin 30 EC as pre-emergence followed by hand hoeing at 30 DAS.

The recommended dose of fertilizer N: P_2O_5: K_2O was applied @ 30:60:30 kg/ha as per treatments in the form of urea, DAP and MOP, respectively. Harvesting was done 109 DAS and 118 DAS. Picked pods and harvested crop were sun dried and threshed manually by sticks. Threshed seed was cleaned manually to remove foreign bodies and soil clods. Then seed was winnowed to remove dust and stover from it.

Data on growth, nutrient content in seed and stover and protein content in seed were recorded at the time of harvesting. The data collected in respect of various observations were statistically analyzed using analysis of variance techniques (ANOVA) for randomized block design as prescribed by Cocharan and Cox (1957). Standard error of means in each case and critical difference were computed at 5% levels of probability to compare the treatment means. The significance of F test was tested at 5 percent level of significance. Critical difference values were used. The software used for analysis was OPSTAT 1.

RESULT AND DISCUSSION

Growth Studies:

Plant height (cm). It is evident from the data obtained on plant height at different growth days (30, 60, 90 and at harvest), that increase in plant height was not uniform during the entire growth period as depicted in Table 1. The increase in height was slow during early stages of growth up to 30 days after sowing (DAS) and thereafter increased rapidly up to the harvesting stage.

There was a significant difference between control versus (v/s) rest of the treatments at all growth days except at 30 DAS where the differences in treatment effects were non-significant. The maximum plant height (92.9 cm) was recorded with treatment T_6 (100% RDF + 2.5 tons/ha of vermicompost + biofertilizers (*Rhizobium* + *PSB*) followed by (86.9) in T_{10} (75 % RDF + V.C + BF) at harvest. There was a discernible significant difference between T_1 (control) and T_6, with a magnitude superiority of 17.4, 30.1, 18.5 and 23.8 percent in plant height at 30, 60, 90 days after sowing and at harvest respectively over control. While comparing the mean plant height between treatments T_4 (100% RDF+V.C) and T_5 (100% RDF+BF), it was at par on 30, 60, and 90 DAS and, at harvest. But, when T_3 (100% RDF) was compared with T_4 (100% RDF+VC) they were also at par at 30, 60, and 90 DAS and at harvesting stage. Similarly, height in T_3 & T_5 (100% RDF +BF) were at par all growth stages. It was also observed that treatments T_7 (75 % RDF) and T_8 (75% RDF +VC), T_9 (75% RDF + BF) and T_{10} (75% RDF +VC + BF) differed significantly at 90 DAS. Similarly, T_7 and T_8 differed significantly at harvest. However, there was no significant difference in same treatments between 30 and 60 DAS. The data also inferred that there was a significant difference in plant height between treatments T_3 and T_6 at 90 DAS and at harvest but, T_7 and T_{10} differed at all growth stages except at 30 DAS.

It seems from the results that combination of organic and inorganic fertilizers significantly increased the plant height than sole use of inorganic or organic fertilizers. Actually, organic fertilizers help to increase the organic matter content of soil, thus reducing the bulk density and decreasing compaction. Thus, plants get a suitable growing environment that promotes better growth and development (Brar *et al*., 2015).

Leaf area index. A perusal of the data (Table 1) revealed that irrespective of treatments leaf area index (LAI) increased sharply up to 90 DAS and then shows a decreasing trend till harvesting. Application of 100% RDF +V.C + BF (T_6) showed a significant variation in leaf area index of mung bean after 30 DAS when compared with rest of the treatments applied, with highest LAI values at 60, 90 DAS and at harvest. The increase in LAI was conspicuous and pronounced at 90 DAS. However, at 30 DAS the leaf area index was at par in all treatments. The data further indicated that while comparing all the treatments with control, the LAI in control was lowest compared to all other treatments. The results also revealed that there was a significant difference in LAI in treatments T_3 (100% RDF) and T_6 (100% RDF+V.C+BF) and T_6 and T10 (75%RDF+V.C+BF) at 60 DAS, respectively, but these treatments were at par during 30, 90 DAS and at harvest. Similarly, treatment T2 (V.C+BF) and T_3 differed significantly at 60, 90 DAS except at harvesting stage. It was also observed from the data that T_3 and T_4 (100%RDF+V.C), T4 and T5 (100% RDF+BF), T_7 (75% RDF) and T_8 (75% RDF+V.C) and T_7 and T_{10} (75% RDF+V.C+BF) were not significantly different at all days of growth. Inoculation of seeds with nitrogen fixing *Rhizobium* in the root nodules might have resulted in vigorous growth of plant (Chattopadhyay and Dutta 2003)

Dry matter accumulation (g/m^2). The data pertaining to effect of different treatments on dry matter accumulation at different days of growth has been presented in Table 2. It is evident from the data that dry matter accumulation increased progressively with advancement of crop age and reached to maximum at harvest. The experimental results also revealed that dry matter accumulation was slow up to 30 DAS and increased sharply thereafter. Dry matter accumulation was significantly affected by treatment T_6 (RDF100%+V.C+BF) and T_{10} (75% RDF+V.C+BF) at 30, 60, 90 DAS and harvest. The highest dry matter accumulation was recorded in T_6 (100% RDF+V.C+BF) followed by T10 (75%RDF+V.C+BF) in 30, 60, 90 DAS and harvesting stage with an edge of 127.6, 23.6, 62.3 and 85.5 percent over control respectively. Both the treatments were statistically non significant at all the growth days with a superiority over all other treatments. The data also indicates that all the treatments differed significantly from T_1 (control) during all the growing days i.e. (30, 60, 90 and at harvest). After perusal of the data (Table 2) it was inferred that treatment T_2 (V.C+ BF) and T_3 (100% RDF) differed significantly at all growing days (30,90 DAS and harvesting) except at 60 DAS. Same trend was observed in treatment T_3 (100% RDF) and T_4 (100% RDF+V.C) at 90 DAS and at harvest. It was also observed that there was a significant difference in dry matter accumulation between T_3 and T_6 at all stages of growth. Similarly, treatment T_7 and T_{10} also differed significantly between one another. It was also noticed from the data that all treatments differed significantly at 90DAS and harvesting except T_8 and T_9, T_6 and T_{10} at 90 DAS and T_4 and T_5 at harvest which were found at par, respectively. It is apparent from the data (Table 2) that integration of inorganic fertilizers & organic fertilizers had beneficial effect on dry matter accumulation at all days of growth. Balanced nutrition under favourable environment might have helped in production of new tissues and development of new shoots which have ultimately increased dry matter accumulation These results are in agreement with those of Jawhara and Owied (2016).

Number of Nodules. The data with respect to number of nodules recorded at different observational days is presented in Table 2. While perusing the data, it indicated that number of nodules/plant increased from sowing to flowering. All the treatments differed significantly from T_1 (control) at all growth days. There was no significant effect of treatments between T_3 (100%RDF) & T_4 (100% RDF+V.C) at all stages except at pre-flowering stage.

It was also observed that all the treatments showed a vivid difference in the number of nodules at pre flowering, flowering and harvest. The number of nodules/plant were less at pre flowering stage, then got momentum up to flowering stage and decreased at harvest as is evident from the data presented in (Table 2). At flowering highest number of nodules/plant (23.5) were recorded with T_6 (100% RDF + V.C + BF) treatment followed by T_5 (22.5), T_{10} (75% RDF+ V.C + BF) (21.6), T_9 (20.73) and T4 (20.7) respectively. While minimum number of nodules (12.2) were recorded in control. It was also evident from the data that the treatments T_5 (100% RDF+BF) and T_9 (75% RDF + BF) were at par at all stages. It was also observed that treatments T_3 (100% RDF) and T_4 (100% RDF and V.C) differed significantly (Chattopadhyay and Dutta 2003) obtained significantly higher nodules/plant due to *Rhizobium* and PSB inoculation over no inoculation.

Fresh weight of root nodules (mg). Fresh weight of nodules/plant as affected by different treatments is presented in Table 2. It is evident from data that fresh root nodule weight/plant increased sharply from pre flowering to flowering and with a drastic decrease in nodule weight/plant at harvest. However, maximum fresh root nodule weight (37.9 mg) was recorded in T_6 (100% RDF+BF+V.C), followed by (365.5 mg) in T_{10} (75% RDF+BF+V.C) at flowering stage respectively. The magnitude of increase in fresh weight of root nodules over control was (26.5) and (21.7) percent respectively. The lowest fresh weight of (300.31 mg) was noticed in T_1 (control). It was also observed from the data that there was a significant difference in T_1 (control) and T_2 (V.C+ BF) at all stages.

It was also observed that T_3 (100% RDF) and T_6 (100% RDF+V.C+BF) differed significantly at pre flowering, flowering and harvest. However, T_3 and T_4 (100%RDF+V.C) treatments were at par at all stages. It was also observed from the data that T_3 (100 % RDF) and T_6 (100% RDF+BF+V.C) showed a significant difference in fresh weight of nodules at pre flowering,

flowering & harvest stage. Similarly application of treatment T_7 (75% RDF) and T10 (75% RDF+V.C+BF) showed a marked significant difference in fresh weight of root nodules as is vivid from Table 2.

Nitrogen Content in grain (%). It is clear from data (Table 3) that nitrogen content in seed significantly increased over control due to application of different treatments. A perusal of data (Table 3) showed that various fertility levels significantly enhanced the nitrogen content in the seed.

The treatment, T_6 (100% RDF+V.C+BF) recorded the maximum nitrogen content (3.93) in seed followed by (3.78) in T_{10} (75% RDF+V.C+BF) which was found at par to treatment T_6. The lowest nitrogen content in seed was found in T_1 (control). The percentage increase in nitrogen content in seed due to application of fertility levels and bio-fertilizers in T_6 (100% RDF+V.C+BF) was 24.7 percent over control.

The data also revealed that there was a significant difference between T_3 (100% RDF) and T_6 (100% RDF+VC+BF), T_7 (75% RDF) and T_{10} (75% RDF +VC+BF) but, T_2 (V.C+ BF) and T_3 were found at par. Similarly, when T_2 (V.C+ BF), T_3 and T_4 (100%RDF+ V.C) were compared, they were found at par with each other. This may be due to more nitrogen fixation by bacteria which in turn helped in better absorption and utilization of all the plant nutrients, resulting in more N seed and protein content in seed. Similar results have also been reported by Rathore *et al*. (2007).

Phosphorous content in grain (%). The data presented in Table 3 inferred that phosphorous content in grain was significantly higher when compared with control. Rest of the treatments were at par with each other in relation of phosphorous concentration in seeds. However, the treatment T_6 (100% RDF+VC+BF) and T_{10} (75%RDF+VC+BF) showed marginal increase over other treatments.

Potassium content in grain (%). From the perusal of the data (Table 3) it is clear, that there is a significant difference in potassium percentage in grain between controls versus rest of the treatments. The data also indicated that {T_2 (V.C+BF) and T_3 (100% RDF), {T_3(100%RDF and T_4(100% RDF+V.C)} and {T_5 (100% RDF +BF) and T_6 (100% RDF +V.C+BF)} differed significantly. The highest potassium content percent in grains was observed in T_6 followed by T_{10}, T_5, and T_4. It has also been noticed that there was a significant difference between T_3 and T_6, T_7 and T_{10}, T_4 and T_6, T_8 and T_{10} treatment in relation to the content. It is apparent from the data (Table 3) that integration of inorganic fertilizers & organic fertilizers had beneficial effect on dry matter accumulation at all days of growth.

Nitrogen content (%) in stover. The data presented in Table 3 revealed that nitrogen content in stover was highest (3.18 %) in T_6 (100% RDF+V.C+BF) followed by T_4 (100% RDF +V.C) (3.03 %) and T_3 (100% RDF) (2.93%). It was also observed from the data, that there was a significant difference between T_1 (control) and T_3, T_1 and T_4, T_1 and T_5 and T_1 and T_6. However, T_1 and T_2 were statistically at par. Also on examining the data it was found that significant differences in nitrogen content were recordedin treatment T_3 and T_6. However treatments T_7, T_8, T_9 and T_{10} were statistically at par.

Phosphorous content(%) in stover. The data (Table 3) revealed that significant differences were noticed between control (T_1) versus rest of the treatments in regards to phosphorous content in stover. The highest phosphorous content (0.23%) was recorded in treatment T_6 (100% RDF+V.C+BF), followed by treatment T_{10} (75%RDF+V.C+BF) (0.227%). It was also observed that while comparing the results significant differences were noticed in treatments T_3 (100% RDF) and T_6 (100% RDF+VC+BF) and between treatment T_7 (75%RDF) and T_{10} (75%RDF+VC+BF). However, treatment T_3 and T_4 (100% RDF+V.C), T_4 and T_5 (100% RDF+BF), T_7 and T_8 (75%RDF+V.C) and T_8 and T_9 (75% RDF+BF were statistically at par.

Potassium content (%)in stover. While comparing the influence of different treatments against control, it was evident from the data (Table 3) that all the treatments showed a significant improvement in potassium content (percent) in stover over control. The data also inferred that treatment T_6 (100%RDF+VC+BF) and treatment T_4 (100% RDF+V.C) were significantly superior in terms of potassium content (percent) in stover overall other treatments. It was also observed from the data that treatments T_2 (V.C+ BF) and T_4(100% RDF+V.C) were significantly different from each other in respect to K content. However, treatment T_3 (100% RDF) and T_6 (100% RDF + V.C+BF) are statistically different. However, treatments T_7 (75% RDF), T_8 (75% RDF+V.C) and T_9 (75%RDF+BF) were statistically at par.

The N content in seed might have increased due to increased protein content and results are in accordance with those of Rathore *et al*. (2007) who observed higher N and P uptake in mungbean due to inoculation of seed with PSB.

Protein content (%) in seed. It is clear from data given in Table 3 that protein content varied by application of fertility levels and biofertilizers. A perusal of data (Table 3) revealed that significant differences were noticed between control (T_1) versus rest of the treatments in regards to protein content in seed by application of different fertility levels and bio-fertilizers.

The highest significant protein content percent (24.5 %) was observed intreatment T6 (100% RDF+V.C+BF) followed by (23.6%) in treatment T_{10} (75% RDF+V.C+BF). Whereas, the lowest protein content (18.5) was found in treatment T_1 (control). Superiority in protein content of seed was to the tune of 4.5% and 4.3%, respectively in treatment T_6 and T_{10} over control (T_1).

There were a significant difference between treatment T_3 (100% RDF) and T_6 (100% RDF+V.C+BF) and between T_7 (75%RDF) and T_{10} (75% RDF+V.C+BF). Similarly, significant difference was observed in treatments T_3 and T_4 (100% RDF+V.C). The N and P content in seed might have increased due to increased protein content and results are in accordance with those of Rathore *et al*. (2007).

Protein yield (q/ha). From the perusal of the data in Table 3 it is evident that highest protein yield (228.1 q/ha) was observed in treatment T_6 (100% RDF+V.C+BF) followed by (213.5 q/ha) in treatment T_{10} (75% RDF +V.C +BF). It was also inferred from the Table 3 that there was a vivid significant difference between control versus rest of the treatments interms of protein yield in mungbean. It was also observed thatthere was a significant difference between treatment T_3(100% RDF) and T_6 (100%RDF+V.C+BF) and treatment T_7(75%RDF) and T_{10} (75%RDF+V.C+BF).

Table 1: Influence of integrated nutrient management on plant height (cm) and leaf area index in mungbean.

Treatment	Plant height (cm)				Leaf area index			
	30DAS	60DAS	90DAS	Harvest	30 days	60 days	90 days	Harvest
T_1 (control)	9.9	33.5	73.7	75.0	0.6	3.9	4.0	3.2
T_2 (V.C+BF)	9.9	39.2	78.7	80.4	0.6	4.1	4.2	3.5
T_3 (100%RDF)	10.4	45.0	83.3	84.6	0.7	4.4	4.5	3.6
T_4 (100%RDF+V.C)	10.4	46.0	85.4	85.8	0.7	4.6	4.6	3.7
T_5 (100%RDF+BF)	10.5	44.8	84.7	85.5	0.7	4.5	4.6	3.5
T_6 (100%RDF+V.C+BF)	10.8	47.7	87.3	92.9	0.7	4.7	4.7	3.7
T_7 (75%RDF)	10.7	38.6	79.2	79.9	0.7	4.4	4.5	3.5
T_8 (75%RDF+V.C)	10.6	42.6	82.9	86.9	0.7	4.5	4.6	3.6
T_9 (75%RDF+BF)	12.0	41.4	80.9	84.0	0.7	4.5	4.5	3.5
T_{10} (75%RDF+V.C+BF)	11.3	44.7	84.3	86.9	0.7	4.5	4.6	3.6
S.E(m)±	0.48	1.3	0.9	1.5		0.07	0.10	0.08
CD(P≤0.05)	NS	4.1	2.8	4.5	NS	0.20	0.32	0.25

Table 2: Influence of integrated nutrient management on dry matter accumulation (g/m^2), Number of nodules and Fresh weight of root nodules in mungbean.

Treatment	Dry matter accumulation				Number of nodules			Fresh weight of root nodules		
	30DAS	60DAS	90DAS	Harvest	Pre-flowering	Flowering	Harvest	Pre-flowering	Flowering	Harvest
T_1(control)	7.2	65.3	99.2	103.1	3.7	12.2	3.3	51.5	300.3	23.7
T_2(V.C+BF)	10.3	71.4	114.6	134.7	7.5	16.5	5.7	56.1	329.2	25.5
T_3 (100%RDF)	13.3	75.4	137.6	167.5	5.6	19.3	4.7	57.4	346.1	27.2
T_4(100%RDF+V.C)	14.4	77.0	156.6	183.9	8.2	20.7	5.6	56.5	354.2	28.3
T_5(100%RDF+BF)	13.3	74.6	139.4	180.9	9.4	22.5	6.6	58.8	360.2	29.4
T_6 (100%RDF+V.C+BF)	16.4	80.7	161.3	191.2	9.5	23.5	8.6	60.8	379.9	30.6
T_7 (75%RDF)	12.9	72.5	143.7	162.2	5.4	17.6	4.7	48.4	332.4	24.3
T_8(75%RDF+V.C)	13.0	75.6	152.2	179.1	6.6	18.5	5.4	51.2	348.3	25.6
T_9(75%RDF+BF)	13.2	73.4	147.6	175.0	8.23	20.7	6.3	53.0	328.0	26.5
T_{10}(75%RDF+V.C+BF)	14.6	78.3	158.0	189.1	9.4	21.6	7.3	57.2	365.4	28.6
S.E(m)±	0.6	1.7	2.1	3.5	0.56	1.2	0.44	0.50	3.3	0.49
CD(P≤(0.05)	2.0	5.2	6.3	10.5	1.6	3.8	1.3	1.5	10.1	1.4

Table 3: Influence of integrated nutrient management on Nutrient content in mungbean grain & Stover, Protein content (%) in seed and Protein yield (q/ha)

Treatment	Nutrient content in mungbean grain			Nutrient content in mungbean Stover			Protein content(%) in seed	Protein yield (q/ha)
	N	P	K	N	P	K		
T_1 (control)	2.9	0.36	1.3	2.7	0.19	1.4	18.5	77.1
T_2 (V.C+BF)	3.4	0.55	1.4	2.8	0.20	1.6	21.3	118.1
T_3 (100%RDF)	3.5	0.58	1.5	2.9	0.21	1.9	21.8	164.2
T_4 (100%RDF+V.C)	3.6	0.58	1.7	3.0	0.22	2.0	22.9	199.4
T_5 (100%RDF+BF)	3.7	0.58	1.7	2.9	0.22	1.9	23.1	187.5
T_6 (100%RDF+V.C+BF)	3.9	0.61	2.1	3.1	0.23	2.9	24.5	228.1
T_7 (75%RDF)	3.4	0.55	1.5	2.7	0.21	1.6	21.4	154.2
T_8 (75%RDF+V.C)	3.5	0.55	1.7	2.8	0.21	1.8	22.3	183.6
T_9 (75%RDF+BF)	3.6	0.58	1.6	2.8	0.21	1.7	22.5	178.22
T_{10} (75%RDF+V.C+BF)	3.7	0.59	1.9	2.9	0.22	2.0	23.6	213.5
S.E(m)±	0.12	0.07	0.05	0.09	0.05	0.09	0.47	7.1
CD(P≤(0.05)	0.26	0.16	0.12	0.19	0.11	0.21	0.85	21.2

Plate 1. Laboratory work for analysis of different parameters.

CONCLUSIONS

Based on results of one year experimentation, it may be inferred that amongst different levels of organic and inorganic fertilizers conjunctive application of 100% RDF+ Vermicompost @ 2.5 t/ha + seed inoculation of biofertilizers (*Rhizobium* + Phosphate solublizing bacteria), in treatment T_6 was found to be the most promising treatment which fetched appreciably higher growth, yield nutrient content in seed & stover, protein content in seed and protein yield. However, these results are only indicative and require further experimentation to arrive at some more consistent and final conclusion.

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