Effect of Organic Manures and Chemical Fertilizers on Growth and Yield of Green gram (*Vigna radiata* L.)

Abstract

A field experiment was conducted at experimental farm, Department of Agronomy, Facultyof Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan)duringRabiseasonof2023-24to effectoforganic manures and chemical fertilizers on growth andyield of green gram, variety "SML-832" wasused in this study. The required quantities of fertilizers as per treatments were applied. Theexperiment was laid out in randomized block design with three replications consisting of ten treatments.The data recorded maximum growth parameters like, plant height (51.45 cm), number of branches per plant (4.08) and yield parameters like, number of pods per plant (20.58, number of seeds per pod (8.65), test weight (38.92 g), grain yield (1106.45 kg/ha), straw yield (2583.85 kg/ha) and maximumnet return (48100 Rs/ha) and B:C ratio (1.58) was recorded withT_9-75% Vermicompost @ 1.25 t per ha.The minimum growth and yieldobtained with control treatment.Therefore, concluded that

impact of different organic manures and chemical fertilizers on the growth and yield of the green gram. Among different T_9-75% RDF + Vermicompost @ 1.25 t per haregistered the maximum production with higher net return. So, it was concluded that the treatment 75% RDF + Vermicompost @ 1.25 t per ha superior among all treatments.

Keywords: -Yield; RDF;Vermicompost; Growth; Economics

1. Introduction

"Green gram (*Vigna radiata* L.) occupies prime position among pulses by virtue of its short growth period, high tonnage capacity and outstanding nutrient value as food, feed and forage. Unlike other pulses, it does not produce heaviness or flatulence. Green gram is fairly rich in carbohydrate and appreciable amount of riboflavin and thiamine" (Roy et al. 2006).

"The use of fertilizers is essential to increasing crop yields. In terms of crop nutrition, nitrogen is crucial. Even while green grams fix nitrogen from the atmosphere, the crop seemed to benefit most from an initial dose of 15 to 20 kg of nitrogen per hectare, depending on the original fertility of the soil. The degree of response is contingent upon several factors, including

temperature, cropping patterns, soil moisture content, and natural fertility" (Roy *et al.* 2006)."Phosphorus is essential for several physiological functions, including protein synthesis and metabolism, as well as for the growth of roots, the generation of dry matter, nodulation, and nitrogen fixation. The use of chemical fertilizers has been negatively impacted and the issues have been made worse by the recent, unheard-of increase in their cost. The fact that no single source of nutrients could completely satisfy a crop's nutritional needs is becoming more and more apparent. The green gram possesses a special ability to capture atmospheric gaseous nitrogen. Through the process of symbiosis, this is achieved. As a result, the well-modulated crop improves the soil in addition to meeting its own nitrogen needs" (Patil *et al*. 2011)

"The nutrient density of organic matter is rather low, there are numerous benefits associated with it. By increasing the physical and biological nutrient storage mechanisms in soils, organic manures naturally reduce the danger of overfertilization. Compared to inorganic fertilizers, organic manures such as FYM and Bio compost have a lower nutritional content and a slower rate of nutrient release. By contributing organic matter and nutrients, like nitrogen, that are held in the soil by bacteria, manures help to make the soil more fertile"(Atik *et al.* 2014). By enhancing soil fertility and soil structure, FYM and Bio compost contribute to increased agricultural productivity (Pal *et al.* 2011)."The productivity of this crop is very low because of its cultivation on marginal and sub marginal lands of low soil fertility where little attention is paying to adequate fertilization. In summer green gram, a high reduction in yield has been reported to occur due to non-use of fertilizers" (Singh and Sekhon 2008). Although, chemical fertilizer is playing a crucial role to meet the nutrients need of the crop, the imbalance and continuous use of chemical fertilizers has adverse effect on soil physical, chemical and biological properties thus affecting the sustainability of crop production, besides causing environmental pollution.

2. MaterialsandMethods

A field experiment was conducted during Rabi season of 2023-24 at experimentalfarm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, MewarUniversity Gangrar, Chittorgarh (Rajasthan). Soil of the experimental field was sandy loam intexture, saline in reaction with a pH value of 7.6, poor in organic carbon (0.16%), deficient inavailable zinc (0.48 ppm) and iron (1.2 ppm) low in available nitrogen (176 kg/ha) andphosphorus (20.2 kg/ha) but medium in available potassium (320 kg/ha). The experiment waslaid out in randomized block design with three replications consisting of tan treatments*viz.* T_1-Control, T_2-100% RDF, T_3-75% RDF, T_4-50% RDF, T_5-FYM @ 2 t/ha, T_6-75% RDF + FYM @ 2 t/ha, T_7-50% RDF + FYM @ 2 t/ha, T_8-Vermicompost @ 1.25 t per

ha, T_9-75% RDF + Vermicompost @ 1.25 t per haand T_{10}-50% RDF + Vermicompost @ 1.25 t per ha. The required quantities of fertilizers as per treatments were applied. The doses ofNPKwereappliedintheformofurea,diammoniumphosphate,murateofpotashrespectively. The half dose of nitrogen gives basal dose and remain two split doses after irrigation and full dose of phosphorus and potassium at basal dose. Vermicompost and FYM apply in field at field preparation before sowing. The seed treatment with Rhizobium culture. The yield parameters were calculated from output from the field. The profitability and productivity of mung bean was calculated from cost of field preparation to harvesting and threshing cost and out pot from straw yield and grain yield as per market rate.

3. ResultsandDiscussion

3.1 Growth attributes

Data presenting to effect of organic manures and chemical fertilizers on growth attributes are presented in Table 1. The organic manures and chemical fertilizerswere showed significant effect on growth attributes of green gram.The data did not show significant difference at 40 DAS but at 60 DAS and at harvest show significant effect of the treatments. The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher plant height (50.70 and 51.45 cm). The lowest plant height was obtained with control treatment (43.10 and 44.02 cm) at both stages.The data show significant difference at 25 DAS and 50 DAS. The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher number of branches per plant (2.85 and 4.08). The lowest number of branches per plant was obtained with control treatment (2.05 and 2.65) at both stages.

3.2 Yield attributes and yield

Data presenting to effect of organic manures and chemical fertilizers on yield attributes are presented in Table 2. The organic manures and chemical fertilizers were showed significant effect on yield attributes of green gram.The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher number of pods per plant (18.58). The lowest number of pods per plant was obtained with control treatment (15.33).The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher number of seed per pod (8.65). The lowest number of seed per pod was obtained with control treatment (6.72).The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher test weight (38.92). The lowest test weight was obtained with control treatment (32.95).These findigs also supported by Patil*etal.*(2012) and Mehta*etal.*(2015). The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher grain yield (1106.45 kg/ha), it was

found at par with treatment T_6-75% RDF + FYM @ 2 t/ha (1087.25 kg/ha), T_2-100% RDF (1053.55 kg/ha) and T_{10}-50% Vermicompost @ 1.25 t per ha (966.66 kg/ha). The lowest grain yield was obtained with control treatment (810.53 kg/ha).The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher straw yield (2583.85 kg/ha), it was found at par with treatment T_6-75% RDF + FYM @ 2 t/ha (2561.44 kg/ha), T_2-100% RDF (2550.14 kg/ha) and T_{10}-50% Vermicompost @ 1.25 t per ha (2435.45 kg/ha). The lowest straw yield was obtained with control treatment (1985.36 kg/ha). Similar result also concluded by Tanwar *et al*. (2010), Singh *et al.* (2022) and Sahu *et al*. (2023).

3.3Economics

Data pertaining to effect of different organic and chemical fertilizers of nutrient on economicspresented in Table 3. The organic manures and inorganic were showed significant effect on economic variability of green gram.The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher cost of cultivation (30500 Rs/ha). The lowest cost of cultivation was obtained with control treatment (22000 Rs/ha).The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher gross return (78600 Rs/ha). The lowest gross return was obtained with control treatment (48500 Rs/ha). The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher net return (48100 Rs/ha). The lowest net return was obtained with control treatment (26500 Rs/ha).The treatment T_9-75% Vermicompost @ 1.25 t per ha recorded higher net return (1.58). The lowest net return was obtained with control treatment (1.20). This result also collaborated withPatil*etal.*(2012), Mehta*etal*.(2015), Phinehas*et al.* (2022) and Sahu *et al*. (2023).

Conclusion

The investigation the present experimentation that significant response of organic manures andchemical fertilizers on the growth and yield of the green gram. Among all treatment T_9-75% RDF + Vermicompost @ 1.25 t per ha registered the maximum production with higher net return. So, it was concluded that the treatment 100% RDF + Vermicompost @ 1.25 t per ha superior among all treatments.

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Details of the AI usage are given below:

1.

2.

3.

Table.1.0Effect of organic manures and chemical fertilizers on plant height and number of branches per plant on green gram

Treatments	Plant height (cm)			Number of branches per plant	
	40 DAS	25 DAS	25 DAS	25 DAS	50 DAS
T_1-Control	24.63	43.10	44.02	2.05	2.65
T_2-100% RDF	28.10	48.65	49.98	2.56	3.68
T_3-75% RDF	27.20	45.48	46.25	2.30	3.16
T_4-50% RDF	26.72	43.62	44.05	2.10	2.95
T_5-FYM @ 2 t/ha	27.00	44.12	44.75	2.11	3.00
T_6-75% RDF + FYM @ 2 t/ha	28.42	50.28	50.98	2.84	3.80
T_7-50% RDF + FYM @ 2 t/ha	27.62	45.90	46.68	2.35	3.20
T_8-Vermicompost @ 1.25 t per ha	27.15	45.42	46.25	2.25	3.15
T_9-75% RDF + Vermicompost @ 1.25 t per ha	28.68	50.70	51.45	2.85	4.08
T_{10}-50% RDF + Vermicompost @ 1.25 t per ha	28.02	47.80	48.88	2.38	3.20
S. Em. ±	0.60	1.62	1.60	0.10	0.14
CD @ 5%	NS	4.85	4.79	0.29	0.41
CV%	8.32	8.02	7.85	7.25	7.85

Table.2Effect of organic manures and chemical fertilizers on yield attributes and yieldof green gram

Treatment	Number of pod per plant	Number of seed per pod	Test weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)
T_1-Absolute control	15.33	6.72	32.95	810.53	1985.36
T_2-RDF + Rhizobium	19.20	7.90	36.62	1053.55	2550.14
T_3-FYM @ 4 t ha^{-1} + Rhizobium	17.95	7.16	34.70	948.45	2309.85
T_4-100% RDF + FYM @ 2 t ha^{-1} + Rhizobium	15.25	6.90	33.00	818.36	2325.39
T_5-75% RDF + FYM @ 2 t ha^{-1} + Rhizobium	16.60	6.93	33.98	876.12	2043.66
T_6-50% RDF + FYM @ 2 t ha^{-1} + Rhizobium	19.92	8.18	37.68	1087.25	2561.44
T_7-Vermicompost @ 2 t ha^{-1} + Rhizobium	18.25	7.22	35.76	964.85	2353.36
T_8-100% RDF + Vermicompost @ 1.0 t ha^{-1} + Rhizobium	16.75	7.18	34.53	928.78	2238.52
T_9-75% RDF + Vermicompost @ 1.0 t ha^{-1} + Rhizobium	20.58	8.65	38.92	1106.45	2583.85
T_{10}-50% RDF + Vermicompost @ 1.0 t ha^{-1} + Rhizobium	19.15	7.30	36.22	966.66	2435.45
S. Em. ±	0.49	0.46	0.90	48.25	50.25
CD @ 5%	1.48	1.36	2.72	144.85	151.02
CV%	8.12	9.36	7.45	7.02	8.17

Table.3Effect of organic manures and chemical fertilizers on economics

Treatments	**Cost of cultivation (Rs/ha)**	**Gross return (Rs/ha)**	**Net return (Rs/ha)**	**B:C ratio**
T_1-Control	22000	48500	26500	1.20
T_2-100% RDF	26000	65500	39500	1.52
T_3-75% RDF	25000	60500	35500	1.42
T_4-50% RDF	24000	56500	32500	1.35
T_5-FYM @ 2 t/ha	24500	54900	29400	1.24
T_6-75% RDF + FYM @ 2 t/ha	28500	72500	44000	1.54
T_7-50% RDF + FYM @ 2 t/ha	26500	64200	37700	1.42
T_8-Vermicompost @ 1.25 t per ha	25000	57400	32400	1.30
T_9-75% Vermicompost @ 1.25 t per ha	30500	78600	48100	1.58
T_{10}-50% Vermicompost @ 1.25 t per ha	29500	70800	41300	1.40

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