Responseof Bio-organicsonSoilFertilityStatusandMorphologicalParametersofGreen-Gram(*VignaradiataL.*)(var.PDM139)

ABSTRACT

An experiment was conducted during zaid (April- July) season 2021-22 to study " Response of Bio-organics on Soil Fertility Status and Morphological Parametersof Green Gram(*Vigna radiata L.*) (var. PDM 139) on central research farm department of Soil Science and Agricultural Chemistry, SHUATS, Prayagraj. The design applied for statistical analysis was carried out with randomized block design having two factors with three levels of@vermicompost0,50and100% per ha, three levels of@FYM 0, 50and100% per ha.The best treatment T_9 (100%FYM+ 100%Vermicompost @10 t ha^{-1})has effect on physical and chemical property of soil. The observed in post harvest soil resulted were significantly increased maximum values of percentage pore space (%)(47.90and45.90)at0-15and15-30cmsoildepth, water holding capcity (46.06 and 43.56%) at 0-15 and 15-30cm soil depth, organic carbon (%) (0.597and0.601%)at0-15and15-30cmsoildepth, Nitrogen (kg ha^{-1}) (287.00and275.88 kg ha^{-1})at0-15and15-30cmsoildepth, Phosphorus (kg ha^{-1}) (26.35and23.41kg ha^{-1})at0-15and15-30cmsoildepth and Potassium (kg ha^{-1}) (209.31and179.31 kg 0-15and15-30cmsoildepth the plant height was at different DAS 30 and 60 (11.2,38.9) No.of branches per plant 30 and 60(3.9,7.4) No.of nodules per plant(46.1) No.of pods per plant(19.40) Test weight(32.58) Grain yield(1357.6)

Keyword: Soil nutrients,FYM, Vermicompost and Greengram.

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INTRODUCTION

Pulses continue to be an important ingredient of human diet, especially for the large vegetarian population in the country. In the era of Green Revolution with major focus on staple food like rice and wheat, pulses were regulated to the marginal lands with least inputs. This, coupled with the increasing population, resulted in reducing percapita availability of pulses to the masses. It is also known as grain legumes, are next to cereals in terms of agricultural importance and have been considered best options fordiversification and intensification of agriculture across the globe because of their intrinsic values such as Nitrogen fixing ability (15-35 kg N ha^{-1}), high protein content and ability to thrive well in less endowed environment (Kumar et al., 2018).The present production of pulses in the country hovers around 19 million tonnes,which falls short of the present domestic requirement of around 21 million tonnes. Thisshort fall in pulses is mainly due to near stagnation in production during the decade (1999-2009) on account of poor spread of improved varieties and technologies, abrupt climatic changes, complex disease-pest syndrome, emergence of new Biotypes and races of key pests and pathogens, and declining total factor productivity. In order to narrow down the demand supply gap, the country resorts to import pulses to the tune of 2-3 million tonnes every year. In order to ensure self-sufficiency, the pulse requirementin the country is projected at 39 million tonnes by the year 2050 which necessitates anannual growth rate of 2.2 per cent. Green gram is grown on about 3.70 million ha with annual production of 1.57 million tons. India is the largest producer of green gramand account for 54 per cent of the world production and covers 65 per cent of the worldacreage. Green gram output accounts for about 10-12 per cent of total pulse productionin the country. Pulses occupies 28.78 million ha. area and contributes 25.46 million tonnes in pulse production with productivity of 8.88 q ha-1 in the country (GOI, 2021).Green gram (*Vigna radiata L.*), also known as mung, moong and green gram, is one of the most ancient and extensively grown leguminous crops of India. It is belie-

vedto be originated from India and mainly grown in East Asia, Southeast Asia and the Indian subcontinent in arid and semi- arid region. It is important short duration grain legume crop with wide adaptability, low input requirement and has the ability to improve soil fertility by fixing atmospheric Nitrogen well suited to small holderproduction under adverse climatic conditions (Vijayalakshmi and Bhattacharya 2006).It is grown in almost all parts of the country, stands third after chickpea.Indian farmers covered 30.84 lakh ha under pulses in which around 16.10 lakh hawas covered in green gram. The state of Rajasthan (18.30 lakh ha^{-1}), Maharashtra (3.28 lakh ha^{-1}), Karnataka (2.89 lakh ha^{-1}), Odisha (1.63 lakh ha^{-1}) and Telangana (0.70 lakh ha^{-1})are major producer of green gram in India.

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Farm Yard Manure (FYM) can have several beneficial effects on green gram (also known as mung bean or moong bean) cultivation. Here are some potential effects of FYM on green gram FYM is rich in organic matter, essential nutrients, and beneficial microorganisms. When added to the soil, it enhances soil fertility by increasing the availability of nutrients, improving soil structure, and promoting microbial activity. This can result in better nutrient uptake by green gram plants, leading to improved growth and productivity.
Vermicompost is rich in essential plant nutrients such as nitrogen, phosphorus, potassium, and micronutrients. These nutrients are present in a form that is readily available to plants, making it easier for black gram plants to absorb and utilize them. The increased nutrient availability can promote healthy growth and development of Green gram plants.

Enhanced soil structure: Vermicompost helps improve soil structure and texture. It improves soil aeration, water-holding capacity, and drainage. Green gram plants grown in vermicompost-amended soil can benefit from better root development and increased access to oxygen, water, and nutrients, leading to improved overall plant health.

Enhanced water retention: FYM helps to improve soil's water-holding capacity. It increases the soil's ability to retain moisture, thereby reducing water stress on the green gram plants.

2.MATERIALS AND METHODS

The investigation on "Responseof Bio-organicsonSoilFertilityStatusandMorphologicalParametersofGreen-Gram(*VignaradiataL.*)(var.PDM139)Comprise of a field experiment on Soil ScienceResearch Farm, Naini Agricultural Institute SHUATS, Prayagraj during *Zaid* season(april – June) 2022. The detail of the experiment site, and climate is described in thischapter to get his with the experimental design, Plan layout, cultural practice and techniquesemployedfor growth studies

2.1 Experimentalsite

The experiment was conducted at research Farm of Soil Science at Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, the area is situated on the south of Prayagraj on the right side of the river Yamuna on the South of Rewa Road at a distance of about 6 km from Prayagraj city. It is situated at 25057^0 N latitude, 81059^0 E longitude and at the altitude of 98 meter above the sea level.

2.2 Climateconditionintheexperimentalarea

The area of Prayagraj district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46C – 480C and seldom falls as low as 4C – 5C. The relative

humidity ranged between 20 to 94 percent. The average rainfall in this area is around 1100 mm annually.

2.3Soil analyis

2.3.1 Physical analyis

MethodEmployed wereSoil Colour Munsell (1971)Bulk density(Mgm^{-3}),Muthuaval *et al.,(*1992),ParticleDensity(Mgm^{-3})**,**1992,PoreSpace(%), muthuavel *et al.,(*1992), Water holding capacity(%)Muthuaval *et al., (*1992)

2.3.2 Chemical analyis

Soil pH (1:2)Jackson (1958)ĘC (dS m^{-1}) ,Wilcox(1950),Organiccarbon(%)Walkleyandblack (1947)ĄvailableNitrogen(kgha^{-1}), Subbiah and Asija (1956),Availablephosphorus (kgha^{-1}Olsen *et al.,(* 1954),Available potassium(kgha^{-1})Toth and prince(1949).

2.4 **StatisticalAnalysis**

The data recorded during the course of the investigation will subject to statisticallyanalysis by randomized block design(RBD), for drawing conclusion. The significant andnonsignificant effect will judge with the help of "F" (variance ratio) table. The significantdifference between the means will be tested against the critical difference of 5% level. Fortestingthe hypothesis

Table.1Treatmentcombinations ofGreengram

S.No.	TreatmentsNo.	Treatmentcombinations
1.	T_1	Absolute Control
2.	T_2	0%FYM + 50%Vermicompost
3.	T_3	0%FYM +100%Vermicompost
4.	T_4	50%FYM +0%Vermicompost
5.	T_5	50%FYM +50%Vermicompost
6.	T_6	50%FYM +100%Vermicompost
7.	T_7	100%FYM +0%Vermicompost
8.	T_8	100%FYM +50%Vermicompost
9.	T_9	100%FYM +100%Vermicompost

RESULTS AND DISCUSSION

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3.1.Response of Bio-organics on Physical properties of soil after harvest

Observation regarding the response of bio organics on soil fertility status and morphological parameters in FYM (0,50,100%) and Vermicompost (0,50,100%) affect the soil Bulk density(Mg m^{-3}), particle density (Mg m^{-3}), pore space (%), water holding capacity(%) 0-15 and 15-30cm soil depth are given in table 2.3.The result of the data depleted that the minimum bulk density (Mg m^{-3}) (1.183,1.187) particle density(Mg m^{-3}) (2.094,2.097) at 0-15 and 15-30 cm soil depth after harvest was found in T_9 100 % Vermicompost +100% FYM @10 t ha^{-1} and maximum bulk density (mg m^{-3}) (1.291,1.295)particle density (mg m^{-3}) (2.262,2.265)was found in T_1.(control) respectively the maximum pore space (%) (47.90,45.90,) water holding capacity (%) (46.06,43.56) at 0-15 cm soil depth was found in T_9.100% Vermicompost +FYM@10 t ha^{-1} However minimum values are detected in T_1.(control) 0-15 and 15-30 cm soil depth respectively (Table 2,3 fig 1,2)

3.2.Response of Bio-organics on chemical properties of soil after harvest

Observation regarding the response of Bio organics on soil fertility status and morphological parameters in FYM (0,50,100%) and Vermicompost (0,50,100%) affect pHEC(dSm^{-1}) ,Organic carbon,Available Nitrogen(kg ha^{-1}) ,Available phosphorus (kg ha^{-1}) ,Available potassium (kg ha^{-1}).The results of data showed that the minimum pH (6.674,6.680) at 0-15 and 15-30 cm depth was found in T_9.100% Vermicompost +100%FYM @ 10 t $ha^{-1}$and maximum pH (6.835,6.839) soil depth was found in T_1. (control) and respectively.The maximum EC (dS m^{-1}) (0.233,0.237) Organic carbon (%) (0.597,0.601) Nitrogen (kg ha^{-1}) (287.0,275.88) phosphorus (kg ha^{-1}) (26.35,23.41) potassium (kg ha^{-1}) (209.31,179.31) at 0-15 and 15-30 cm soil depth was found in T_9.100%Vermicompost + 100% FYM @10 t ha^{-1}.However minimum values are detected in T_1.(control) 0-15 and 15-30 cm depth respectively(Table 2,3 fig 1,2)

3.3.Response of Bio-organics on Morphological Parameters of Greengram

It is indicated from table (4) that nutrient souces significantly improved the growth and yield attributes of Greengram.Among the nutrient sources100%FYM+100% Vertmicompost@10tha^{-1} gave highest values of plant height at 60DAS (38.9cm),no.of branches per plant at 60DAS(7.4) , no.of nodules per plant(46.1),no.of pods per plant (19.40),test weight(32.5g), grain yield q ha^{-1} (1357.6) .

Table 2:Response of Bio organics on Physico-Chemical Properties of Soil on BD,PD %Porespace, WHC,pH

S. No.	Treatments No.	Treatmentcombinations	BulkDensity(Mg m^{-3})		ParticleDensi-ty(Mgm^{-3})		Porespace(%)		Waterholding-capacity(%)		pH	
			0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15cm	15-30cm	0-15 cm	15-30 cm
1	T_1	Absolute Control	1.291	1.295	2.262	2.265	46.31	44.31	43.31	41.65	6.835	6.839
2	T_2	0%FYM + 50%Vermicompost	1.290	1.293	2.264	2.269	47.20	45.20	43.87	41.54	6.867	6.872
3	T_3	0% FYM +100%Vermicompost	1.287	1.291	2.265	2.271	47.42	45.42	44.22	41.42	6.852	6.856
4	T_4	50% FYM +0%Vermicompost	1.230	1.236	2.141	2.144	47.09	45.09	43.43	41.09	6.741	6.744
5	T_5	50%FYM +50%Vermicompost	1.233	1.238	2.147	2.151	47.43	45.43	45.43	42.48	6.798	6.803
6	T_6	50%FYM +100%Vermicompost	1.237	1.241	2.149	2.153	47.79	45.79	45.48	42.46	6.789	6.795
7	T_7	100%FYM +0% Vermicompost	1.190	1.196	2.098	2.104	47.21	45.21	44.21	42.21	6.696	6.701
8	T_8	100% FYM +50%Vermicompost	1.193	1.199	2.095	2.099	47.48	45.48	45.46	42.43	6.663	6.668
9	T_9	100%FYM +100%Vermicompost	1.183	1.187	2.094	2.097	47.90	45.90	46.06	43.56	6.674	6.680
		F-Test	**NS**	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
		C.D. at5%			**0.021**	**0.032**	**0.23**	**0.23**	**1.40**	**0.028**	**0.133**	**0.135**
		S.Em.(+)			**0.014**	**0.016**	**0.68**	**0.68**	**0.47**	**0.09**	**0.041**	**0.042**

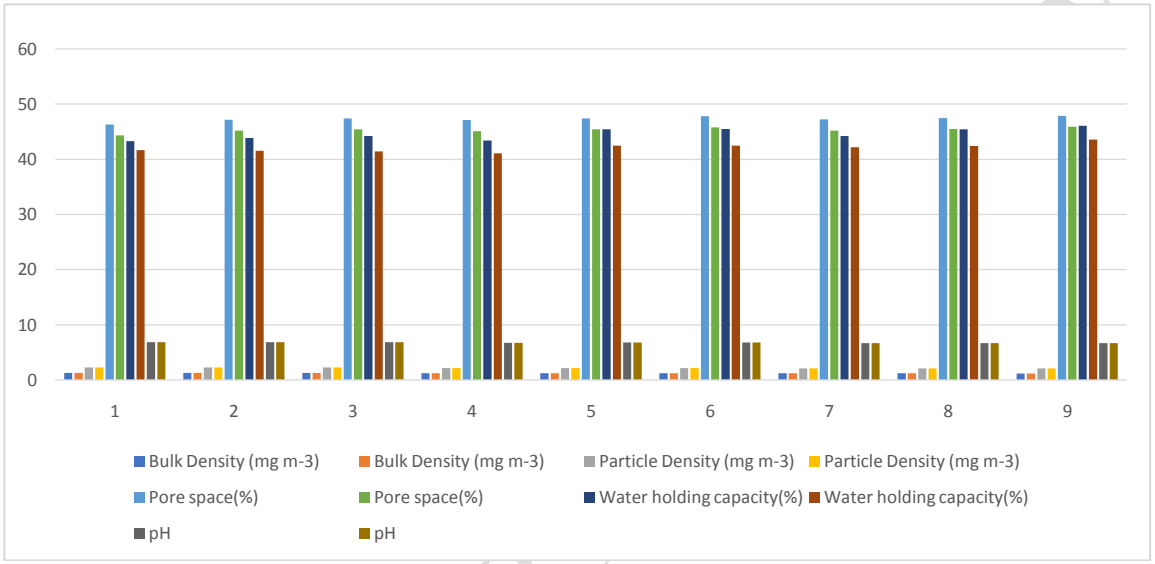

Fig.1 Response of Bio organics on Physico-Chemical Properties of Soil BD,PD,Porespace,WHC,pH

Table 3:Response of Bio-organics on Physico-Chemical Properties of Soil EC(dSm^{-1}),Organic carbon(%),Nitrogen,Phosphorus,Potassium.

S. No.	Treatments No.	Treatmentcombinations	EC($dS\ m^{-1}$)		Organic carbon(%)		Nitrogen ($kg\ ha^{-1}$)		Phosphorus ($kg\ ha^{-1}$)		Potassium ($kg\ ha^{-1}$)	
			0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
1	T_1	Absolute Control	0.207	0.212	0.467	0.472	252.50	231.54	22.08	18.72	182.38	152.38
2	T_2	0%FYM + 50%Vermicompost	0.208	0.214	0.483	0.487	272.88	238.88	23.65	19.28	198.39	163.72
3	T_3	0% FYM +100%Vermicompost	0.210	0.216	0.487	0.492	279.64	258.54	24.76	20.74	200.33	169.67
4	T_4	50% FYM +0%Vermicompost	0.213	0.218	0.517	0.522	275.19	236.92	23.44	18.88	197.11	158.11
5	T_5	50%FYM +50%Vermicompost	0.217	0.223	0.527	0.533	280.32	260.33	25.18	21.61	201.17	170.17
6	T_6	50%FYM +100%Vermicompost	0.213	0.219	0.537	0.541	284.85	272.88	25.84	22.47	207.22	177.15
7	T_7	100%FYM +0% Vermicompost	0.220	0.224	0.583	0.588	275.19	245.84	24.17	20.12	199.67	167.84
8	T_8	100% FYM +50%Vermicompost	0.221	0.227	0.587	0.593	283.41	266.92	25.65	21.77	205.85	175.87
9	T_9	100%FYM +100%Vermicompost	0.233	0.237	0.597	0.601	287.00	275.88	26.35	23.41	209.31	179.31
		F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
		C.D. at5%	**0.015**	**0.016**	**0.011**	**0.009**	**5.53**	**9.75**	**0.26**	**2.94**	**10.19**	**10.59**
		S.Em.(+)	**0.005**	**0.006**	**0.004**	**0.003**	**16.57**	**29.22**	**0.532**	**0.75**	**3.40**	**3.53**

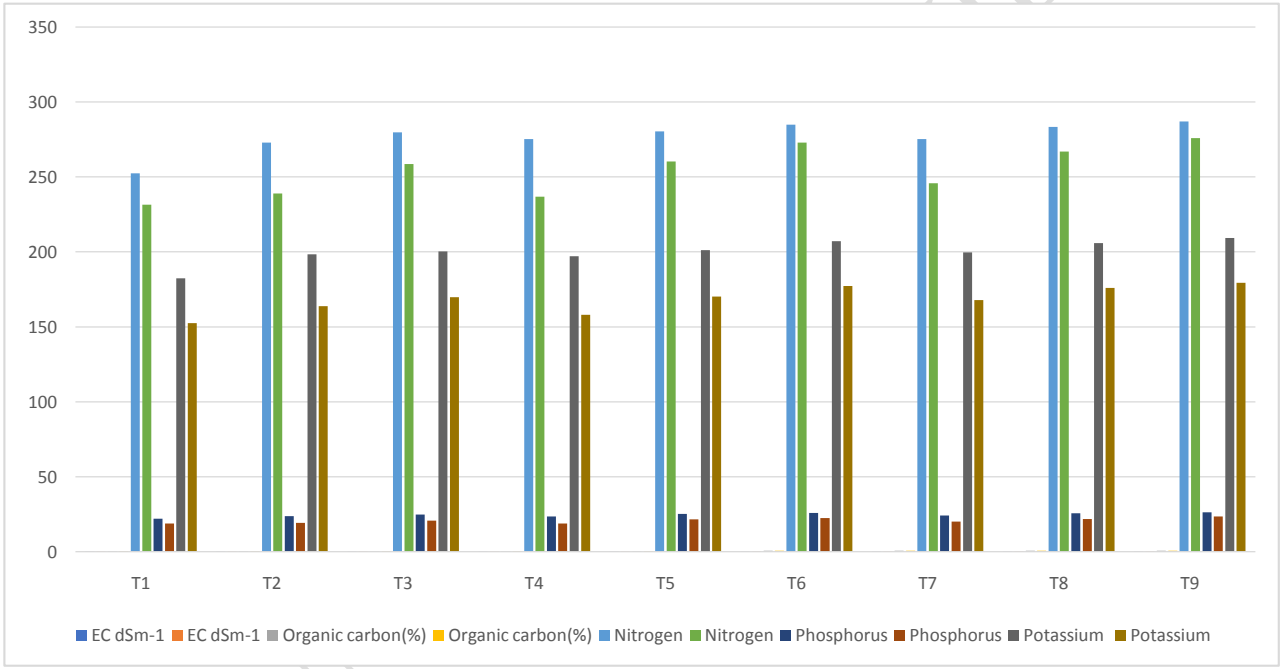

Fig.2Response of Bio- organics on Physico-Chemical Properties of Soil EC (dSm^{-1}),Organic carbon(%),Nitrogen,Phosphorus,Potassium

Table:4 Response of Bio-organics on Morphological Parameters of Greengram

			Plant height		No of branches		No of Nodules		No of pods	Test weight	Grain yield
S.No	**Treatment no**	**Treatment combina-tion**	**30DAS**	**60DAS**	**30DAS**	**60DAS**	**60DAS**	**60DAS**	**60 DAS**	**60 DAS**	**60 DAS**
1	T_1	Absolute Control	9.0	22.0	3.0	6.7	40.7	12.03	12.03	31.16	551.3
2	T_2	0%FYM + 50%Vermicompost	9.3	24.7	3.2	6.8	42.4	13.98	13.98	32.03	855.0
3	T_3	0% FYM +100%Vermicompost	10.1	26.4	3.8	7.0	43.9	15.77	15.77	32.31	962.4
4	T_4	50% FYM +0%Vermicompost	9.2	23.3	3.1	6.8	41.7	13.93	13.93	31.84	804.7
5	T_5	50%FYM +50%Vermicompost	10.2	29.7	3.6	7.1	44.8	15.80	15.80	32.33	994.3
6	T_6	50%FYM +100%Vermicompost	10.9	34.4	3.8	7.3	45.7	17.68	17.68	32.51	1127.6
7	T_7	100%FYM +0% Vermicompost	10.0	24.7	3.3	6.9	42.9	14.01	14.01	32.29	875.0
8	T_8	100% FYM +50%Vermicompost	10.8	30.7	3.7	7.2	45.2	17.20	17.20	32.42	1081.4
9	T_9	100%FYM +100%Vermicompost	11.2	38.9	3.9	7.4	46.1	19.40	19.40	32.58	1357.6
		F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
		C.D.at 5%	**0.53**	**1.28**	**0.32**	**0.04**	**2.34**	**1.66**	**1.66**	**3.42**	**108.61**
		S.Em.(+)	**1.60**	**3.83**	**0.96**	**0.13**	**0.78**	**0.55**	**0.55**	**1.14**	**36.23**

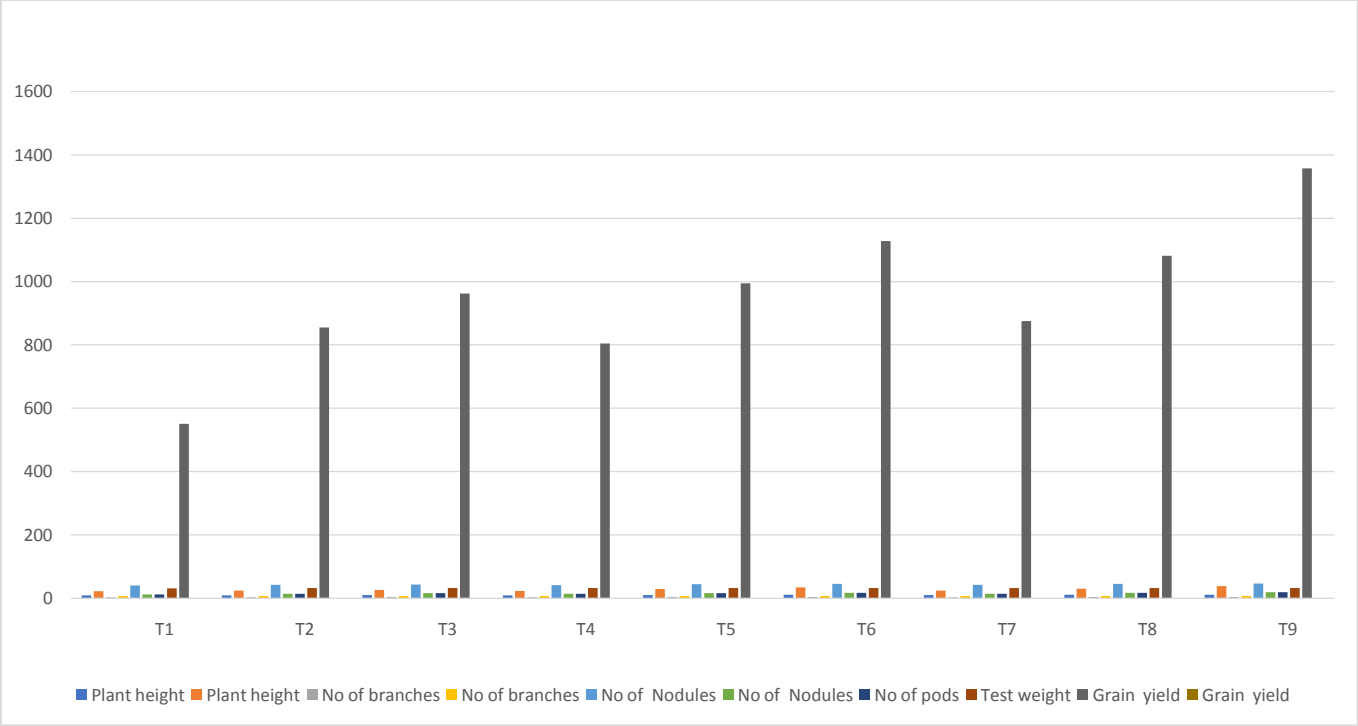

Fig.3.Response of Bio-organics on Morphological Parameters of Greengram

CONCLUSION

On the basis of findings it is concluded that the treatment combination 100% FYM+100%Vermicompost @10t ha^{-1}i.e, Treatment T_9shows best result onphysio-chemical properties of soil analysis after harvest of greengram (*Vigna radiata*) in comparison to othertreatment combination. Since the findings are based ontheresearchdoneinoneofseason-furtherexperimentswithmorethanoneseasonwillhelpin better to study the effect of integrated nutrienton soil health analysis of soil after crop harvest. The minimum bulk density (Mg m^{-3}), particledensity(Mgm^{-3}),Waterholdingcapacity,pHandEC(dSm^{-1})wasnotedin100%FYM+100%Vermicompost @10 t ha^{-1}which was significantly superior over T_0Control.Whereas the The maximum pore space (%), organic carbon,available nitrogen(kg ha^{-1}),available phosphorus (kg ha^{-1}) and available potassium (kg ha^{-1}), was noted in100% FYM +100%Vermicompost 10t ha^{-1}which was significantly superioroverT$_0$ Control.

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