Response of Bio-organics on Soil Fertility Status and Morphological Parameters of Black Gram*(Vigna mungo)* var. Shekar 2

ABSTRACT

An experiment was conducted during *zaid* (April- July) season 2021-22 to study 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 @vermicompost 0, 50,and 100% ha^{-1}, three levelsof@Neemcake0,50and100%ha^{-1} .The best treatmentT_9 vermicompost +100%Neemcake+ 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 (%)(48.20 and 46.96) at 0-15 and 15-30 cm soil depth, water holding capcity (43.22 and 41.98%) at 0-15 and 15-30 cm soil depth, organic carbon (%) (0.181and 0.182%) at 0-15 and 15-30 cm soil depth, Nitrogen (kg ha^{-1}) (264.45 and 265.50 kg ha^{-1}) at 0-15 and 15-30 cm soil depth, Phosphorus (kg ha^{-1}) (24.82 and 24.15kg ha^{-1}) at 0-15 and 15-30 cm soil depth and Potassium (kg ha^{-1}) (186.58 and178.41 kg 0-15 and 15-30 cm soil depth. The plant height was at different DAS 25,50 and75(16.2,30.3,34.6).No leaves per plant DAS 25,50 and75(25,70.66,93.66).No of branches per plant25,50 and75(11.3,32.33,37.33).No of pods (31.66).Test weight of plant(32.88).Dry weight per plant(21.65). maximum (B:C)ratio 1;1.56 max gross returns Rs/ha^{-1} 129600 max net profit Rs/ha^{-1} 74720 per ha higest grain yield is q ha^{-1} 12.096 found in T_9 100% vermicompost 100% Neemcake .

Keyword: *Soil nutrients, vermicompost, Neemcake and Blackgram etc.*

1. INTRODUCTION

Black gram is the fourth important pulses crop grown in our country covering anarea of about 3.45 million hectares, accounting for the production of 1.55 million tonnes with a productivity of 512 kg ha^{-1}(The Hindu, 2012). Black gram (Urd) ranks third in terms of tonnesaverageproductionafterchick (Pea and Pigeon pea).A leguminous plant species, *Vigna mungo L.* This crop has been cultivatedfor a long time in the Indian subcontinent and is known in a wild state. A drought resistant crop, it is own both as a summer and winter crop; often in rotation with rice.

But sometimesin mixedcultivation it is sually planted on a rough seed bed as too muchtiltencourages vegetative growth at theexpense of the seed. Period of maturity of legume. crops are 70-120 days. It is cultivated inabout 161,000 acres of land in Bangladesh and total annual production is about 50,000 million tonnes. India is one of the ancient countries in t world growing wide of pulse crops as prime source of protein. Fur this, India is the leading country in pulse cultivation area and 25-27% of the world production and consumption respectively but also the largest importer of pulses with the contribution of 34% of the global food. (FAO 2012)Among diverse pulse crops, black gram is one of the

important legumes after chick pea *(Cicer arietinum)*and pigeon pea *(Cajanus cajan).* India shares 70% of the total world black gram and green gram (Vigna radiata) production in which black gram constitute 1.65 MT with the share of 12.4% Elzebrok (2008) Black gram is predominantly cultivated and consumed in southern states like Andhra Pradesh. Karnataka and Tamil Nadu. Generally, black gram is used to consume along with cereals and the benefits of black gram were also mentioned in several ancient literatures as food. feed, medicine and manure (Nene, 2006).

2.MATERIALS AND METHODS

The investigation on **"Response of Bio organics on Soil Fertility Status and Morphological Parameters of Blackgram(*Vignamungo*) var. Shekar 2** Comprise of a field experiment on Soil Science Research Farm, Naini Agricultural Institute SHUATS, Prayagraj during *Zaid* season (March – June) 2022. The detail of the experiment site, and climate is described in this chapter to get his with the experimental design, Plan layout, cultural practice and techniques employed for growth studies.

2.1 Experimental site

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 $25^0 57^{"}$ N latitude, $81^0 59^{"}$ E longitude and at the altitude of 98 meter above the sea level.

2.2 Climate condition in the experimental area

The area of Prayagraj district comes under subtropical belt in the South east of UttarPradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to $46^0C – 48^0C$ and seldom falls as low as $4^0C – 5^0C$.The relative humidity ranged between 20 to 94 percent. The average rainfall in this area isaround 1100 mm annually.

2.3 soil analyis

2.3.1 physical analyis

Method Employed were Soil Colour Munsell (1971)Bulk density (Mg m^{-3})Muthuaval *et al., (*1992)ParticleDensity(Mgm^{-3}) 1992Pore Space (%) muthuavel *et al.,(*1992)Water holding capacity(%)Muthuaval *et al., (*1992)

2.3.2 chemical analyis

Soil pH (1:2) Jackson (1958)EC (dS m^{-1}) Wilcox 1950)Organiccarbon(%)Walkleyandblack (1947) Available Nitrogen (kg ha^{-1})) Subbiah and Asija (1956)Available hosphorus (kg ha^{-1}Olsen *et al.,(* 1954)avilable potassium(kg ha^{-1})Toth and prince(1949)

2.4 **Statistical Analysis**

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

Table.1Treatment combinations of Blackgram

S. No.	Treatments No.	Treatment combinations
1.	T_1	Control
2.	T_2	0% Vermicompost + 50% Neem Cake
3.	T_3	0% Vermicompost + 100% Neem Cake
4.	T_4	50% Vermicompost + 0% Neem Cake
5.	T_5	50% Vermicompost + 50% Neem Cake
6.	T_6	50% Vermicompost + 100% Neem Cake
7.	T_7	100% Vermicompost + 0% Neem Cake
8.	T_8	100% Vermicompost + 50% Neem Cake
9.	T_9	100% Vermicompost + 100% Neem Cake

3.RESULTS AND DISCUSSION

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

Observations regarding the response of Bio-organics on soil fertility status and morphological status in Vermicompost (0, 50, and 100%) and Neem cake (0, 50, and 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}) (1.42& 1.45) at 0-15 and 15-30 cm soil depth after harvest was found in T_9 100% Vermicompost +100%Neemcake @ 5 t ha^{-1} and maximum bulk density (mg m^{-3}) (1.49 and 1.51) was found in T_1. (control)

respectively the maximum particle density (mg m^{-3}) (2.316 and 2.317) pore space (%) (48.20 and 46.96) water holding capacity (%) (43.22 and 41.98) at 0-15 and 15-30 cm soil depth was found in T_9. 100% Vermicompost +100%Neemcake @5 t ha^{-1}However mimimum 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

Observations regarding the response of Bio-organics on soil fertility status and morphological status in Vermicompost (0.0050, and 100%) and Neem cake (0.0050, and 100%) affect pH, EC dS m^{-1}, Organic carbon, available nitrogen (kg ha^{-1}), available phosphorus (kg ha^{-1}), available potassium (kg ha^{-1} The result of the data showed that the minimum pH (7.250 & 7.567) EC d Sm-1 (0.319 & 0.315) at 0-15 and 15-30 cm soil depth was found in T_9. 100% Vermicompost +100%Neemcake @5 t ha^{-1} and maximum pH (7.657 & 7.810) EC dSm^{-1}(0.338 and 0.334) soil depth was found in T_1. (control) and respectively. The maximum Organic carbon(%) (0.181 and 0.182) nitrogen (kg ha^{-1}) (264.45 and 263.50) phosphorus (kg ha^{-1}) (24.82 and 24.15) potassium (kg ha^{-1}) (186.58 and 178.41)) at 0-15 and 15-30 cm soil depth was found in T_9. 100%Vermicompost +100%Neemcake@5t ha^{-1}However mimimum values are detected in T_1. (control) 0-15 and 15-30 cm soil depth respectively(Table 2, 3 fig 1,2)

3.3.Response of Bio-organics on morphological parameters of Blackgram

It is indicated from table (4) that nutrient souces significantly improved the growth and yield attributes of cluster bean.Among the nutrient sources100%Vermicompost+100% Neem cake @5 t ha^{-1} gave highest values of plant height at 75DAS (34.6cm),no of leaves per plant at 75DAS(93.66) ,no of pods per plant (31.66),pod test weight(32.88), Dry weight per plant (21.65g),Grain yield q ha^{-1} (12.096)

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

S. No.	Treatments No.	Treatment combinations	Bulk Density (mg m^{-3})		Particle Density (mg m^{-3})		Pore space(%)		Water holding capacity(%)		pH	
			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	Control	1.49	1.51	2.310	2.311	42.34	40.12	38.35	36.16	7.657	7.810
2	T_2	0% Vermicompost + 50% Neem Cake	1.48	1.49	2.313	2.314	42.99	40.86	38.99	36.87	7.553	7.767
3	T_3	0% Vermicompost + 100% Neem Cake	1.46	1.47	2.315	2.316	43.53	41.28	39.51	37.23	7.537	7.697
4	T_4	50% Vermicompost + 0% Neem Cake	1.48	1.48	2.313	2.314	43.87	41.98	39.87	37.95	7.503	7.660
5	T_5	50% Vermicompost + 50% Neem Cake	1.47	1.49	2.314	2.315	45.38	43.51	40.33	38.52	7.487	7.663
6	T_6	50% Vermicompost + 100% Neem Cake	1.46	1.48	2.311	2.312	46.95	45.22	41.96	40.26	7.403	7.633
7	T_7	100% Vermicompost + 0% Neem Cake	1.45	1.46	2.311	2.312	47.35	45.98	42.32	40.93	7.400	7.657
8	T_8	100% Vermicompost + 50% Neem Cake	1.44	1.46	2.313	2.314	47.86	46.37	42.84	41.31	7.367	7.603
9	T_9	100% Vermicompost + 100% Neem Cake	1.42	1.45	2.316	2.317	48.20	46.96	43.22	41.98	7.250	7.567
		F-Test	**NS**	**NS**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
		C. D. at 0.5%			**0.54**	**0.55**	**0.03**	**0.09**	**0.87**	**0.76**	**0.070**	**0.067**
		S.Ed. (+)			**1.20**	**1.21**	**2.59**	**1.98**	**1.87**	**1.62**	**0.033**	**0.032**

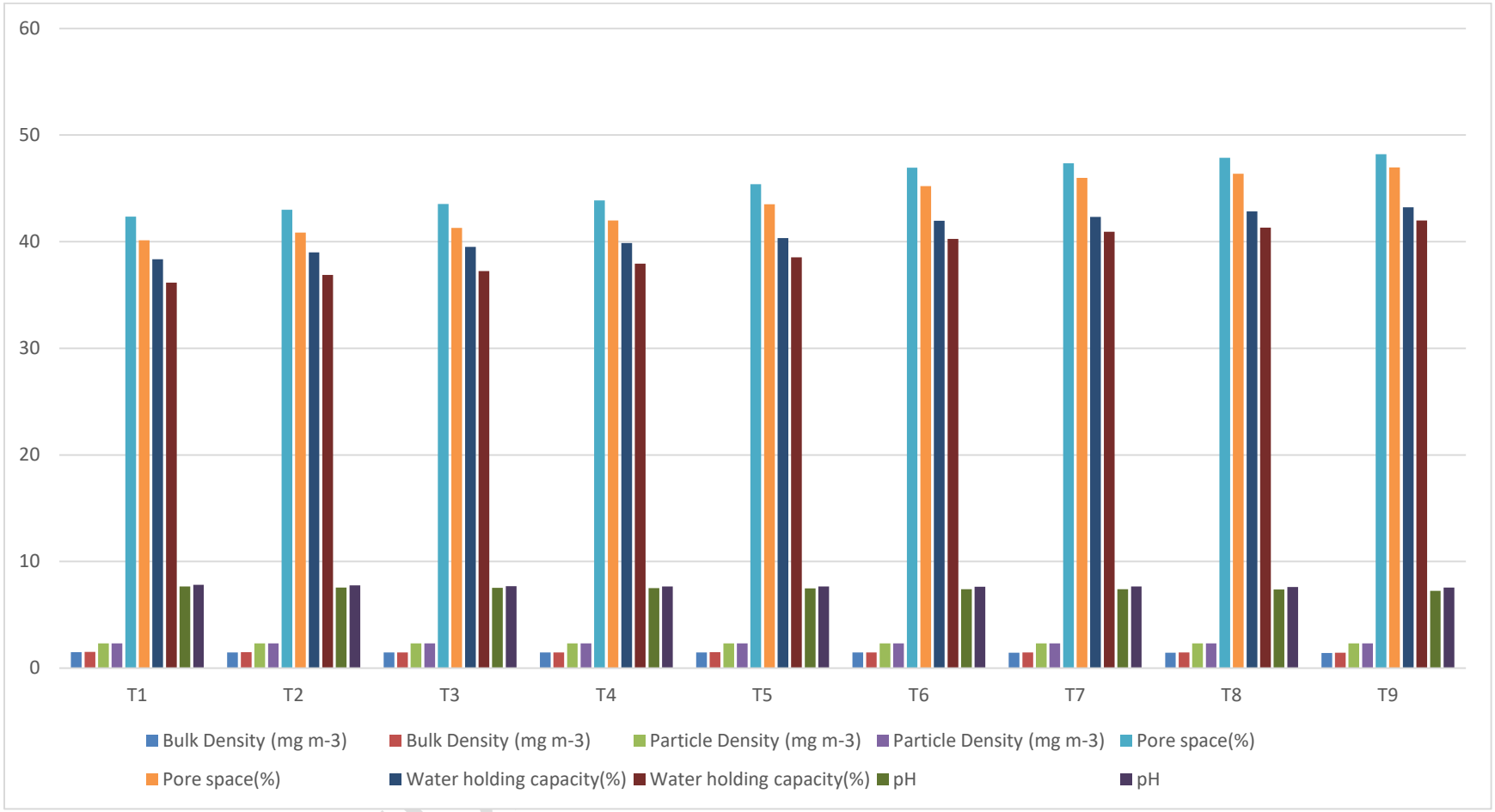

Fig . 1 Response of Bio-organics on physico-Chemical properties of Soil BD,PD,Porespace,WHC,p^{H}

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

S. No.	Treat-ments No.	Treatment combina-tions	EC (dS m^{-1})		Organic car-bon(%)		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	Control	0.319	0.315	0.150	0.151	262.50	261.25	22.30	21.64	140.25	132.08
2	T_2	0% Vermicompost +50 Neem Cake	0.321	0.317	0.153	0.154	262.25	260.50	22.50	21.75	142.59	134.43
3	T_3	0% Vermicompost +100 Neem Cake	0.324	0.319	0.170	0.171	261.75	260.85	21.75	20.63	169.32	161.15
4	T_4	50% vermicompost +0 Neem Cake	0.326	0.321	0.176	0.177	262.65	261.50	22.75	21.75	161.74	153.57
5	T_5	50%Vermicompost +50 Neem Cake	0.328	0.323	0.153	0.154	262.45	261.25	22.85	21.50	165.33	157.16
6	T_6	50%Vermicompost +100 Neem Cake	0.331	0.325	0.180	0.181	263.15	262.25	23.75	22.85	178.87	170.70
7	T_7	100%Vermicompost +0 Neem Cake	0.333	0.328	0.163	0.164	263.75	262.65	23.50	22.06	154.88	146.80
8	T_8	100%Vermicompost +50 Neem Cake	0.336	0.331	0.150	0.151	264.25	263.25	24.50	23.65	180.12	171.95
9	T_9	100%Vermicompost +100 Neem Cake	0.338	0.334	0.181	0.182	264.45	263.50	24.82	24.15	186.58	178.41
		F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
		C. D. at 0.5%	**0.028**	**0.028**	**0.041**	**0.042**	**0.917**	**1.21**	**0.228**	**0.230**	**0.90**	**1.08**
		S.Ed. (+)	**0.19**	**0.19**	**0.145**	**0.146**	**1.95**	**2.25**	**0.532**	**0.541**	**1.90**	**2.18**

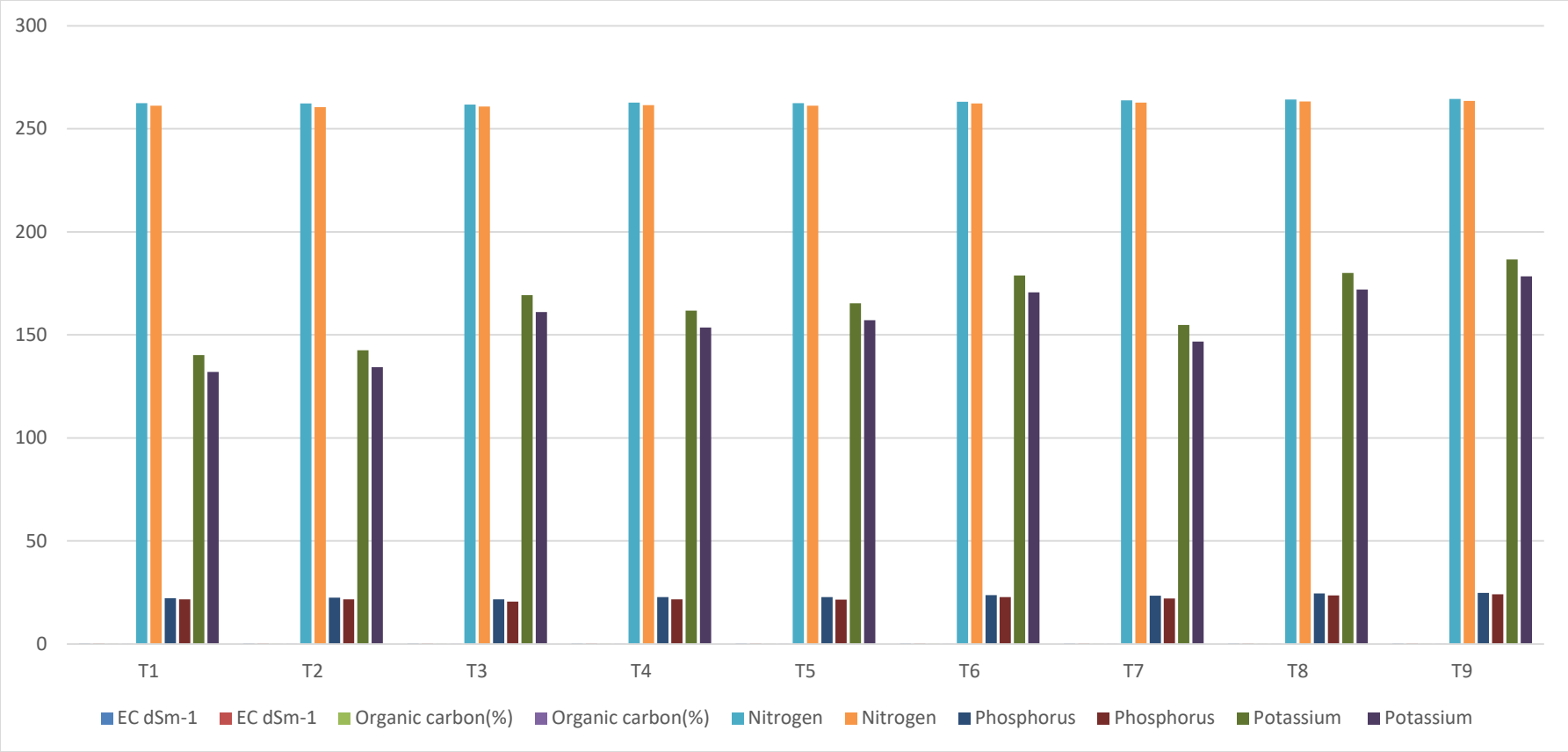

Fig . 2 Response of Bio-organics on physico-Chemical properties of Soil EC dSm^{-1}, Organic carbon(%),Nitrogen,

Table:4 Response of Bio-organics on Morphological parameters of Blackgram

			Plant height			No. of leaves per plant			Podlength	No of pods per plant	Test weight	Dry weight	Grain yield (q ha^{-1})
S.No	**Treatment no**	**Treatment combina-tion**	**25 DAS**	**50 DAS**	**75 DAS**	**25 DAS**	**50 DAS**	**75 DAS**	**75 DAS**	**75 DAS**			
1	**T_1**	Control	9.5	24.5	27.3	12.000	51.00	71.66	10.01	20.00	26.02	11.43	6.9
2	**T_2**	0% Vermicompost +50 Neem Cake	13.5	26.1	28	21.000	57.66	74.00	12.24	27.33	29.10	18.10	7.056
3	**T_3**	0% Vermicompost +100 Neem Cake	13.1	25.8	27	24.000	46.33	92.00	13.01	25.85	29.75	19.05	7.6
4	**T_4**	50% vermicompost +0 Neem Cake	13.8	29.9	31.0	18.000	54.00	91.66	11.43	27.33	27.60	16.30	8.063
5	**T_5**	50%Vermicompost +50 Neem Cake	10.7	25.2	28.3	13.000	61.33	87.00	12.86	28.66	30.02	19.83	8.623
6	**T_6**	50%Vermicompost +100 Neem Cake	15.2	27.8	30.3	23.000	59.66	92.00	13.17	25.00	31.00	15.15	9
7	**T_7**	100%Vermicompost +0 Neem Cake	15.9	29.8	33.1	30.000	52.66	77.33	12.04	26.33	28.00	17.12	9.443
8	**T_8**	100%Vermicompost +50 Neem Cake	12.3	27.5	32.6	25.33	64.33	93.33	13.73	30.00	31.50	20.31	11.16
9	**T_9**	100%Vermicompost +100 Neem Cake	16.2	30.3	34.6	25.00	70.66	93.66	14.11	31.66	32.88	21.65	12.096
		F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
		C.D.at 0.5%	**1.883**	**2.229**	**1.112**	**4.559**	**5.445**	**4.898**	**0.705**	**2.595**	**0.31**	**0.25**	**0.003**
		S.Ed.(+)	**4.270**	**6.869**	**3.014**	**10.378**	**9.381**	**12.819**	**0.333**	**6.754**	**0.66**	**0.54**	**0.108**

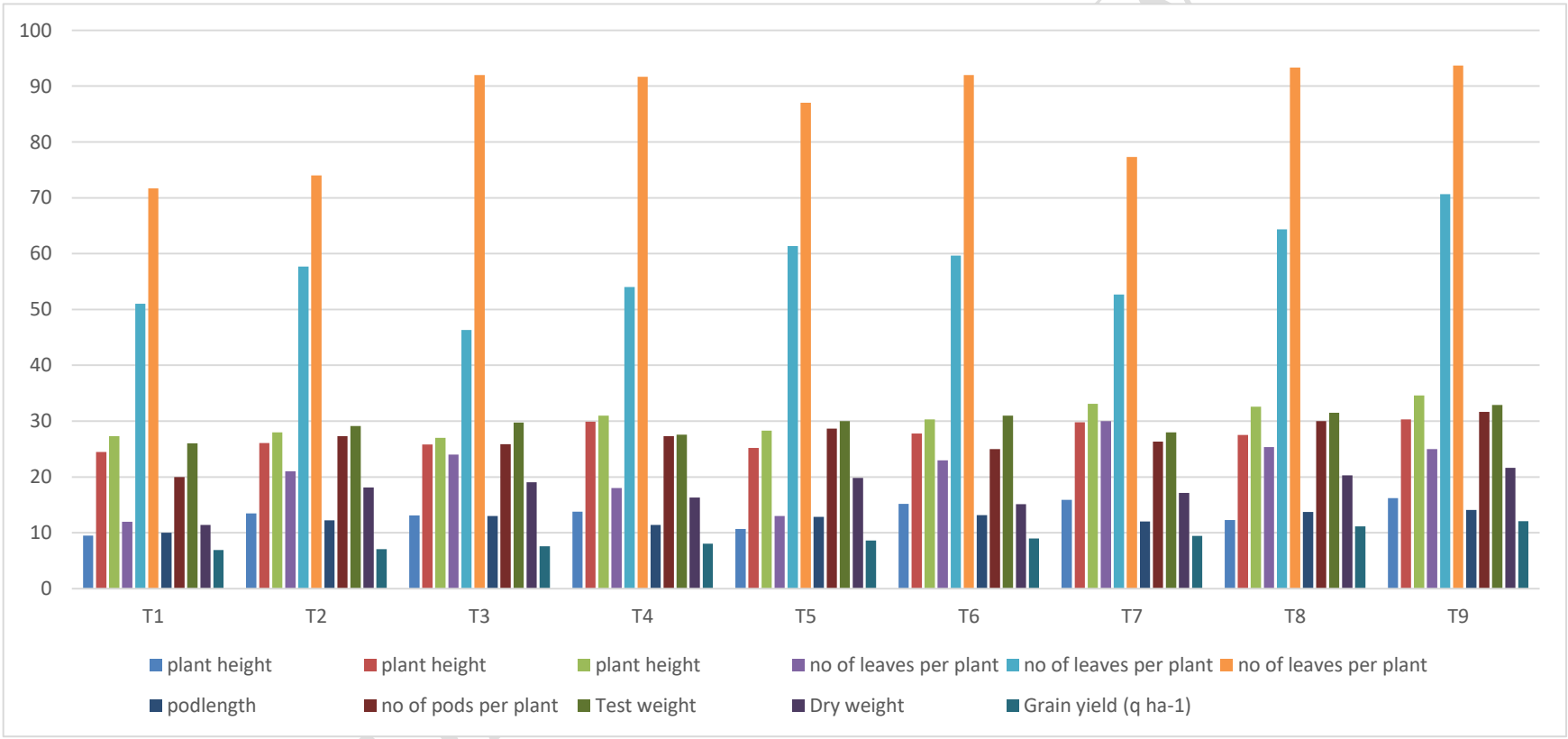

Fig .3 Response of Bio-organics on morphological parameters of Blackgram

4. CONCLUSION

On the basis of findings it is concluded that the treatment combination 100%+ Vermicompost +100%Neemcake @5t ha^{-1} i.e, Treatment T_9 shows best result on physio-chemical properties of soil analysis after harvest of Black gram (*Vigna mungo*) in comparison to other treatment combination. Since the findings are based on the research done in one of season further experiments with more than one season will helpin better to study the effect of integrated nutrient on soil health analysis of soil after crop harvest. The minimum bulk density (mg m^{-3}), particle density (mg m^{-3}),Water holding capacity, pH and EC dS m^{-1} was noted in 100% Vermicompost +100%Neemcake @5 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 in 100% Vermicompost +100%Neemcake@5t ha^{-1} which was significantly superior over T_0 Control.

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