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

ABSTRACT

An experiment to study the r**esponse of bio-organics on soil fertility status, growth and yield parameters of** Black Gram ***(Vigna mungo)*** was conducted during Z*aid* (April- July) season in 2021-22 at central research farm department of Soil Science and Agricultural Chemistry, SHUATS, Prayagraj. The experiment was a randomized block design with two factors and three levels of both vermicompost and neem cake at 0, 50~~,~~ and 100% per ha resulting in nine treatments. **Data collected included soil bulk density, particle d ensity, pore space, water holding capacity, pH, EC, organic carbon, nitrogen, phosphorus and potassium. On both growth and yield parameters of Black gram plant height, number of leaves per plant, pod length, number of pods per plant, test weight, dry weight and grain yield were collected.** Treatment 9 which comprised of 100% vermicompost and 100% neem cake at 10 t ha^{-1} had an effect on physical and chemical properties of soil. Results were significant with maximum values on pore space 48.20% and 46.96%, water holding capacity of 43.22 and 41.98% , organic carbon (%) (0.181and 0.182%) , Nitrogen 264.45 and 265.50 kg ha^{-1}) , Phosphorus 24.82 and 24.15 kg ha^{-1} and Potassium 186.58 and 178.41 per kg at 0-15 and 15-30 cm soil depths respectively. The same treatment 9 recorded maximum plant height of 34.6; number of leaves per plant of number of branches per plant of 37.33; number of pods of 31.66; test weight of 32.88; dry weight per plant of 21.65; maximum (B:C) ratio of 1:1.56; maximum gross returns of Rs/ha^{-1} 129600 with net profit of Rs/ha^{-1} 74720 per ha highest grain yield of 12.096 per ha 75 DAS respectively. Further experimentation will help to better understand the effects and make desirable recommendations.

Keyword*:* Soil nutrients, vermicompost, n~~N~~eem cake and Blackgram

1. INTRODUCTION

Black gram *Vigna mungo L* is the fourth important pulses crop grown in India~~our country~~ covering an area 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 ~~tonnes~~stones average production after chick ~~(~~p~~P~~ea *(Cicer arietinum)* and p~~P~~igeon pea *(Cajanus cajan)*. ~~A leguminous plant species, *Vigna mungo L*~~. This crop has been cultivated for a long time in the Indian subcontinent and is known in a wild state. It is a~~A~~ drought resistant crop grown ~~, it is own~~ both during~~as a~~ summer and winter and ~~crop;~~ often in rotation with rice.

~~But~~ S~~s~~ometimes in mixed cultivation it is ~~sually~~ planted on a rough seed bed as too much tilt encourages vegetative growth at the expense of the seed. Black gram ~~Period of~~ matur~~esity of legume. crops are~~ in 70-120 days. It is cultivated in about 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 the world growing a wide range of pulse crops as prime source

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of protein. In this case ~~Fur this,~~ India is the leading country in pulse cultivation area wise 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). ~~(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 predominantlycultivated and consumed in southern states like Andhra Pradesh, ~~,~~ Karnataka and Tamil Nadu. Generally, B~~b~~lack gram is ~~used to~~ best consumed along with cereals with its~~and the~~ benefits ~~of black gram were also~~ mentioned in several ancient literatures as food, ~~,~~ feed, medicine and manure (Nene, 2006). **The objective of the research was to study the response of bio organics on soil fertility status and morphological parameters of Blackgram (*Vignamungo*) var.**

You need to write a paragraph on both vermicompost and neem cake to support the objective

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~~ techniques employed for growth studies.

2.1 Experimental site

The experiment was conducted at the research Farm of Soil Science at Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj. ~~,~~ T~~t~~he 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 range~~d~~s between 20 to 94 percent. The average rainfall in this area is around 1100 mm annually.

2.3 S~~s~~oil ~~analysis~~analysis

2.3.1 P~~p~~hysical ~~analysis~~analysis

Method e~~E~~mployed were Soil Colour Munsell (1971) Bulk density (Mg m^{-3})Muthuaval *et*

*al., (*1992) Particle Density (Mgm^{-3}) 1992 Pore Space (%) muthuavel *et al.,*(1992) Water holding capacity (%) Muthuaval *et al., (*1992)

2.3.2 Cchemical ~~analysis~~analysis

Soil pH and the rest of the parameters were determined according to Jackson (1958); ,EC by Wilcox 1950); Organic carbon (%) by Walkley and B~~b~~lack (1947); Available Nitrogen (kg ha^{-1}) by Subbiah and Asija (1956); Available phosphorus (kg ha^{-1} by Olsen *et al.,*(1954) and available potassium (kg ha^{-1}) by Toth and P~~p~~rince (1949).

2.3.3 Treatments and design

The study had nine different treatment combinations of vermicompost and neem cake replicated three times (Table 1) in the randomized block design (RBD).

Table 1: Different combinations of vermicompost and neem cake

S. No.	Treatments No.	Treatment combinations
1.	T_1	0% Vermicompost + 0% Neem Cake
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

2.3.4 Data collected

The following data were collected on soil properties: bulk density, particle d ensity, pore space, water holding capacity, pH, EC, organic carbon, nitrogen, phosphorus and potassium. On both growth and yield parameters of Black gram plant height, number of leaves per plant, pod length, number of pods per plant, test weight, dry weight and grain yield were

collected.

2.4 **Statistical Analysis**

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

3.0 RESULTS AND DISCUSSIONS

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 and Neem cake the three levels of 0, 50 and 100% affected the soil bulk dDensity (mg m^{-3}), particle density (mg m^{-3}), pore space (%), water holding capacity (%) in the 0-15 and 15-30cm soil depths (Table 2 and 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 with 5 t ha^{-1} and maximum bulk density (mg m^{-3}) (1.49 and 1.51) was recordedfound 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 recordedfound in T_9 with~~: 100% Vermicompost +100%Neemcake @~~ 5 t ha^{-1}.

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

Observations regarding the response of Bio-organics on soil fertility status and morphological status in Vermicompost and Neem cake at the three levels of (0, 50 and 100%) affected pH, EC dS m^{-1}, Organic carbon, available nitrogen (kg ha^{-1}), available phosphorus (kg ha^{-1}) and available potassium (kg ha^{-1}). The result 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 depths was recorded 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 depths was found in T_9. However minimum values are detected in T_1 (control) 0-15 and 15-30 cm soil depth respectively (Table 2 and 3).

3.3 Response of bBio-organics on growth and yield parameters of Black gram

It is indicated from table (4) that nutrient sources significantly improved the growth and yield attributes of cluster bean. Among the nutrient sources100%Vermicompost+100% Neem cake @5 t ha^{-1} gave highest and significant values of plant height at 75DAS (34.6cm), numbero of leaves per plant at 75DAS (93.66), numbero of pods per plant (31.66), pod test weight (32.88),),dDry weight per plant (21.65g), Grain yield q ha^{-1} (12.096)

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

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
T_1	Control	1.49	1.51	2.310	2.311	42.34	40.12	38.35	36.16	7.657	7.810
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
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
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
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
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
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
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
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
	Mean	?	?	?	?	?	?	?	?	?	?
	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

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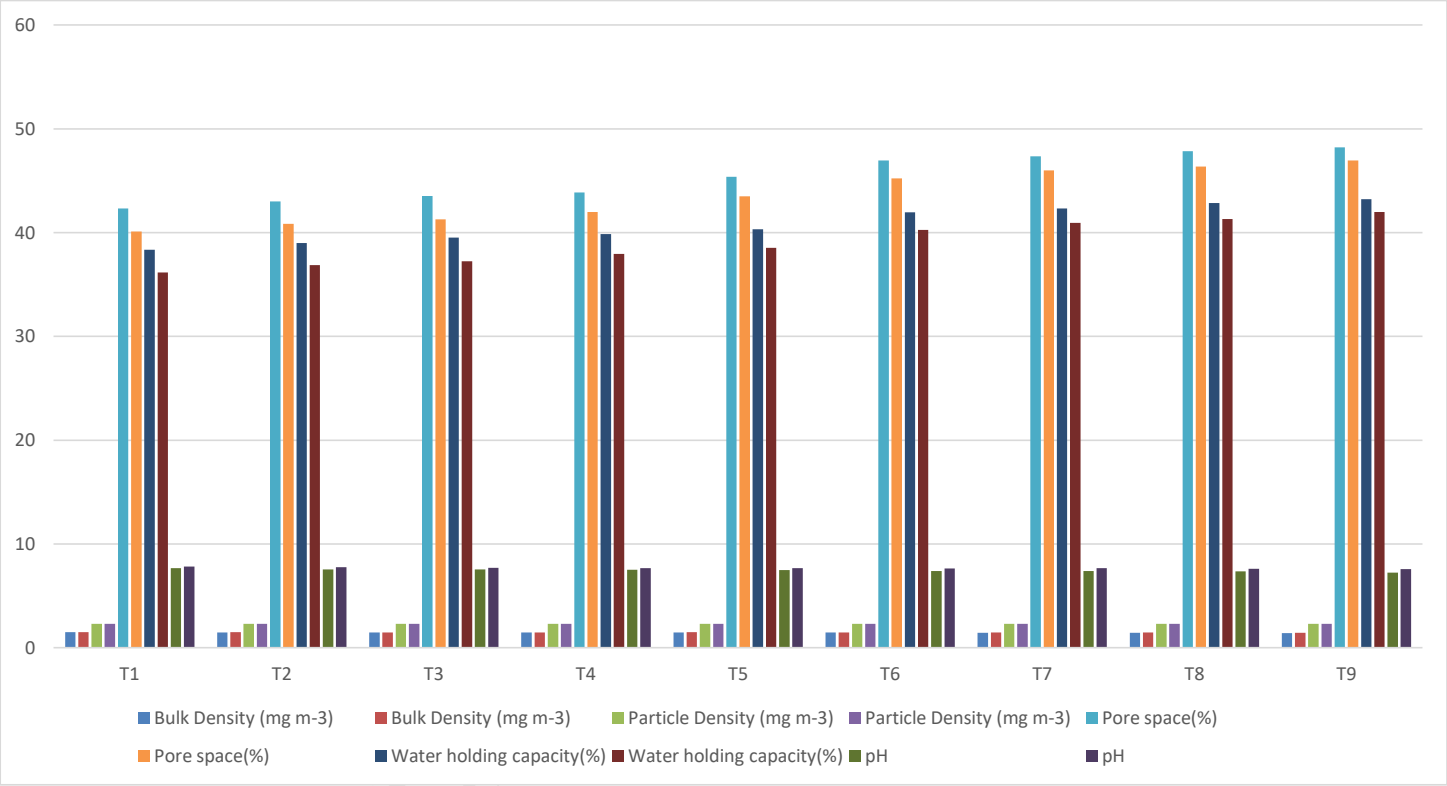

Fig . 1 Response of Bio-organics on physico-Chemical properties of Soil BD,PD,Porespace,WHC,p^{H}

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Table 3: Response of bBio-organics on pPhysico-chemical pProperties of Soil EC, - oOrganic carbon, nNitrogen, pPhosphorus and pPotassium.

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
T_1	Control	0.319	0.315	0.150	0.151	262.50	261.25	22.30	21.64	140.25	132.08
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
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
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
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
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
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
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
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
	Mean	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**
	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**

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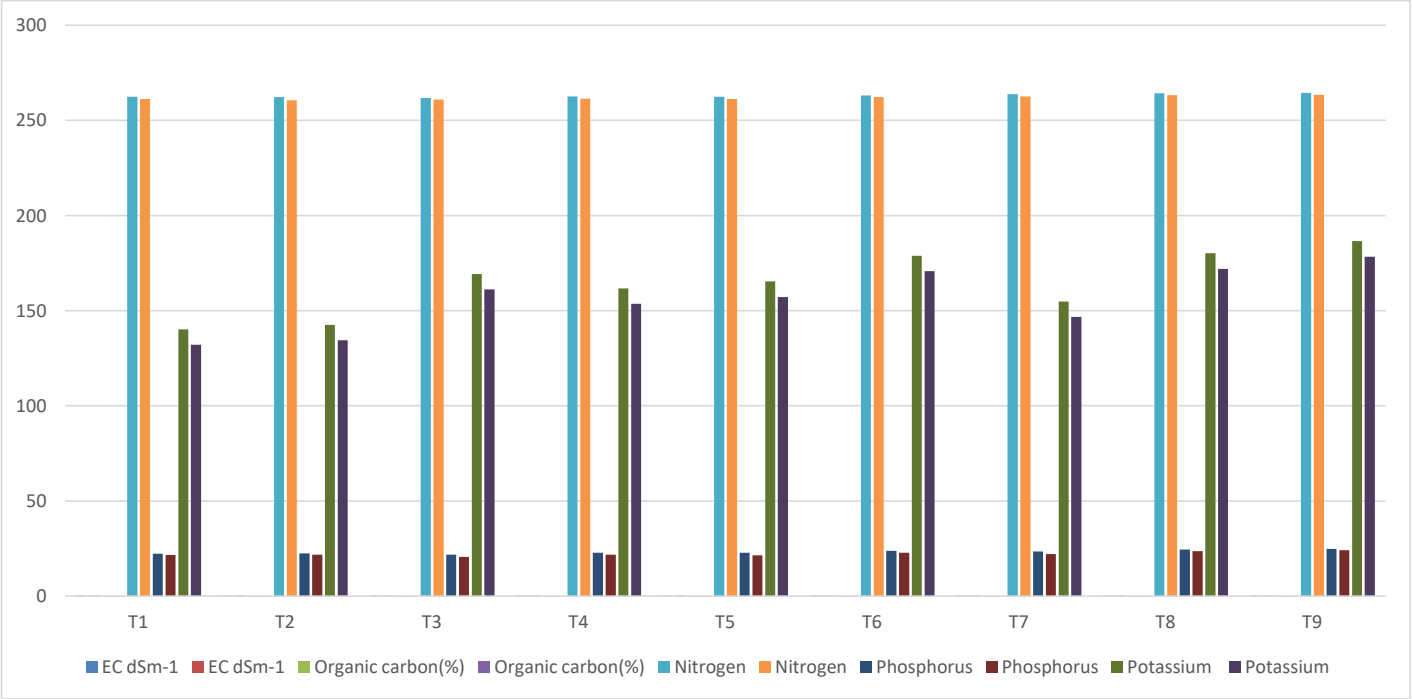

Fig . 2 Response of Bio-organics on physico-Chemical properties of Soil EC dSm^{-1}, Organic carbon(%),Nitrogen,

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Table 4: Response of bBio-organics on growth and yield ~~Morphological~~ parameters of Blackgram

Treatment no	Treatment combination	Plant height (cm)			No. of leaves per plant			Pod length (cm)	No of pods per plant	Test weight (g)	Dry weight (g)	Grain yield (q ha^{-1})
		25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	75 DAS	75 DAS	75 DAS	75 DAS	75 DAS
T_1	Control	9.5	24.5	27.3	12.00	51.00	71.66	10.01	20.00	26.02	11.43	6.90
T_2	0% Vermicompost +50 Neem Cake	13.5	26.1	28.0	21.00	57.66	74.00	12.24	27.33	29.10	18.10	7.056
T_3	0% Vermicompost +100 Neem Cake	13.1	25.8	27.0	24.00	46.33	92.00	13.01	25.85	29.75	19.05	7.60
T_4	50% vermicompost +0 Neem Cake	13.8	29.9	31.0	18.00	54.00	91.66	11.43	27.33	27.60	16.30	8.063
T_5	50%Vermicompost +50 Neem Cake	10.7	25.2	28.3	13.00	61.33	87.00	12.86	28.66	30.02	19.83	8.623
T_6	50%Vermicompost +100 Neem Cake	15.2	27.8	30.3	23.00	59.66	92.00	13.17	25.00	31.00	15.15	9.00
T_7	100%Vermicompost +0 Neem Cake	15.9	29.8	33.1	30.00	52.66	77.33	12.04	26.33	28.00	17.12	9.443
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
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
	Mean	?	?	?	?	?	?	?	?	?	?	?
	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	0.00
	S.Ed.(+)	4.270	6.869	3.014	10.378	9.381	12.819	0.333	6.754	0.66	0.54	0.108

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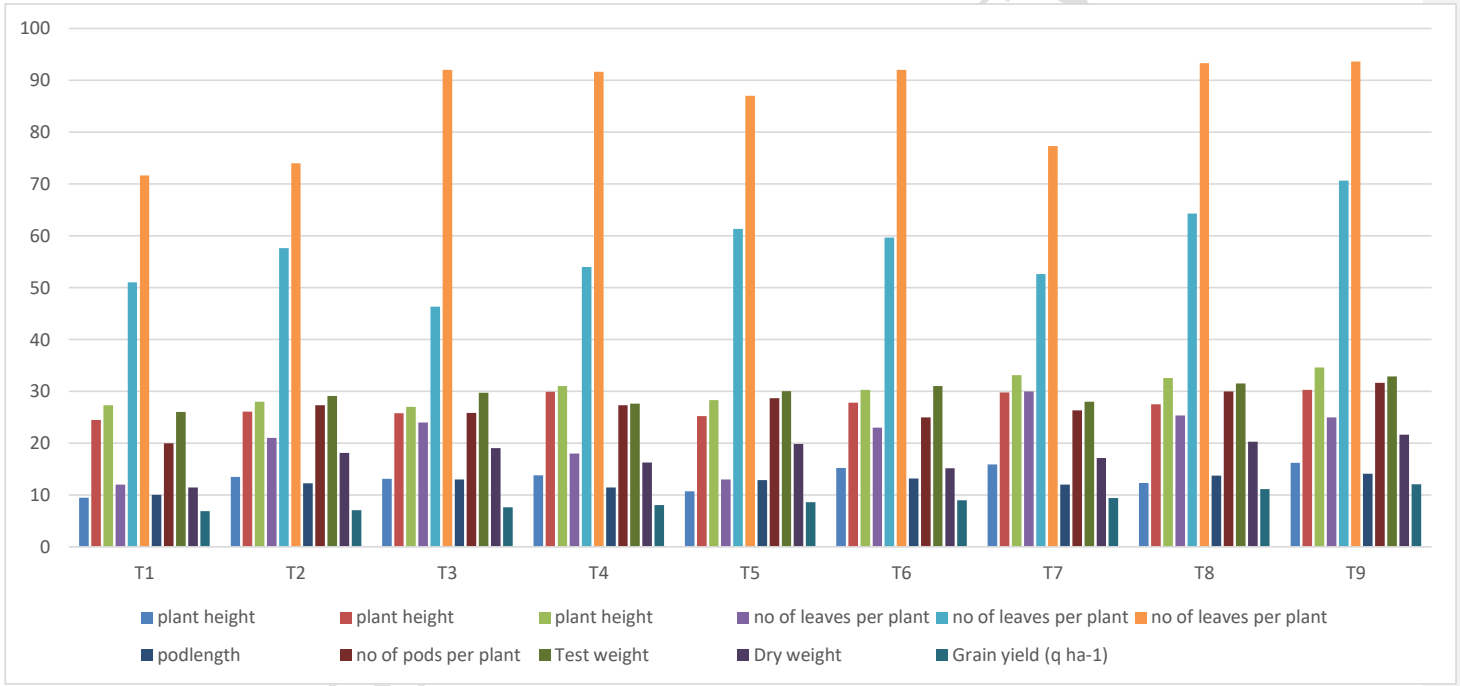

Fig .3 Response of Bio-organics on morphological parameters of Blackgram

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4.0 CONCLUSION

On the basis of the findings it is concluded that the treatment combination 100%+ Vermicompost +100% Neem cake at 5t ha^{-1} i.e, ~~Treatment T_9~~ showeds 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 help ~~in better~~ to better understand~~study~~ the effect of integrated nutrient on soil health analysis ~~of soil~~ after crop harvest.

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