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Impact of organic amendments on soil properties and yield of Green gram (*Vigna radiata* (L.) R. Wilczek

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Abstract

A field experiment was conducted at Mukuperi village in Thoothukudi district of Tamil Nadu, South India in 2018, which is situated at 8.5649 latitude and 77.9910 longitude, to study the effect of different organic amendments on soil and the impact of Green gram. The treatments of this study were Vermicompost (VC), Farm yard manure (FYM) and Poultry manure (PM) and their combinations at three different concentrations 8.5, 12.5 and 16.5 t ha^{-1}. The organic amendments were applied and after the harvest of the crop, the soil samples were taken from each plot and examined. The values of pH and Electrical conductivity (EC) were found to be minimum in Vermicompost treated soil. The values of Nitrogen (N), Phosphorus (P), Potassium (K) and pod yield were significantly increased. Thus, the additon of organic amendments was found beneficial for sustaining soil fertility and enhancing the crop yield.

Key words : Electrical conductivity, Farmyard manure, Organic amendments, Poultry manure Vermicompost.

Organic manure has multiple benefits due to the balanced supply of nutrients, including micro-nutrients, increased soil nutrient availability due to increased soil microbial activity, the decomposition of harmful elements, soil structure improvements and root development, and increased soil water availability[7]. Organic fertilizer has the potential to enhance soil quality and reduce pollution, which is crucial to the sustainable development

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of agriculture. The application of organic manures have greater positive impact on soil physico-chemical properties compared to that of inorganic fertilizers. Green gram *Vigna radiata* is an important pulse crop and an excellent source of high quality protein. The protein content is about 25% protein which is almost 2.5 - 3.0 times more than the cereals. Green gram, commonly referred to as mung bean, is consumed as whole grain and as well as dal. In South India, curry or savory dishes are made with sprouted green gram seeds. India has the largest production and consumption of pulses in the world. Pulses are the major source of protein for vegetarians, while crop residues are a major source of high quality livestock feed. Organic manures play a vital role in maintenance of physical, chemical and biological conditions of soil and in supply of macro and micro nutrients to the crops. The use of organic manure is one of the alternative ways for enhancing production and improving the soil health, without harming the environment and ecology. Hence, the present work was carried out to study both the combined and individual effect of Vermicompost on soil analysis and yield of Green gram.

The Field Experiment was carried out at Mukuperi village of Thoothukudi district of Tamil Nadu, South India in 2018, which is located at 8.5717 latitude and 77.5827 longitude. The soil of the experimental field was sandy loam with poor fertility status. The experiment was laid out in randomized block design with thirteen plots. The treatments of this study were Vermicompost (VC), Farm yard manure (FYM) and Poultry manure (PM) and their combinations at three different concentrations 8.5, 12.5 and 16.5 t ha^{-1}. Green Gram seeds were sown following the application of the organic manures and 30 days of drip irrigation. After harvesting the crop, the soil samples were collected from each plot at a depth of 15 to 30 cm. The collected samples were dried, grinded and passed through 2mm sieve and then analyzed in various Laboratories. Analysis of the soil was done to determine its pH, electrical conductivity, available nitrogen, available phosphorus, and available potassium. Soil pH was measured using Blackman glass electrode pH meter. Electrical conductivity was measured using conductivity meter. Kjeldhal's approach was used to determine the amount of nitrogen in the soil. Olsen's technique was utilized to quantify phosphorus. Using a flame photometer, the amount of potassium in the soil was determined. The data were statistically analysed using IBM SPSS Statistics version 26.

Physico chemical and chemical properties:

pH:

The pH value was lowest (7.1) in plot amended with VC+PM @ 12.5 t ha^{-1} and the highest value (8.3) was found in the control. The result is in close agreement with that of (Kumar *et.al.*, 2018) who reported that the application of organic amendments significantly decreased the pH value.

Electrical conductivity (EC) :

The maximum value of EC (0.53 ds m^{-1}) was obtained under the control while minimum value (0.26 ds m^{-1}) was found in the plot amended with VC @ 12.5 t ha^{-1}. These results are in line with Kansotia *et. al.*,[5] who

Table 1.

S. No.	Manure	Plots	pH	EC (ds m^{-1})	N (Kg ha^{-1})	P (Kg ha^{-1})	K (Kg ha^{-1})
1.	VC	T1-A	7.7	0.45	135	29	108
2.	VC	T1-B	7.3	0.26	247	87	127.5
3.	VC	T1-C	7.5	0.32	143	63.5	115
4.	VC+FYM	T2-A	7.8	0.39	146	36.5	101
5.	VC+FYM	T2-B	7.4	0.24	235.5	85	126
6.	VC+FYM	T2-C	7.6	0.28	192	72.5	125
7.	VC+PM	T3-A	7.6	0.38	122	27	110
8.	VC+PM	T3-B	7.1	0.28	265	81.5	129
9.	VC+PM	T3-C	7.5	0.27	188	49	107
10.	VC+FYM+PM	T4-A	7.7	0.29	222.5	71.5	113.5
11.	VC+FYM+PM	T4-B	8.1	0.37	126	33	89
12.	VC+FYM+PM	T4-C	8.1	0.41	133	29	85
13.	CONTROL	T5	8.3	0.53	95	14	78.5
Grand Mean			7.669	0.344	173.077	52.192	108.808
Std. Error of mean			0.094	0.024	15.286	7.095	4.613
Standard Deviation			0.340	0.086	55.113	25.583	16.631
CV(%)			4.434	25.089	31.843	49.016	15.285
t test			-8.027	-10.183	5.625	6.002	7.825
Significance P=0.05			0.000	0.000	0.000	0.000	0.000
F test (one way ANOVA)			2.124	3.850	107.474	325.031	38.502
Significance P=0.05			0.244	0.380	0.000	0.043	0.000

Physico Chemical and Chemical properties of soil

EC- Electrical Conductivity N-Nitrogen P-Phosphorous K-Potassium

A - 8.5 t ha^{-1} B - 12.5 t ha^{-1} C - 16.5 t ha^{-1}

reported decreased pH and EC of soil with the application of Vermicompost.

Available Nitrogen (N) :

Due to the addition of Vermicompost, the Nitrogen content (N) in the soil had increased. The level of nitrogen content was maximum as 247 Kg ha^{-1} in plot with VC @12.5 t ha^{-1} and control had the lowest value (95 Kg ha^{-1}) which was 61.5% more than control. This is in line with the findings of Gadi *et.al.*,[5] who stated that the highest available nitrogen was recorded in Vermicompost applied plot over the control.

Available Phosphorous (P):

The Phosphorous content in the plots amended with Vermicompost were found to be higher than the control. The lowest value (14 Kg ha^{-1}) was observed in the control. The

results are in accordance with (Sankaramoorthy *et.al.*, 2019) who reported that there was appreciable build up in available P status in soil due to application of organic manures.

Available Potassium (K) :

The value of potassium (K) was high as 127.5 Kg ha^{-1} in plot with VC +PM@12.5 t ha^{-1} and it was low as 78.5 Kg ha^{-1} in the control plot. This was similar to Subha *et.al.*,[8] who reported that K availability found to be higher due to the addition of organic amendments.

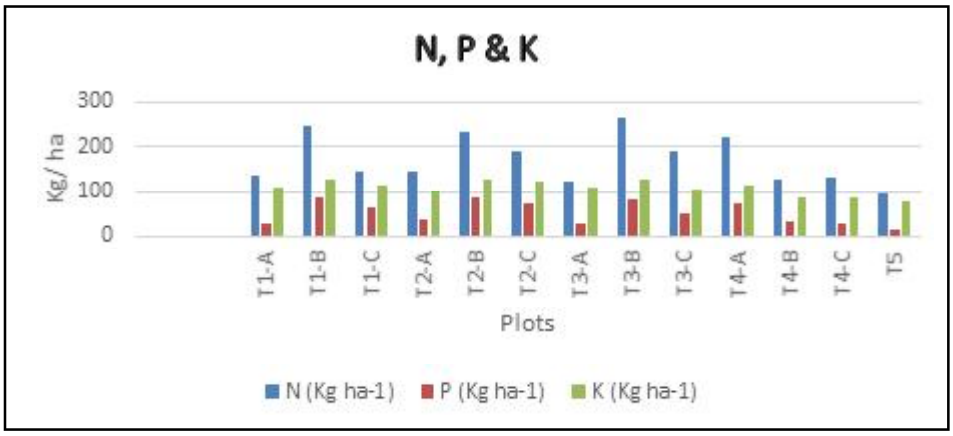

Figure 1. *N, P and K (Kg ha^{-1}).*

Yield :

The maximum pod yield (1112 Kg ha^{-1}) was recorded in VC @12.5 t ha^{-1}. This is in line with the findings of Jeyamangalam *et.al.*,[3] who reported that the application of organic amendment helps to increase crop yield**.**

Table-2.

S.No.	Manure	Plots	Yield
1.	VC	T1-A	484
2.	VC	T1-B	1112
3.	VC	T1-C	768
4.	VC+FYM	T2-A	514
5.	VC+FYM	T2-B	1020
6.	VC+FYM	T2-C	830
7.	VC+PM	T3-A	488
8.	VC+PM	T3-B	1048
9.	VC+PM	T3-C	840
10.	VC+FYM+PM	T4-A	988
11.	VC+FYM+PM	T4-B	332
12.	VC+FYM+PM	T4-C	460
13.	CONTROL	T5	260

Yield after harvest

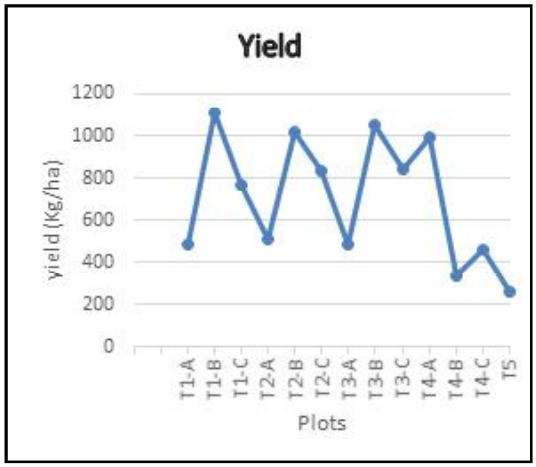

Figure 2.
Yield (Kg ha^{-1})

The results showed that the yield was highest in the treatment VC@ 12.5 t ha^{-1} and it was found as 1112 Kg ha^{-1} in which the control had 260 Kg ha^{-1}. Soil pH and Electical Conductivity of the soil had decreased in Vermicompost treated soil, whereas the corresponding values in control were maximum. Nitrogen (N), Phosphorus (P), and Potassium (K) levels were found to be higher in vermi-compost-treated soil. Thus, organic manure amended soil has influenced the various physico-chemical and chemical properties of the soil. It is therefore concluded that the application of vermicompost has a considerable favorable effect on soil physicochemical and chemical parameters, thereby improving soil fertility, plant growth, and crop yield.

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