EFFECT OF SOIL PHYSICO -CHEMICAL, CHEMICAL AND IR ANALYSIS USINGVERMICOMPOST MANURE

[1]P.Jeyaseeli,* [2] Dr F.Jeyamangalam, [3] Dr S.Selvaraj
[1]Assistant Professor, [2]Associate Professor, [3]Head & Associate Professor
[1,2]Department of Physics, Sarah Tucker college (Autonomous),[3] The M.D.T Hindu Collage,
(Affliated to Manonmaniam Sundaranar University) Tirunelveli, India

Abstract : A field experiment was conductedat Karisalpattivillage whichis located at 8.60^0 latitude and 77.58^0 longitudein Cheranmahadevi block, Tirunelveli district of Tamil Nadu, South India in 2018 to evaluate the effectof Vermicompost(VC) an organic amendmentfor the sandy loam soil. The experiment was laid out in randomized block design with three replications. The aim of this study was to determine the Physico-Chemical and IR analysis of the soil by adding vermicompost(VC) and other organic manure like Farm yard manure(F) andGoat manure(GM)at different combinations and concentrations such as 7.5 t ha^{-1}, 12.5 t ha^{-1}, 17.5 t ha^{-1}. The treatments of this study were applied on the soil and after 30 daysof drip irrigation the soil was collected in each sample area and analysed in soil testing laboratory.

Keywords *-Vermicompost, Amendment, IR analysis, Physico-chemical, Chemical Properties.*

I.INTRODUCTION

Organic farming improves the soil physical properties and provides healthy environment. Soils having high organic matter content and significant water holding capacity with neutral pH balance are considered as proficient for high productivity of crop. (Inderpal Singh Brar et.al., 2017). Organic farming produces 100% nutritional values of organic food elements.Vermicompost plays an important role in faster decomposition of organic material. Vermicompost is the product or the process of composting using various worms usually red wrigglers white worms and other earthworms to create a heterogeneous mixture of decomposting vegetable or food waste bedding materials and vermicast. Vermicast is called worm castings, worm humus or worm manure, is the end product of the breakdown of organic matter by an earthworms. Vermicompost are finely divided mature peat like materials with a high porosity, aeration, drainage and water holding capacity and microbial activity which are stabilized by interactions between earthworms and micro-organisms in a non-thermopile process (Cristina Lazcano and Jorge Dominguez,2011).

II. RESEARCH METHODOLOGY

A field experiment was conducted at Karisalpatti in Cheranmahadevi block, Tirunelveli district of Tamilnadu.The ground was prepared by proper ploughing three or four times into a fine tilthand manured before 30 days of cultivation.Thirteen plots each of 5 x 8 mts where chosen. A control plot without applying organic manure was taken. In the next three plots VC was applied @ 7.5, 12.5,17.5 t ha^{-1} respectively. Similarly for the other combination like VC+F(3), VC+GM(3) and VC+GM+F(3) in equal combination with above 3 concentration were added.Therefore total treatments were 1+3+3+3+3=13 plots. The manures were completely mixed by manvatti and drip irrigated. The experiment was laid out in Randomized block design.

This study aims at the effect of Vermicompost(VC) with goat manure(GM), and farm yard manure(F) in different ratios in soil physical properties. The EC and pH were measured with (1:2.5 – soil water) potentiometry method given by Jackson, (1970). Nitrogen content was measured using the method given by Subbiah et. al.,(1956), phosphorus by Olsen et. al.,(1954), potassium by Hanway et.al.,(1952). The experimental site is of sandy loam texture with clay type minerals consisting of microscopic layers. Sandy loam soils have high concentration of sand that require more frequent irrigation and fertilization.

Soil Analysis Results for VC along with F & GM (Before harvest)

S.No	Manure	Plots	EC (ds/m)	pH	N Kgha^{-1}	P Kg ha^{-1}	K Kg ha^{-1}
1	VC	T1-A	0.22	6.2	195.0	35.0	245.0
2	VC	T1-B	0.18	6.5	202.5	65.0	255.0
3	VC	T1-C	0.25	6.4	205.0	107.5	255.0
4	VC+F	T2-A	0.24	6.7	185.0	17.5	287.5
5	VC+F	T2-B	0.23	6.5	195.0	17.5	297.5
6	VC+F	T2-C	0.21	6.3	200.0	32.5	450.0

7	VC+GM	T3-A	0.15	6.6	237.5	12.5	225.0
8	VC+GM	T3-B	0.13	6.4	190.0	25.0	225.0
9	VC+GM	T3-C	0.14	6.4	202.5	22.5	265.0
10	VC+F+GM	T4-A	0.12	6.5	217.5	27.5	245.0
11	VC+F+GM	T4-B	0.15	6.2	190.0	30.0	255.0
12	VC+F+GM	T4-C	0.20	6.4	202.5	32.5	265.0
13	Control	T5	0.26	7.0	177.5	7.5	215.0

F – Farm Yard Manure GM – Goat Manure VC – Vermicompost
A – 7.5 t ha^{-1} B – 12.5 tha^{-1} C – 17.5 tha^{-1}
EC – Electrical Conductivity N – Nitrogen P – Phosphorus K– Pottassium

III. PHYSICO-CHEMICAL PROPERTIES OF THE SOIL

3.1Electrical Conductivity (EC):

In the present study for VC+F+GM @ 7.5tha^{-1} the EC value was at its lowest 0.12 dsm^{-1} which was 53.8% less than the control plot as shown in the table. As the dosage of concentration increases as 7.5,12.5 and 17.5 tha^{-1},the EC value decreases as 0.24,0.23 and 0.21ds m^{-1} for the VC+F plots.EC values was maximum as 0.26 dsm^{-1} in the control plot .This is similar toRamesh (2001) who revealed that the practice of addition of silty loam tank sediment to clay soils resulted in increased sand and silt content.

3.2Determination of soil (pH):

The pH value was found to be minimum in VCplot@7.5tha^{-1}, with the value of 6.2and (VC+F+GM) @12.5tha^{-1} as 6.2 which was11.4% less than the control plot. As the dosage of manure increases as 7.5, 12.5 and 17.5tha^{-1}respectively the pH value decreases as 6.7,6.5 and 6.3 for VC+F plot. The control plot had the maximum value of pH as 7.0. This is possible during microbial decomposition of organic manure. Organic acid may have been released which neutralized the alkanity of the organic manures thereby leaving the pH of the soil almost what it was initially which is favourable for a good crop production as revealed by Okwuagu et.al.,(2003).

IV. CHEMICAL PROPERTIES

4.1 Available Nitrogen (N):

The N value was found to be maximum in VC+GM plot at 7.5 t ha^{-1} with a value of 237.5 Kg ha^{-1}, which was 25.3% higher than the control plot. For the control plot the value of N content was minimum as 177.5 Kg ha^{-1}. The higher nitrogen content contribute to greater height of the plant(Sharma and Dayal, 2005).

4.2 Available Phosphorus (P):

The value of phosphorus content was maximum at VC @ 17.5 t ha^{-1} as 107.5 Kg ha^{-1} and minimum as 7.5 Kg ha^{-1} which was 93% higher than the control plot. As the dosage of concentration increasesat VC as 7.5, 12.5 and 17.5t ha^{-1},the P value increases as 35, 65 and 107.5 Kg ha^{-1} respectively.Similar findings was given by Jeyamangalam(2016) where P availability was found to be higher due to addition of organic manures.

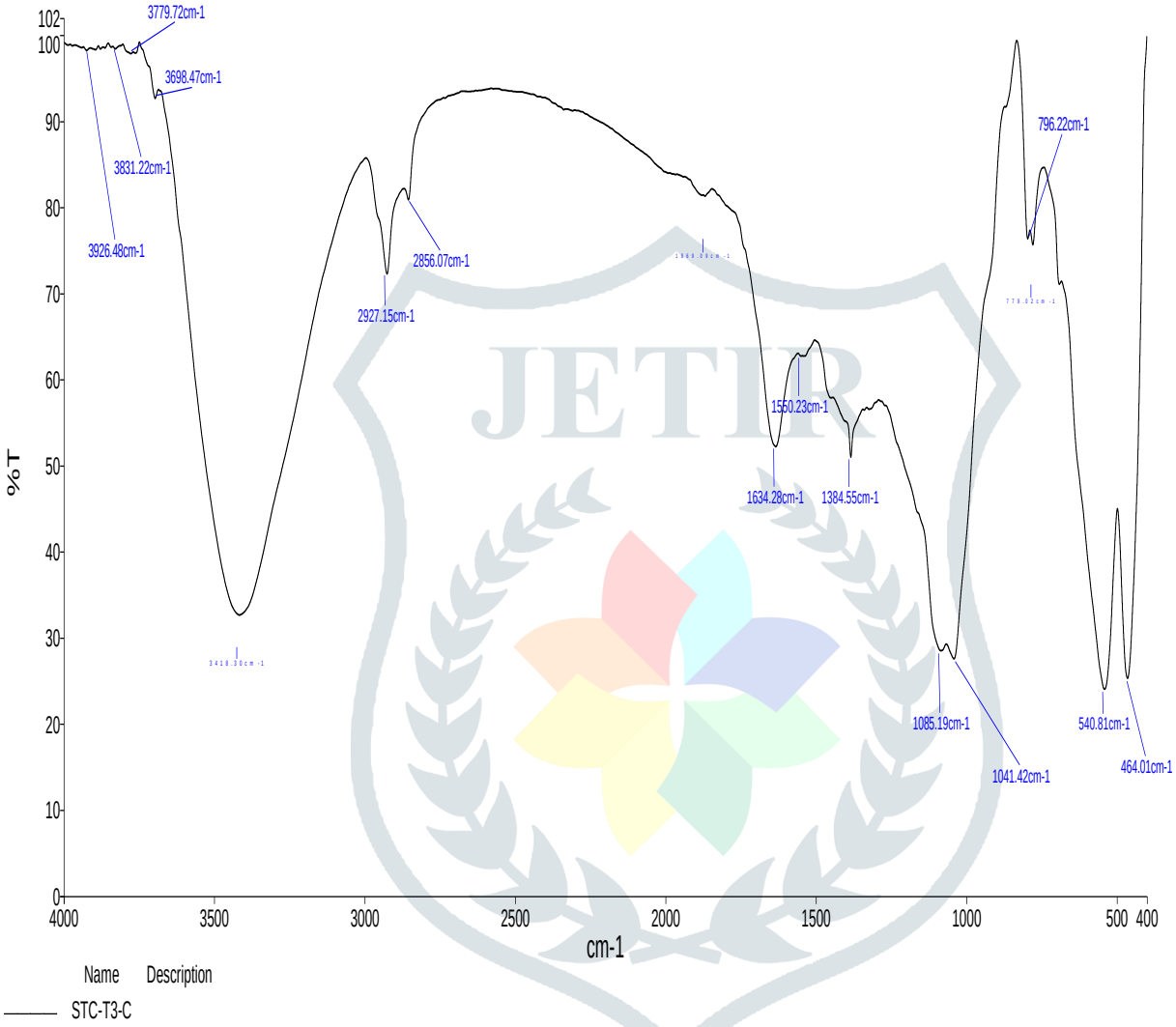
4.3 Available Potassium (K) :

The K content increased as concentration of the dosage increased. This was noticed in the combinations of amendmentsin VC+F plot @ 7.5, 12.5 and 17.5 t ha^{-1} the value of K content was 287.5, 297.5 and450 Kg ha^{-1} and similarly for F+GM+VC @ 7.5, 12.5 and 17.5 t ha^{-1} the value of K content was 245, 255 and 265 Kg ha^{-1} respectively. The level of potassium was high as 450 Kg ha^{-1} in VC+F @ 7.5 t ha^{-1} and low as 215 Kg ha^{-1} which was52.2% more than the control plot. The present results were in accordance with Mohankumar and Narase Gowda (2010).

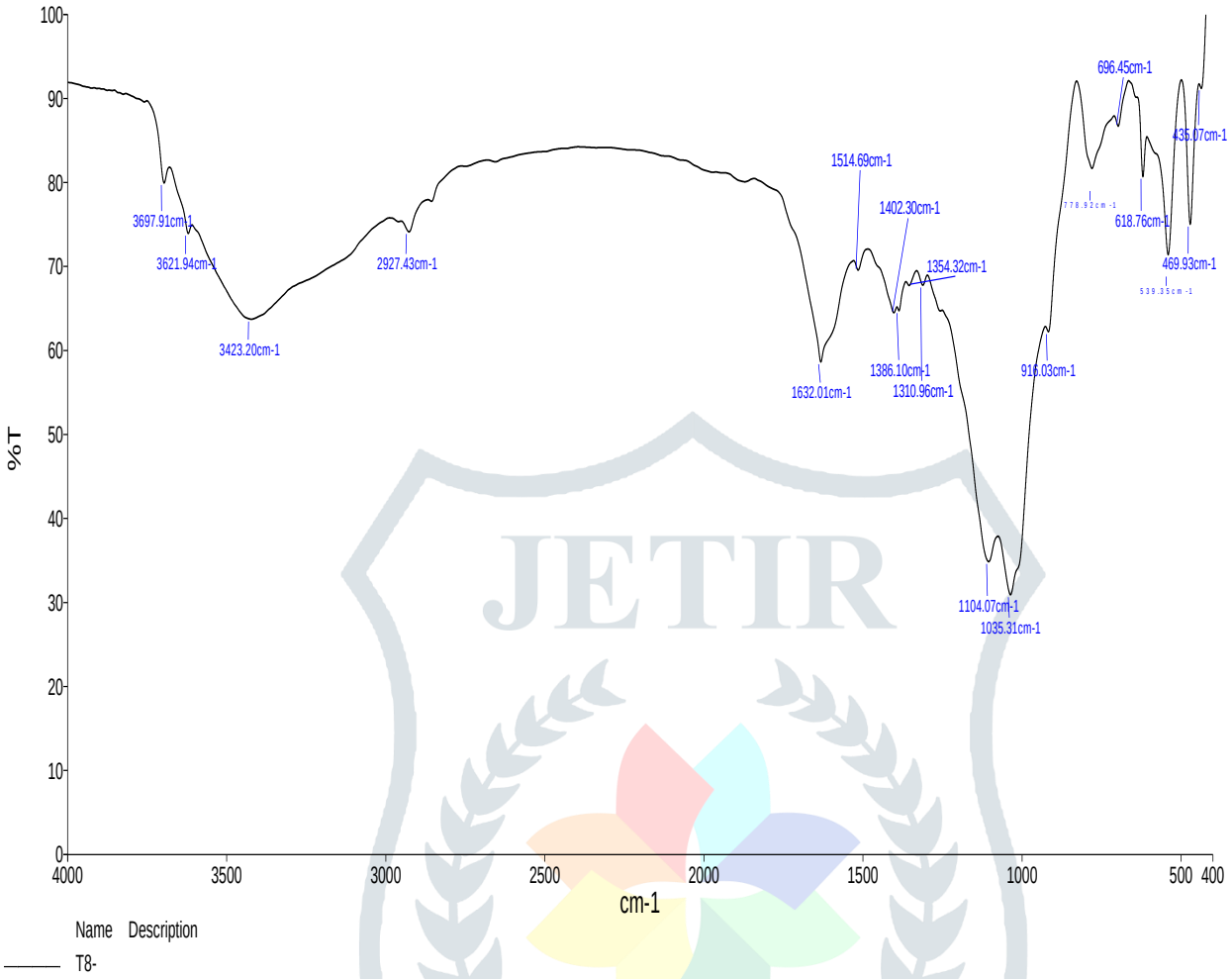
V. IR Analysis:

Fourier transform infrared spectroscopy (FTIR) is used to analyse the mineral and organic components of soil samples. The soil components occurs at 3500–1634 cm^{-1}. Soil structural characterization is based on absorbances by mineral structural units, hydroxyl,interlayer and octahedral layer cations. Hydroxyl OH stretching occurs at 3750 – 3400 cm^{-1} Strong intensity bands occur at 1550-1384cm^{-1}.Si-O Stretching occurs at 1085 – 796cm^{-1}.Overlapping of organic and mineral absorbances occur in the range of 1550-464cm^{-1}.

Graph 1: FTIRSpectrumfor the soil by adding vermicompost at 17.5 tha^{-1}



Graph 2: FTIR Spectrum for the soil without organic manure



The graphs 1 and 2 clearly shows that the soil with vermicompost manure have strong OH bond absorption at 3926 cm^{-1}whereas without organic manure have weak bond which proves that vermicompost manure has good water holding capacity.The transmittance of IR radiation is more for the vermicompost manure which shows that the sunlight can easily penetrate into the soil.

VI CONCLUSION:

Among the thirteen plots the pH and electrical conductivity(EC) values decreased than control plot.Available Nitrogen, Phosphorus and Potassium values increased. FTIR provides the molecular resolution of mineral and organic functional groups. The most important aspects of compost produced by earthworms is that it is 100% organic. There is no need to mix harmful chemical and fertilizers. This helps the plants to become more disease resistant.Results show that by amending the soil with organic manurethe environmental pollution and cost of production are reduced which helps the farmers to get reasonable returns.

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