Analysis Minerals, UV-Visible and FTIR Spectroscopy from Srirangam Temple Flower Waste Manure

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ABSTRACT

The trend of using inorganic fertilizers is on a boom amongst agricultural society, farmers are magnetized towards the short term advantages privileged by inorganic fertilizers, but they are unable to understand the ill effects of these fertilizers on human health and soil fertility. The availability of nutrition in the soil is influenced by the availability of organic matter in the soil. Resulting in increase of essential elements in organic compost makes it an important source for control of acidic soil P^H and soil nutrient replenished. Flower waste collected from Srirangam Temple has proven to be significant economic and ecological solution in organic manure preparation. Flower waste was composted and used as organic manure for plants. The minerals present in flower waste are iron, manganese, calcium, potassium, zinc, magnesium, nitrogen and copper. The results signify that use of flower waste as the organic manure enriches the soil quality and increases the crop yield. The bonds and functional groups present in sample prove that it can be used as best manure and this Organic manure is very cheap and effective as a good source of nitrogen for sustainable crop production.

***Key Words**: Minerals, UV VISIBLE, FTIR*

I. INTRODUCTION

Herbicides and Pesticide are chemicals used to kill or damage unwanted plants or parts of them. Chemical pesticides may negatively influence the structure and composition of soil micro-flora [1] .Due to soil fertility problems, crop returns often decrease and the crops are more susceptible to pests and diseases because they are in bad condition. In order to increase soil fertility, nutrients have to be added to the soil. Manure is a good fertilizer because it contains nutrients as well as organic matter [2]. Recycling of green waste through composting could not only reduce environmental problems caused by landfills and incineration but also decrease the cost of green waste disposal. Manure is a well-known and widely used method for converting organic manure into a nutrient enriched soil product. Composting is the biological decomposition and stabilization of organic substrates that allows development of thermophilic temperatures as a result of biologically produced heat. The end product produced is stable. It is free of pathogens and can be beneficially applied to land. These organic fertilizers are eco-friendly and do not damage natural resources. Instead they improve the fertility of the soil resulting in healthy plants. Additionally, the soil organic matter, soil microbial biomass and activities are enhanced by using organic fertilizers [3]. Manure was the first concept for using effective microorganisms (EM) in environment.

One such option is conversion of waste biomass into organic fertilizer through composting. When a substrate is composted, it converts the latter into fine peat like material and transforms some of its nutrients into more bioavailable forms [4].The compost acquires several species of microflora, besides hormones and enzymes. The recycled material when applied to soil, improves soil fertility. The compost serves as an excellent source of nutrient in organic farming and migrates the ill effects due to usage of chemical fertilizers [5]. Increases the nutrient level of the soil or improve the soil's physical condition by improving soil structure and aeration. Increases the infiltration capacity of the soil, thus reducing surface runoff and helps to retain plant nutrients and moisture. Well decomposed compost buffers soil reaction and controls soil temperature. It also increases soil microbial activity which helps mineralization. Organic manures are beneficial in the cultivation of crops. They are natural products used by farmers to provide food for the crop plants. Organic manures enable a soil to hold more water and also help to improve the drainage in clay soils. They even provide organic acids that help to dissolve soil nutrients and make them available for plants. The compost serves as an excellent source of nutrient in organic farming and migrates the ill effects due to usage of chemical fertilizers

[5].Manure is an organic fertilizer that can be made at very low cost. The most important input is the farmer's labour. However, now there is a modern approach to convert the flower wastes into value-added products viz., compost, biofuels, bioethanol, organic acids, and pigment [6].

Organic manure is being increasingly popular for organic farming. Composting was the first concept for using effective microorganisms in environmental management [7]. Conventional farming and its basic common practices still guarantees a sufficient crop production to match the present demand for human food. The inevitable raise on the cost of these fertilizers calls for the development of innovative low- cost and eco sustainable crop nutrition practices. The capacity of soil microorganisms to affect plant growth depends on sophisticated nutritional and chemical signalling, but also on soil conditions and climate factors.

Flower waste gets accumulated at religious sites like Temples, Mosques and churches due to a number of religious practices and is also generated in places like residential areas, community centers. Flower waste (FW) falls under the category of municipal solid waste. India has a variety of cultural heritage and uses flowers for decoration purposes as well as for worship in holy places and as an offering to deities. Later these flowers are thrown away as waste material. Most of the time their flowers are mixed with municipal solid waste or allowed to decay naturally. They are also at times dumped into nearby water bodies thereby leading to water as well as environmental pollution. The Flower waste thrown into water bodies, affects the aquatic life.

In land treatment final state of the waste is disposed by making intimate contact with the soil. The land treatment exploits the natural capacity of the soil to return substances to a condition forthcoming the unique state from which they were won by a process of extraction and purification. Volatilization method is also used for the treatment and disposal of wastes. Dried and decayed flowers are considered waste material and thus, dumped in landfills, various waterbodies. These flowers are thrown into water or dumped into landside causing water pollution as well as environmental pollution.

Srirangam temple is the world's largest temple complex. It is the highest temple tower in the world. Large numbers of garlands are used for god and goddess in temple. Minimum 3-6 times garlands are changed in normal days and dried garlands are thrower as waste. In festival season flower showers are increased and flower waste also increased. Planning made to convert the flower waste to organic manure. The aim of this study is to analysis the minerals, bonds through

UV VISIBLE and functional groups using FTIR analysis present in Flower waste manure of Srirangam temple.

2. Experimental Materials and Methods

2.1 Collection of Flower Waste and Preparation of Manure

The flower garlands were collected from Srirangam temple in Tiruchirappalli. The threads and fibers from the garland were removed, cutted into small pieces and let it allowed to dry for few days in shade. After that it was dumped in the composter. The plant and the Saw dust are sandwiched between the soils upon three to four layers. Then added dry leaves of the same quantity as the waste and semi-composted material, buttermilk or cow dung to start with the decomposition process. To that Efficient microbes (EM) solution was added which is available in the market. The composition of efficient microbes (EM) solution and water in the ratio of 1/2l: 2l was added to the flower waste. This EM solution was sprinkled once in a 2 to 3 days to the flower waste which was dumped in to the composter. Turn the pile around every other day. Keep the pile at the right level of dampness. If it is too wet, add dry leaves and stir and if it is too dry add water and stir. Once it is full, leave the pot open for 30-45 days for the composition to happen. Then move the semi composted matter into a larger container or .Water was sprinkled after every layer in order to maintain moisture content. Continued this procedure for 2 months then it becomes manure and the manure was taken for analysis.

2.2 Qualitative Analysis of Minerals in Manure: As per the standard Protocol [8]

2.2.1 Iron

Few drops of 2% potassium Ferro cyanide were added to 5ml of the test solution. Dark blue coloration was observed.

2.2.2 Manganese

Manganese sulphide precipitate dissolves in dil. HCl on boiling. On addition of NaOH solution in excess, a white precipitate of manganese hydroxide is formed Which turns brown due to atmospheric oxidation into hydrated manganese dioxide.

2.2.3 **Calcium**

1drop of diluted ammonium hydroxide and saturated ammonium oxalate solution was added to 10ml of the filtrate. White precipitate of calcium oxalate, soluble in hydrochloric acid but insoluble in acetic acid.

2.2.4 **Potassium**

Few drops of sodium cobalt nitrite solution were added to 2-3ml of the test solution. Yellow precipitate of potassium cobalt nitrite was observed.

2.2.5 Zinc

Few drops of sample, on addition of sodium hydroxide solution it gives a white precipitate of zinc hydroxide, which is soluble in excess of NaOH solution on heating. This confirms the presence of Zinc.

2.2.6 Magnesium

White calcium oxalate precipitate was separated by filtering the above solution. The filtrate was heated and cooled. To that dilute ammonia solution was added. White crystalline precipitate was observed.

2.2.7 Nitrogen

Ferrous sulphate solution was added to 5ml of the test solution. No brown color was produced but when sulphuric acid was added (slowly from the side of the test tube) a brown colored ring was produced at the junction of two liquid layers.

2.2.8 Copper

Few drops of sample, the blue solution on acidification with acetic acid and then adding Potassium Ferro cyanide solution gives a chocolate

2.2.9 Sodium

3-5 drops of uranyl magnesium acetate reagent was added to 2ml of the test solution, shaken well and kept for 5 minutes. Yellow crystalline precipitate of sodium magnesium uranyl acetate was observed.

2.2.10 Phosphorous

5ml of test solution was prepared in nitric acid and a few drops of ammonium molybdate solution were added to it and it was heated for about 10 minutes and left to be cooled. A yellow crystalline precipitate of ammonium molybdate was observed.

2.2.11 Cobalt

Cobalt sulphide dissolves in aqua regia in the same manner as nickel sulphide.When the aqueous solution of the residue obtained after treatment with aquaregia is treated with a strong solution of potassium nitrite after neutralisation with ammonium hydroxide and the solution is acidified with dil. acetic acid, a yellow precipitate of the complex of cobalt named potassium hexanitritocobaltate (III) is formed.

2.2.12 **Sulphur**

To 5ml of the test solution, lead acetate reagent was added. A white precipitate soluble in sodium hydroxide was observed.

2.3 Quantitative Analysis of Minerals in Manure: As per the standard Protocol [8]

2.3.1 Micronutrients Estimation (Zn, Cu, Fe, Mn,)

Lindsay and Norvell, (1978) gave the method commonly used for determining the available micronutrients in sample which consists of use of DTPA (Diethylene triamine penta acetic acid) as an extractant which has been widely accepted for the simultaneous extraction of micronutrient cations *viz*. Zinc (Zn), Copper (Cu), Boron (Bo), Phosphorous (P), Iron (Fe), Manganese (Mn) in neutral and alkaline substrates. Then it was determined with the help of Atomic Absorption Spectrophotometer (AAS).

A. Stock Standard Solution of Microelements

The Standard Solution of different micronutrient cation are prepared preferably by using their foil or wire (AR Grade). Dissolved 0.1g of the foil in diluted HCl and made the volume to one liter with deionized water to obtain 100 mg/ml (i.e. mg/L or ppm) solution of every micronutrient cation. Alternatively, analytical grade salts can be used to prepare Stock Standard

Solution of different micronutrients. The quantity of the salt to be dissolved its chemical formula and concentration of receptive stock solution is given below.

1. $ZnSO_4.7H_2O$ - 0.4398 g / litre
2. $FeSO_4.7H_2O$ - 0.4946 g / litre
3. $CuSO_4.5H_2O$ - 0.3928 g / litre
4. $MnSO_4.H_2O$ - 0.3076 g / litre
5. Boric acid - 0.286 g / litre
6. KH_2PO_4 - 0.400 g / litre

The amount of salt as given above was dissolved in a small volume of water followed by shaking after adding about 5ml of 1.5M sulphuric acids. The contents were then diluted to one litre with deionized or glass distilled water.

a. Working Standard Solutions

a) Zinc (Zn)

Transferred 10ml of Stock Standard solution to 100ml volumetric flask and diluted up to the mark with DTPA extracting solution. This will give Standard Solution having zinc concentration 0, 0.1, 0.2, 0.4, 0.6 and 0.8 (mg/ml) (ppm).

b) Iron (Fe)

0.0, 1.0, 2.0, 4.0, 6.0 and 8.0ml of Stock Solution 100mg Fe or 100 ppm Fe were transferred to a series of 100ml volumetric flasks and diluted each to the make with DTPA extracting solution. This will give standard solution having iron concentration of 0, 1, 2, 4, 6 and 8 mg/ml (ppm).

c) Copper (Cu)

0, 1, 2, 4, 6 and 8ml of Stock Solution containing 100mg Cu/ml (100ml Cu) were transferred to a 100ml volumetric flask and each was diluted to the mark with DTPA extracting solution. Thus the prepared standard solution contains 0, 1,2,4,6 and 8mg/ml (ppm) of copper concentration.

d) Manganese (Mn)

0, 1, 2, 4, 6 and 8ml of Stock Solution containing 100mg/ml or 100 ppm Mn were transferred to a series of 100ml volumetric flask and each was diluted to the mark with DTPA extracting solutions. Thus the prepared standard solution contains 0, 1,2,4,6 and 8mg/ml (ppm) of manganese concentration.

Atomic Absorption Spectrophotometer

100 ppm stock solution of the Zinc, Copper, Iron, Manganese and Boron were formed by mixing required quantity of salts in distilled water for elemental analysis of fruit. Diethylene triamine penta acetic acid method was used for elemental analysis. Weighed 10g of fruit sample and added 20ml of the extractant DTPA solution. The flask was shaked continuously for 2h preferably on a horizontal shaker and filtered through Whatman filter paper No 42. The filtrate was then analysed with Solar-AAS2-(UK made) Atomic Absorption Spectrophotometer. Quantity of each element was calculated by using the following formula.

Calculation

The amount of the given micronutrient is then calculated as below.

Wt. of fruit taken = 10g.

Volume of DTPA extract = 20 ml

Dilution = 20/10 = 2 times

Absorbance shown by the AAS = T

Concentration of the heavy metal as read from the standard curve against T = C µg/ml

Content of the micronutrient cation in the sample = C x 2 mg/Kg or ppm

2.3.2 Flame Photometry

The estimation for sodium, calcium, magnesium and potassium ions were carried out using systronics mediflame 127 – flame photometer.

Preparation of stock solutions

a. Sodium

Stock solution was prepared by dissolving 2.542g NaCl in 1litre of distilled water. It contains 1mg Na per ml (i.e. 1000 ppm). Stock solution was diluted to give four solutions containing 10, 5, 2.5 and 1 ppm of sodium ions.

b. Potassium

Stock solution was prepared by dissolving 1.909g KCl in 1liter of distilled water. It contains 1mg potassium per ml (i.e. 1000 ppm). Stock solution was diluted to give four solutions containing 20, 10, 5 and 2.5 ppm of potassium ions.

c. Calcium

Stock solution was prepared by dissolving 2.497 g $CaCO_3$ (1000-ppm) (AR grade) into a 100 ml beaker and then transferred to 1 litre volumetric flask. Made up to volume with deionized-distilled water. Diluted standards of 100, 75, 50 and 25 ppm using deionised water as diluents.

d. Magnesium

Added 1g (1000-ppm) of unoxidized Mg metal (reagent grade) into a 100ml beaker. Covered the beaker with a Pyrex watch glass and very carefully added 50ml of 1:1 (v/v) HCl. Boiled the solution gently for a few minutes to ensure that the magnesium dissolves completely. Then transfered the solution to a 1 litre volumetric flask and made up to volume with deionized-distilled water.

Procedure

For sodium, potassium, calcium and magnesium the flame intensity corresponding to the concentration of stock solution was noted using appropriate filters. The flame intensity of the sample was noted.

2.3.3 Determination of Sulphur

Sulphates estimated by the method of Golterman (1969).

Requirements

1. Whatman filter paper No 1

2. Sulphate
3. Barium chloride
4. Magnetic stirrer

Procedure

Filtered the sample through whatman filter paper. 50ml of filtered water sample was taken in a conical flask containing not more than 10mg/ml sulphate. Added 0.15gm of barium chloride and mixed for 30minutes using a magnetic stirrer. Measured the absorbance against distilled water blank at 420nm and compared with the standard curve. The sulphates are expressed in percentage.

2.3.4 Determination of Phosphorus

The phosphorus was estimated by the method of Dickman and Bray's, 1940.

Extracting Solution

Added 15ml of 1N NH_4F and 25ml of 0.5N HCl to 450ml distilled water. This gives a solution of 0.03N NH4F and 0.025N HCl.

Dickman and Bray's Reagent

Dissolved 15g of ammonium molybdate $(NH_4)_6Mo_7O_{24}.4H_2O$ in 300ml distilled water. Warmed to about 60°C, filtered and cooled. To that added 34.2ml of Con. HCl and made up the volume to 1 litre. This is 1.5% solution of ammonium molybdate in the HCl.

Stannous Chloride ($SnCl_2$. 2 H_2O) Solution (stock)

Dissolved 2g of $SnCl_2$. 2 H_2O crystals in 8.3ml Conc. HCl, diluted to 100ml and stored in a brown colored bottle. This is 40 % $SnCl_2$ stock solution. A piece of tin metal if added will keep the stock solution for long.

Stannous Chloride Working Solution

Diluted 0.5ml of the stock solution to 66ml with distilled water. Prepared this solution just before use.

Preparation of Standard Phosphorous Solution

0.439g of Potassium Dihydrogen Phosphate was weighed into a 500ml standard flask. Added approximately 25ml of Conc. H_2SO_4 to it and made up the solution. Pipetted out 2ml from this solution into a 10ml standard flask and made up the solution. This gives 2 ppm stock solution of Phosphorus.

Extraction

Weighed 5g sample and transferred it to a 100ml conical flask and added 50ml extract solution to it. Shaken the content for exact 5minutes and filtered through whatman No 42 filter paper. Prepared a blank in which all the reagents are added similarly, except the sample.

Procedure

Pipetted out 5ml of sample extract into one 25ml standard flask which is labeled. 5ml “Dickman and Bray’s Reagent” was taken and transferred that into 25 ml standard flask which contain the fruit extract. To that added 7.5ml Boric acid. Take the “Standard Phosphorus solution” in a clean burette. From this burette added 1, 2, 3 etc up to 5ml “Standard Phosphorus solution” in previously labeled 25ml standard flasks. Pipetted out 5ml “Dickman and Bray’s Reagent” and transferred that into each 25ml standard flask containing “Standard Phosphorus solution”. To that added 7.5ml Boric acid. A test tube full of distilled water was taken and added through the neck of the flask down to remove the adhering Ammonium Molybdate. Thoroughly mixed the content. Finally added 1ml $SnCl_2$ working solution with immediate mixing and made up to the mark with distilled water. Water analysis directly taken for investigations. Measured the intensity of blue color just after 10minutes at 690nm.

2.3.5 Total Nitrogen by Kjeldahl Method

500mg (80 mesh) oven dried fruit samples were taken in the digestion tube, 5ml Conc. H_2SO_4 and 1 – 2g catalyst were added into the tube. The digestion tube was then placed in digestion unit or block and heated to boiling until green. Heating time was very long and temperature at that time was very high. After the complete digestion, the digestion tubes were allowed to cool for 5 – 10minutes outside the block and then 20ml of distilled water was used to dilute the contents. Finally the volume was made up to 50ml.

Distillation and Titration

Distillation was done in the Kjeldahl apparatus (Micro Kjeldahl apparatus - Borosil). 10ml digest (aliquot) were placed in steam chamber of Kjeldahl apparatus with 10ml of 2N NaOH. A 50ml conical flask containing 10ml of H_3BO_3, a few drops of mixed indicator was placed under the condenser, steam of the distillation apparatus. The liberated NH4 –N, liberated by distillation of the digest with 2N NaOH was absorbed in unstabilization H_3BO_3 in the form of ammonium borate. The contents were titrated against standard 0.01 N HCl by Auto-Titrator (Systronics – 351). The blank solution was prepared as described without the sample.

Calculation:

$$\textbf{Total Nitrogen}\ \% = \frac{(\mathbf{T}-\mathbf{B}) * \textbf{Molarity of Standard HCl} * \mathbf{1.401}}{\textbf{Mass of Sample}\ (\mathbf{g})}$$

Where, T = Volume of Standard HCl for titration of the sample.

B = Volume of Standard HCl for titration of the blank solution.

2.4 UV-Visible and FTIR Spectroscopic Analysis for Identification of Bonds in flower waste Manure [9].

The extracts were examined under visible and UV light for proximate analysis. For UV spectrophotometer analysis, the extracts were centrifuged at 3000rpm for 10 minutes and filtered through Whitman No.1 filter paper by using a high pressure vacuum pump. The sample is diluted to 1:10 with the same solvent. The extracts were scanned in the wavelength ranging from 260900 nm using Perkin Elmer Spectrophotometer and the characteristic peaks were detected.

FTIR analysis was performed using Perkin Elemer Spectrophotometer system, which was used to detect the characteristic peaks ranging from 400-4000 $cm^{-1}$and their functional groups. The peak values were recorded. Each and every analysis was repeated twice for the spectrum confirmation.

3. RESULTS AND DISCUSSION

3.1 Qualitative and Quantitative analysis of minerals in flower *manure* extract

In this present study, the flower manure extract of Srirangam temple was subjected to mineral analysis and it is represented in (Table 3.1a and 3.1b). The result shows that manure contains Iron in rich amount , Manganese, Calcium, Zinc, Potassium, Magnesium are in abundant level, Nitrogen, Copper in moderate amount and Phosphorus, Sodium, Cobalt, Sulphur were present in trace amount.

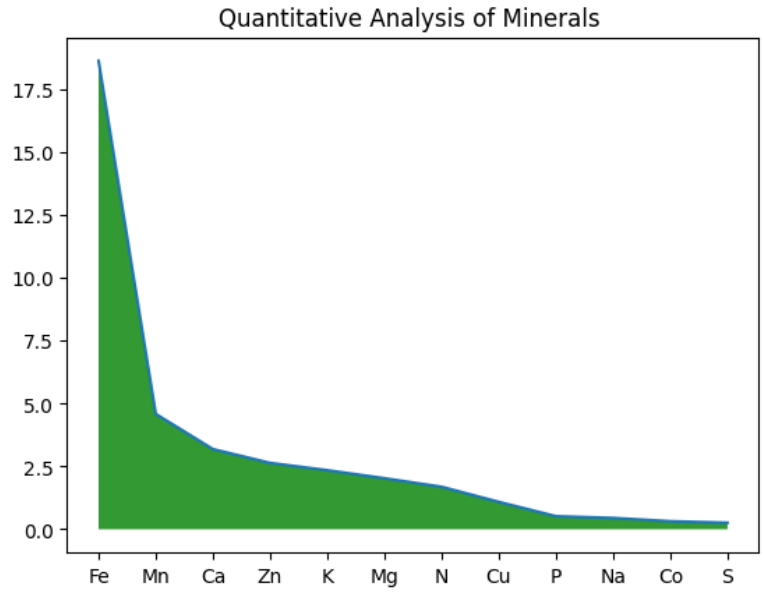
Table 3.1a –Qualitative analysis of Minerals

S.No	Mineral	Observations
1.	Iron	+++
2.	Manganese	++
3.	Calcium	++
4.	Potassium	++
5.	Zinc	++
6.	Magnesium	++
7.	Nitrogen	+
9	Copper	+
10	Sodium	+
11	Phosphorus	+
12	Cobalt	+
13	Sulphur	+

+++ = High Concentration, ++ Moderate, + Trace

Table 3.1b Quantitative analysis of minerals

S.No	Mineral	Quantity
1.	Total Iron (ppm)	18.64
2.	Total Manganese (ppm)	4.59
3.	Total Calcium (%)	3.19
4.	Total Zinc (ppm)	2.64
5.	Total Potassium (%)	2.35
6.	Total Magnesium (%)	2.03
7.	Total Nitrogen (%)	1.69
8.	Total Copper (ppm)	1.09
9	Total Phosphorus (%)	0.52
10	Total Sodium (%)	0.45
11	Total Cobalt (%)	0.32
12	Total Sulphur (%)	0.26



Graph: 3.1- Quantitative estimation of minerals

Plants require macro and micronutrients for normal growth. Minerals are called a "spark plugs of life". Iron is the component of metallo flavoprotein and iron porphyrin proteins such as cytochrome, peroxidase and catalase. It is also an important part of ferrodoxin and nitrite reductase. It plays critical role in metabolic process such as DNA synthesis, respiration and photosynthesis and plays a significant role in various physiological and biochemical pathways in plants (Gyanna *et al*., 2015 [10]). Manganese is used in plants as a major contributor to various biological systems including photosynthesis, respiration, and nitrogen assimilation. Manganese is also involved in pollen germination, pollen tube growth, root cell elongation and resistance to root pathogens (Frans 2014 [11]). Calcium is an essential plant nutrient that absorbed from the soil in the form of calcium nitrate or calcium sulphate which is essential for the formation of cell membrane and lipid structures. Calcium involves in metabolic processes of other nutrients uptake and also helps in protecting the plants against diseases. Zinc is one of the essential micronutrients that helps the plants to produce chlorophyll and plays a key role in physical growth and development (Hafeez et *al*., [12]).Potassium occurs mainly as soluble inorganic salt or salts of organic acid in the cells and is highly mobile in plants. In photosynthesis potassium regulates the opening and closing of stomata, and therefore regulates co_2 uptake. Potassium plays a major role in the regulation of water in plants (wakeel *et al*., 2011 [13]). Magnesium plays significant role in photosynthesis, carbohydrate metabolism and important role in respiratory mechanism by regulating phosphate metabolism in plant (Bose *et al*., 2011[14]).

Nitrogen being a major food for plants which is an essential constituent of protein and chlorophyll present in many major portions of the plant body. It is an essential component of proteins, protoplasm, enzymes and also chlorophyll. It also a constituent of purines, pyrimidines porphyrins and coenzymes (Leghari *et al*., 2016 [15]).Copper activates some enzymes in plants which are involved in lignin synthesis. It is also required in the process of photosynthesis, essential in plant respiration and assist in plant metabolism of carbohydrates and proteins. Copper also serves to intensify flavour and colour in vegetables and colouring flowers. Phosphorus is vital to plant growth and is found in every living plant cell. It is involved in several key plant functions, including energy transfer, photosynthesis, transformation of sugars and starches, nutrient movement within the plant and transfer of genetic characteristics from one generation to the next. Sodium has the benefit to the growth of algae and cyanobacteria .Sodium used in small quantities similar to micronutrients to aid in metabolism and synthesis of chlorophyll. Cobalt is a trace element in plants which is a component of a number of enzymes and increases the drought resistance of seeds (Leghari *et al*., 2016 [16]). Sulphur is essential for the synthesis and helps to form important enzymes and assists in the formation of plant protein. In Mineral analysis, based on the light of current literature, we conclude that manure extract has a high concentration of nutritionally important minerals .It enriches the soil fertility and enhances the nutrition supply to the plants.

3.2 UV Visible Spectroscopic Analysis for Identification of Bonds in flower waste Manure

The UV-Visible spectra were performed to identify the compounds containing σ- bonds, π bonds, and lone pair of electrons, chromophores and aromatic rings. The profile showed the peaks at 275 and 328 nm with the absorption 10.32 and 1.82 respectively (Table 3.2a and figure 3.2b).The occurrence of peaks at 244-1064 nm reveals that the absorption bands are due to the presence of flavonoids, phenol and its derivatives in the Manure. Through this we came to conclusion that this manure enriches the soil fertility and enhances the plant growth with no side effects.

Table 3. 2a UV-VISIBLE Spectra Wave Length and Absorption Peak of Flower waste *Manure*

S. No	Wave length (nm)	Absorption peak
1	275	10.32
2	328	1.81

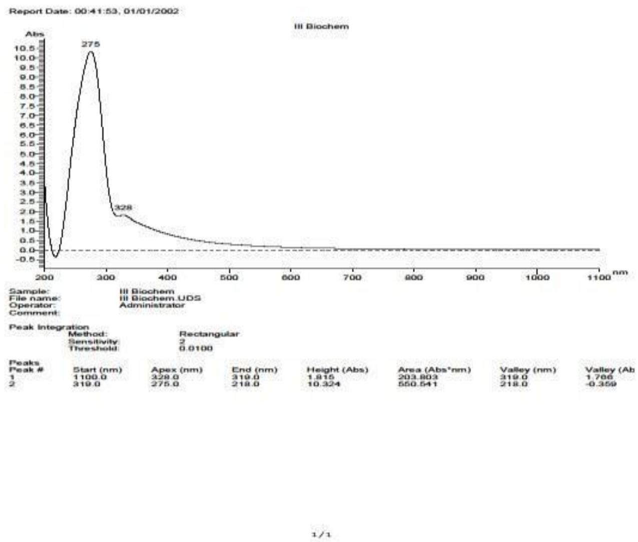


Figure 4.2b - UV-VISIBLE Spectra Peak Values of flower waste manure *Manure*

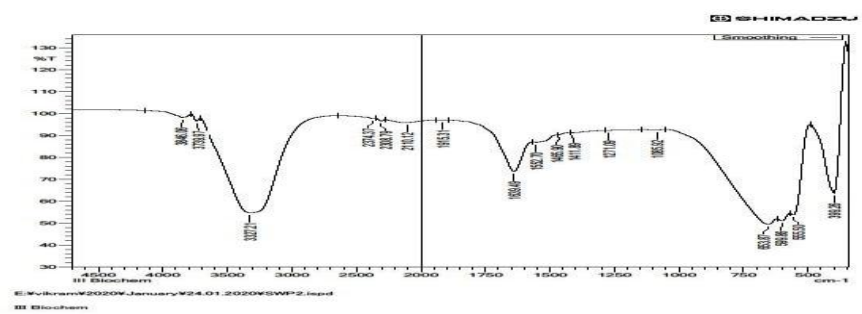
3.3FTIR Spectroscopic Analysis for Identification of Functional Groups in Flower waste Manure

FTIR Spectrum identified the functional group of the active chemical components present in the flower waste manure based on the peak value in the region of infra-red radiation. When the manure was passed in to the FTIR, the functional group of the components was separated based on its ratio. The peak values and the functional groups were represented in (Table 3.3a and Figure 3.3b).The identified functional groups depicts that the manure extract contains rich effective compounds for plant growth and also it enriches the soil fertility (Sandosh et al., 2013 [17], Karpagasundari and S.Kulothungan 2018 [18], Lata,N.and Veenapani,D 2011 [19] , Adrian *et al*., 2019 [20], Hussain *et al*., 2018 [21])

Table 3. 3a FTIR Spectra Peak and functional group of flower waste *Manure*

S. No	Peak Values	Functional groups
1	3846.o6	Unknown
2	3739.97	Unknown
3	3327.21	Alcohol
4	2374.37	Phosphorous Compounds
5	2308.79	Carbon dioxide
6	2110.12	Alliphatic hydrocarbon
7	1915.31	Aromatic Compounds
8	1639.49	Primary amide NH2 bending

9	1552.70	Aromatic Compounds C=C Stretching
10	1465.90	Aromatic Compounds C=C Stretching
11	1411.89	Azo compounds N=N stretching
12	1271.09	Silicon Compounds
13	1085.92	P-OH groups
14	653.87	Halo Compound
15	599.86	Halo Compound
16	555.50	Halo Compound
17	399.26	Phosphorous Compounds



Graph 3. 3b FTIR Spectra Peak and functional group of *Manure*

4. SUMMARY AND CONCLUSION

Manure is a well-known and widely used method for converting organic manure into a nutrient enriched soil product. Composting is the biological decomposition and stabilization of organic substrates that allows development of thermophilic temperatures as a result of biologically produced heat. The end product produced is stable. It is free of pathogens, and plant seeds, and can be beneficially applied to land. These organic fertilizers are eco-friendly and do not damage natural resources. Instead they improve the fertility of the soil resulting in healthy plants. Additionally, the levels of soil organic matter, soil microbial biomass and activities are enhanced by using organic fertilizers. Organic manure material has sufficient nutrient content for plants growth and development. Elements present in organic manure in the form of macronutrients and micronutrients. Macronutrients generally have an important role for the growth of plants, strengthen rooting, simulate translocation, storing and transferring energy from photosynthetic and used in metabolic processes. Resulting in increase of essential elements in organic compost makes it an important source for control of acidic soil P^H and soil nutrient replenished. Srirangam flower waste is valuable green compost used for plant. The minerals present in water hyacinth are iron, manganese, calcium, potassium, zinc, magnesium, nitrogen and copper. The results signify the use of flower waste as the organic manure. The bonds and functional groups present in sample proves that it can be used as best manure and this Organic manure is very cheap and effective as a good source of nitrogen for sustainable crop production. The end product produced is stable. It is free of pathogens, and plant seeds, and can be beneficially applied to land. These organic fertilizers are eco-friendly and do not damage natural resources. Instead they improve the fertility of the soil resulting in healthy plants. Additionally, the levels of soil organic matter, soil microbial biomass and activities are enhanced by using organic fertilizers.

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