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Study of Quality of Industrial Sewage Soil Sample by Inoculation of Jeevamrutha and Vermicompost and their Combined Effect

Mahesha[1], Martha Joanna[2], Likhitha K[3] Meena E[4], Vandana K[5], Nabeela Farheen S N[6], Mubasheera Unnisa[7], Lavanya G C[8]

[1,2,3,4,5,6,7,8]DOSR In Zoology, Tumkur University

ABSTRACT:
The main aim of the work was to study the quality of industrial sewage soil using amendments like jeevamrutha, vermicompost, earthworm and their combination. Jeevamrutha and vermicompost with *Eudrilus eugeniae*added to the Industrial sewage soil and found significant variations in the micro (Cu, Mn, Zn and Fe) and macronutrients(N, P, K, Ca, Mg and S) of industrial soil. Compared topre-decompose soil sample, the addition of jeevamrutha and vermicompost increases the nutrients level in the soil. But within the amendments the addition of vermicompost and control soil sample shows better results. Compared to above mentioned amendments jeevamrutha and combination of vermicompost and jeevamrutha shows fewer nutrients respectively.

Keywords: Jeevamrutha, Vermicomposting, Earthworms, Industrial Area Soil, Agriculture Area Soil, Heavy Metals.

INTRODUCTION

Over usage of chemical pesticides and fertilizers has led to many problems like a health risk, the outbreak of secondary pests normally in check due to normal microflora, biodiversity reduction and insecticide resistance (Lacey and Shapiro-Ilan 2008). The increasing disadvantages and cost of chemical fertilizers used for enhancing soil fertility have led to the need for natural solutions to enhance soil fertility. Earthworms called farmer's friend is used in the composting process called vermicomposting. Earthworm activity in the soil and using organic waste as substrates is known to increase soil fertility by increasing the nutrient content of soil and enriching the microbial community (Pathma and Sakthivel 2012). Vermicomposting is the method of breaking down organic waste by the synergistic activity of earthworms and microbial communities. Even though there is much knowledge about the advantages of vermicomposting in reducing organic biomass and generating high-quality fertilizer for plants, there is much to be explored about the bacterial communities associated with vermicomposting. As vermicompost promotes the growth of beneficial microbes, it enhances soil biodiversity and also promotes plant growth. Physically earthworm helps in increasing microbial diversity by improving aeration in the soil through burrowing actions. The positive effect of vermicompost is due to the microbial community associated with it. The decomposing capacity of earthworms has been attributed to the microbial communities that inhabit their gut and the vermicompost and cast produced by them, which make up the drilosphere, a hotspot for microbial activity(Medina-Sauza et al. 2019). Vermicomposting also serves as a significant method of composting agricultural, domestic, municipal wastes and helps in waste management. This present book chapter describes the benefits of vermicompost, microbial diversity associated with vermicompost and its role in enhancing soil fertility and plant growth. The benefits of using various organic sources are well documented (Mohit et al. 2019; Sharma et al. 2020; Singh et al.2019). The research on various crops confirms that the use of farmyard manure and vermicompost provides necessary macro and micronutrients to plants and improves seed germination, plant growth flowering, fruiting, root development, and quality of produce (Adhikari, Khanal, and Subedi 2016;Meena, Meena, and Kumar 2019; Premsekhar and Rajashree 2009; Sharma and Verma 2011)

Soil fertility is one of the important factors for crop production and protection. Earthworms improve the soil fertility through making nutrients easily available to plants by degrading organic matter and increasing soil porosity which improves good root penetration and water infiltration capacity. Earthworms also increase the microbial activity of soil, which indirectly improves the plant growth. Earthworms not only enhance plant growth; they also improve plant health. But in the modern agricultural practices, usage of chemical fertilizers improves the crop productivity and diminishes the soil fertility. Usage of proper organic manure, in spite of using inorganic chemicals could enhance the earthworm abundance in the soil which leads to sustainable agriculture.

Jeevamrit is a traditional fermented liquid organic concoction commonly used as soil microbial enhancer in natural farming. It is a rich source of Bacteria, fungi, actinomycetes and also contains other beneficial microorganisms. It is claimed that the application of jeevamrit stimulates crop growth and repels some of the insect-pests.

It is prepared by using simple on-farm inputs like cow dung, urine, pulse flour, jaggery, water and microbial rich healthy soil. The sugars present in Jaggery acts as ready source of energy for growing microbes, while pulse flour (besan) acts as a nitrogen source in the formulation. Cow dung and urine provide nitrogen and other essential nutrients for growing microorganisms.

Soil, Cow urine and dung provide the culture of beneficial microbes in the jeevamrit. During last few years,there has been an increasing interest on jeevamrit and other liquid organic formulations for use in organic and natural farming. The scientific characterization and validation of jeevamrit is under progress (Kumar et al., 2021).

MATERIALS AND METHODS:

Soil sample collected in “Antharasanahalli Industrial area , Tumakuru. Tumakuru is a city located in the southern part of Indian state of Karnataka .Antharasanahalli is a locality in Tumkur city in Karnataka state India. It belongs to Bangalore division. Antharasanahalli, Tumkur pin code is 572106 and postal head office is Northern Extension. Shanthi Nagar, Arakere, Tuda layout ,Chickpete,Harpet circle are the nearby localities of Tumkur. Distance between Tumkur and Antharasanahalli is 7kms an extent of 208 acres has been acquired by KIABD .It is an industrial area and is situated towards Ammanikere road to Sira road .It is home to various numbers of industries, Santoor soap industry -Wipro ,film caps rubber and Oil industry .It is including manufacturing, textiles, and engineering. The presence of industrial units in Antharasanahalli contributes to the economic development of the region.

Procedure of soil sample collection:

Material required:-Spade or auger (screw or tube or post hole type), Hand hoe, Core sampler, Sampling

bags, Plastic tray or bucket .
We Divided the field into different homogeneous units, removed the surface litter at the sampling spot. Dig the plough depth of 15cm and collected at least 10 to 15 samples from each sampling unit and placed in a tray. Made a 'V' shaped cut to a depth of 15cm remove thick slices of soil from top to bottom of exposed face of the 'V'-shaped cut and place in a clean container and collected the sample in a clean polythene bag. We labelled the bag as industrial sewage soil sample.

Method Of Preparation of Jeevamrutha (Liquid Form):
Prepared Jeevamrutha by taking 200 litres of water with 10 kg of Indian/desi cow dung and 10 litre of desi cow urine to above liquid formulation, added 2 kg of Jaggery, 2kg of gram flour and one handful of soil. All the ingredients were mixed in a plastic drum and the drum was kept in a cool place and away from the sunlight for about 10 days. During this period the content was mixed thoroughly with a wooden stick for every 24 hours. The fresh preparation of Jeevamrutha was moderate green in colour with mild foul odour. As the storage period progressed, the preparation become darker in colour with a strong foul odour.

Method of Vermicomposting:
We arranged Vermicompost unit (Polybag) in a cool, moist, and shady site and collected cow dung, cow urine, various plant material, sheep and goat excreta. At the bottom of the Polybag we prepared fine bedding by adding above materials. We left for 25 - 30 days for partial decomposition of waste materials. After decomposition the bedding materials goes down in the Polybag. After a fine decomposition of about 30-35 days we released a "*Eudrilus eugeniae*" worm (2kg) on the upper layer of the bed. Water should be sprinkled immediately after release of worms and maintain a 60-70% of moisture. Bed should be kept moist by sprinkling of water, cow dung, cow urine and bed should be turned once after 20-25 days to maintain aeration and proper decomposition. We got vermicompost ready in 70-80 days.

Method of Preparation of 8 sample pits:
Collected the earthworm (*Eudrilus eugeniae)* at vermicompost production unit KVK(krishi vigyan Kendra) hirehalli,Tumakuru and industrial sewage soil from Industrial area Antharasanahalli.
Taken 8 polythene bags and added 10 kg of Industrial sewage soil to these polythene bags and named as S2A and S2B(Industrial area sewage soil control);; S4A and S4B(Industrial area sewage soil+Vermicompost); S6A and S6B(Industrial area sewage soil+Jeevamrutha); S8A and S8B (Industrial area sewage soil+Jeevamrutha+ Vermicompost). To S4A and S4B polythene bags added 500g of vermicompost and to S8A and S8B added 250 grams of vermicompost and 100 ml of Jeevamrutha to each bag. To above all bags released 14 grams of earthworm (*Eudrilus eugeniae*) aged about 45 days old, and kept these samples for about two months in shady place.
After 15 days of pit preparation organic matter of about 200g is added to all the pits (i.e. 2 % of ratio of total soil present) and frequent water sprinkling is done in order to maintain the moisture in pits.
Analysis Of Soil Sample:

Table 1: Showing instruments and methods used to test physico chemical, nutrients and heavy metals of soil samples.

Nutrients:	Methods:	Instrument Used :
pH(Potential Hydrogen)	Glass electrode method	Digital pH meter

EC(Electric Conductivity)	Conductometric method	Digital conductivity meter
OC(Organic Carbon)	Titration method	-
Primary Nutrients :		
Nitrogen	Kjedhal method	-
Phosphorus	Bray's reagent method-below pH 7 Olsen reagent method-above pH 7	Spectrophotometer
Potassium	Ammonium acetate method	Flame photometer
Secondary Nutrients:		
Calcium Magnesium	Ammonium acetate method	Atomic absorption Spectro photometer
Sulphur	Morgan's reagent method	Atomic absorption Spectro photometer
Micronutrients :(Fe,Cu,Mn,Zn)	DTPA extract method	Atomic absorption Spectro photometer
Heavy Metals: (Pb,Cd,Ni)	DTPA extract method	Atomic absorption Spectro photometer

Vermicompost and Jeevamrutha Analysis Method:-

Micronutrients and heavy metals analysis-

Microwave Digestion Method is a technique used to estimate the availability of certain nutrients, particularly micronutrients like iron, zinc, manganese, copper, calcium, magnesium and sulphur. Heavy metals like lead, cadmium and nickel in Vermicompost and Jeevamrutha.

Other analysis like pH, Nitrogen, Phosphorous, Potassium is analysed similarly to soil analysis. Only Vermicompost- EC Analysis is different from soil analysis.

RESULTS AND DISCUSSION:

Results and Discussion

Physical Parameters:

Table 1: Physical(pH and EC) and chemical parameters(OC) of different soil samples.

Parameters	Industrial area soil.	Industrial area soil +Jeevamrutha.	Industrial area soil + Vermicompost.	Industrial area soil + Jeevamrutha+ Vermicompost.	P-Value.
pH	7.14± 0.014142	7.125± 0.0353553	7.295± 0.021213	7.23± 0.028284	0.00798
EC (dsml)	1.14± 0.02828	1.165± 0.04949	1.085± 0.459619	0.87± 0.806102	0.90302
OC %	3.72± 0.19799	1228.3± 12.869343	3.27± 2.022325	3.29± 0.296985	0.96604

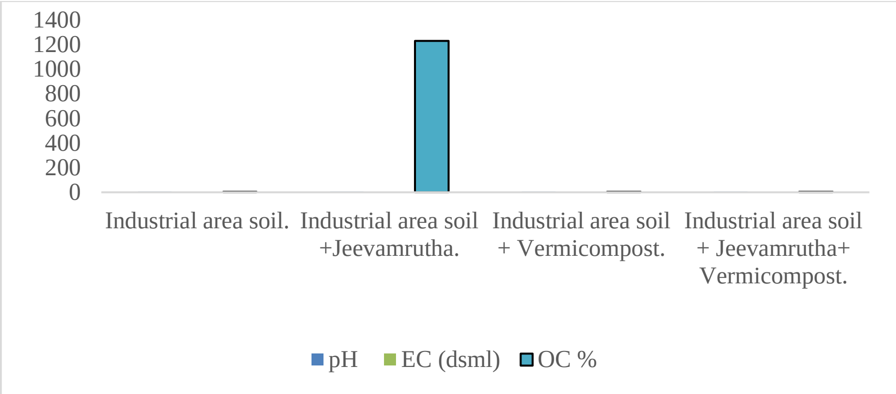

Figure 1: Graphical representation of Physical and chemical parameters of different soil samples.

1.pH

We observed that pH is increased in IAS + VC (7.295±0.021213) compared to other three samples that is IAS (7.14±0.014142), IAS + JA (7.125 ± 0.0353553) and IAS+ JA+ VC (7.23±0.028284). (English and Costello 2005) and (Ova *et al*., 2008) concluded that soil pass through the earthworm gut the pH is altered by enzymatic activity and microbial activity in the earthworm gut. According to N. Deva Kumar reveals that Jeevamrutha is acidic in nature hence the increased pH is due to the activity of earthworm and applied Vermicompost but Jeevamrutha might not play huge role in increasing the pH. Pre-treated sample has7.40 which is slightly more than all the post samples. The change in pH value towards neutrality may be due to the mineralization of N and P into nitrites or nitrates and into orthophosphates (Kaviraj and Sharma, 2003). (Kansotia *et al*., 2015 and Sharma *et al*., 2013) who reported that decreased pH of soil with the application of vermicompost.

2.Electrical conductivity (EC) (dSml)

EC is increased in IAS+JA (1.165±0. 049497) compared to other three samples that is IAS (1.14±0.02828), IAS + VC (1.085±0.459619) and IAS+ JA+ VC(0.87±0.806102). The result shows increased in EC in jeevamrutha treated sample then compare to other samples. According to Ashmeet Kaur, 2020 Jeevamrutha have its own advantage like increase in N, micronutrients and EC and our result are in congruent to their work because EC content in our sample that is IAS+ JA has drastically increased. The results are in congruence with the findings of (Shilpa *et al*., 2019) and (Kansotia *et al*., 2015) who has noticed the decrease in the percentage of EC from Vermicompost and our sample IAS+VC is less than compare with control post and JA treated samples. . The decrease in EC may be due to the pass of organic matter and release of different mineral salts in available forms such as phosphate, ammonium and potassium (Singh *et al*., 2014). High salt concentration may cause phytotoxicity problems and therefore EC is good indicator for suitability agriculture purpose (Villar *et al*., 1993). Pre-treated sample has 0.42dSml which is less than all the post samples.

3.Organic carbon (OC) (%)

The result shows that OC is slightly increased in IAS soil (3.72±0.19799) compared to other three samples that is IAS + VC (3.27±2.022325), IAS+ JA (3.385±0.0353553) and IAS+ JA+ VC (3.29±0.296985). Result is matching with (Singh, *et al*., 2012) and Tare, *et al*., (2011) the addition of Vermicompost to the soil decreases the OC concentration. Earthworm activity brings about significant decline in organic carbon level of the waste resource and accelerates waste stabilization process and so industrial sewage soil has less OC content when it is treated with vermicompost. According to (Ravi G. K. et al., 2022) higher dosage of Jeevamrutha (1000 lit/ha) helps to increase OC content in soil their studies are congruent with our work when compare to pre and post treated samples but when compare within the post samples it is contradictory effect because post control soil has more OC. The pre-treated sample has 1.8% of OC where all post samples are increased with OC Content.

chemical Parameters:

Table 2:Macro nutrients(NPK) present in different soil samples.

Parameters	Industrial area soil.	Industrial area soil +Jeevamrutha.	Industrial area soil + Vermicompost.	Industrial area soil + Jeevamrutha+ Vermicompost.	P-Value.
N kg/ha	1350.2± 71.417	1228.3± 12.869343	1186.55± 733.90	1193.8 ± 107.76	0.96583
P kg/ha	74.215± 2.5950	118.57± 4.5679098	132 ± 24.607	104.15± 1.7677	0.3826
K kg/ha	1890± 98.994	1960± 0	2590 ± 98.994	2240 ± 197.98	0.01416

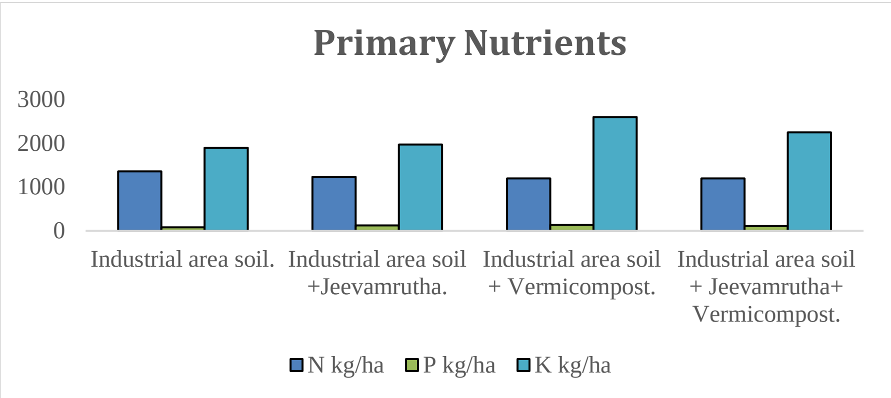

Figure 2: Graphical representation Macro nutrients(NPK) present in different soil samples.

1. Nitrogen (N) (Kg/Ha)

The result observed that a macronutrient (primary nutrient) such as N is increased in IAS soil (1350.2±71.417) compared to other samples that is IAS soil+ VC (1186.55±733.90), IAS soil+ JA (1228.3±12.869343) and IAS soil+ JA+ VC (1193.8±107.76). Suthar and Singh 2008 suggested that the earthworm activity enriches the Nitrogen profile of Vermicompost through microbial –mediated nitrogen transformation, though addition of earthworm excretory product, mucus, body fluid, enzyme etc. to the substrate. The Nitrogen content in the Vermicompost depending upon the initial Nitrogen content of the substrate and the extent of decomposition depending on prevailing environmental condition and earthworm density, result are in contradiction to their studies when compared within the post samples. Pre samples has 653.18 Kg/Ha of nitrogen content which is less than all the post treatment samples has they contain earthworm, jeevamrutha and vermicompost in them.

2. Phosphorus (P) (Kg/Ha)

Observed that a macronutrient (primary nutrient) such as P is increased in IAS soil + VC (132±24.607) compared to other samples that is IAS soil (74.215±2.5950) and IAS+ JA (118.57±4.5679098) IAS+ JA+ VC (104.15±1.7677). The result is matching with (Suthar 2009) the increased phosphorus content in Vermicompost clearly indicate earthworm mediated phosphorus mineralization. The release of phosphorus in available form is partly by earthworm gut phosphatases and further release may be by phosphorus solubilizing microorganism. Vinotha *et al.*, 2000 Reported that the micro flora plays an important role in enhance phosphatase activity in worm cast. Therefore, it can be inferred from the study that the vermicomposting process could be considered as on efficient technology for the transformation of unavailable forms of plant nutrients to easy available form. Jeevamrit is well thought-out to be a gifted source of natural carbon, N, P, K, and a lot of other micronutrients required for the crops (Somdutt, Rathore, and Shekhawat 2021; Yoga Nanda, Thimmegowda, and Shruthi 2020) which range just after the vermicompost treated samples. The pre soil sample has 137.07 kg/ha which is highest than all the post samples.

3. Potassium (K) (Kg/ha)

The obtained result of macronutrient (primary nutrient) such as K is increased in IAS + VC (2590±98.994) compared to other samples that is IAS soil (1890±98.994), IAS+ JA (1960±0) and IAS+ JA+ VC (2240±197.98). (Delgado *et al.,* 1995) have reported higher potassium content in the sewage sludge Vermicompost which is matching to the result on the contrary, lower potassium content in Vermicompost from coffee pulp waste has been reported (Orozco *et al.,* 1996) this difference in potassium content can be attributed to the difference in the chemical nature of substrate. This might be also due to leaching of potassium by excess water that drained through the feeds (Benitez *et al.,* 1999) have reported that the leachate collected during vermicomposting process had higher potassium concentration, all these matching with the result. The improved level of available K content might be due to the addition of vermicompost as well as FYM (Farm Yard Manure) along with Jeevamrutha which facilitated the disintegration of the slowly exchangeable potassium to soil solution K besides the reduction in potassium fixation (Chatterjee and Bandyopadhyay 2014; Yadav et al. 2013) where the combined effect rank second in the K concentration but the amendment of only jeevamrutha shows no significant improvement in K .The pre-treated soil sample has 980
kg/ha which is less than all other post samples.

Table 3: Secondary Macro nutrients(Ca,Mg,S)present in different soil samples

Parameters	Industrial area soil.	Industrial area soil +Jeevamrutha.	Industrial area soil + Vermicompost.	Industrial area soil + Jeevamrutha+ Vermicompost.	P-Value.
Ca(ppm)	2900.2± 12.727	2687.55± 73.609816	3061.3 ± 135.6231	2831.4 ± 256.5383	0.23705
Mg(ppm)	362.95 ± 46.88118	346.15± 2.3334524	541.55 ± 28.07214	437.7 ± 69.57931	0.5199
S(ppm)	58.7 ± 2.262742	102.5± 14.142136	89.955 ± 17.17562	78.12 ± 21.65161	0.1677

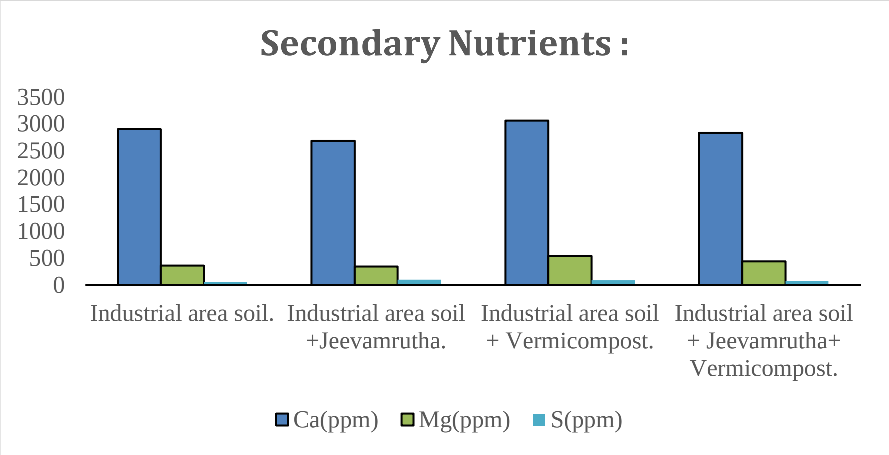

Figure 3: Graphical representation Secondary Macro nutrients(Ca,Mg,S)present in different soil samples.

1. Calcium (Ca) (ppm)

It is observed that macro nutrient (secondary nutrient) such as Ca is increased in IAS+ VC (3061.3±135.6231) compared to other samples that is IAS soil (2900.2±12.727), IAS+ JA (2687.55±73.609816) and IAS+ JA+ VC (2831.4±256.5383). Whereas pre decompose

Industrial sewage soil treatment has 4404.5ppm, it decreased in all the post treatment samples. According to Subrata Hait *et al.*, 2012 there was an increase in total Ca content as compare to the compost material in all the reactors. The increments of Ca for primary sewage sludge were increased in vermicompost than control. For waste activated sewage sludge, the increase in total Ca content in vermicompost than control respectively. Both the above studies are contradiction with the work comparing with pre and post decomposes treatment, but among the post decomposes treatment IAS + VC as high calcium content compare to other two treatments. The results are also in contradiction with Rakesh Sharma and Shivani Chadak (2022) who observed the improved level of macro nutrients due to the addition of VC as well as FYM (Farm yard manure) along with JA.

2. Magnesium (Mg) (ppm)

From our work it is noticed that macro nutrient (secondary nutrients) such as Mg is increasedin IAS + VC (541.55±28.07214) compared to other samples that is IAS (362.95±46.88118), IAS +JA (346.15±2.3334524) and IAS+ JA+ VC (437.7±69.57931). Whereas pre decomposes IAS soil has 501ppm. According to Subrata Hait *et al.*, 2012, the total Mg content for primary sewage sludge, was found to increase for vermicompost than control. For waste activated sewage sludge, an increase in total Mg content under all the experimental conditions was observe in increase for vermicompost than control respectively which favours our result of increasing Mg content in IAS+ VC, comparing with other pre and post decomposes treatment soils.

3. Sulphur (S) (ppm)

The work shows that macro nutrients (secondary nutrients) such as S is increased in IAS+JA (102.5±14.142136) compared to other samples that is IAS+VC (89.955±17.17562) IAS+VC+JA (78.12±21.65161) and Industrial sewage soil(58.7±2.262742). Whereas pre decompose Industrial sewage soil treatment has 176.87ppm, so decreased in all the post treatment samples. The results are matching with (Aulakh et al- 2018; Yoga Nanda, Thimmegowda, and Shruthi 2020) The naturally fermented organic inputs (jeevamrit) are rich sources of micro flora, essential macro and micronutrients, vitamins, and plant hormones like indole acetic acid and gibberellic acid. According to Subrata Hait *et al.*, 2012 vermicomposting resulted into significant increase in the macro nutrients in there total as well as water soluble contents as compare to the initial compost. There was no effect of earthworm density on the transformation of macro nutrients during vermicomposting but the results are in contradiction to their study.

Table 4: Micro nutrients(Fe,Mn,Cu,Zn)present in different soil samples

Parameters	Industrial area soil.	Industrial area soil +Jeevamrutha.	Industrial area soil + Vermicompost.	Industrial area soil + Jeevamrutha+ Vermicompost.	P-Value.
Fe(ppm)	35.335 ± 10.50054	24.59± 1.1879394	22.28 ± 0.537401	22.635 ± 2.156676	0.19831
Mn(ppm)	1.01 ± 0.014142	0.96± 0.0565685	0.91 ± 0.014142	0.89 ± 0.084853	0.23789
Cu(ppm)	0.9 ± 0.141421	0.89± 0.0282843	0.945 ± 0.205061	1.035 ± 0.049497	0.68225
Zn(ppm)	9.07 ± 0.381838	9.075± 0.1909188	9.055 ± 0.162635	8.885 ± 1.011163	0.99318

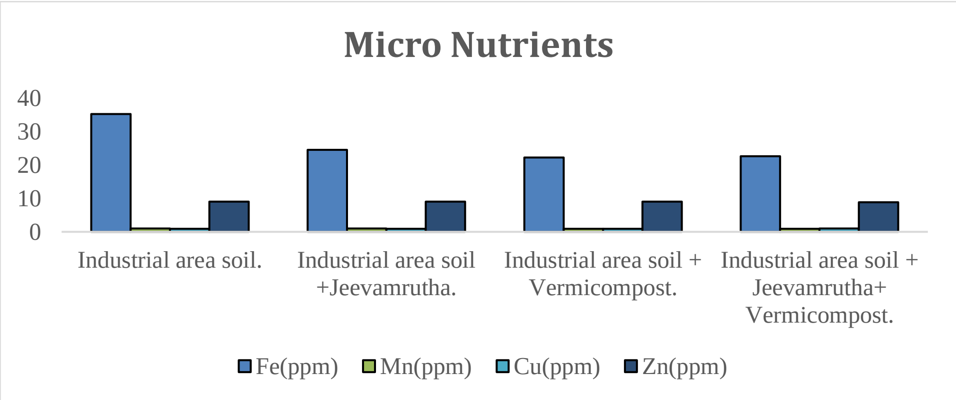

Figure 4: Graphical representation Micro nutrients(Fe,Mn,Cu,Zn)present in different soil samples.

1. Iron (Fe) (ppm)

Our work shows that micro nutrients such as Fe are increased in IAS (35.335±10.50054) than compared with IAS+ JA+ VC (22.635±2.156676), IAS+ JA (24.59±1.1879394) and IAS + VC (22.28±0.537401). Fe pre decomposes soil sample has 25.0ppm which is almost near to all the post samples except control IAS has more Fe concentration. The trend of low availability of Fe in the present study is in consistent with the findings from other researchers. Suthar (2009) have demonstrated that vermicomposting caused considerable reduction in concentration of DTPA extractable metals like Cu, Fe, Mn, and Zn during vermicomposting of sewage sludge spiked with sugarcane trash, which matches with our results. It is contradictory with (Sharma, Bali, and Gupta 2001) the increased availability of micronutrients in bio organically treated plots may be due to chelating agents released from microbial disintegration of farmyard manure, compost, and fermented organics (jeevamrit) which might have prevented the precipitation, oxidation, and leaching of micronutrients.

2. Manganese (Mn) (ppm)

Mn is increased in IAS (1.01±0.014142) than compare with other samples that is IAS + VC (0.91±0.014142), IAS+JA (0.96±0.0565685) and IAS+ JA+ VC (0.89±0.084853), the pre decomposes soil sample has 0.87ppm which is almost equal to Industrial sewage soil+ Jeevamrutha+ Vermicompost whereas other two samples are increased in Mn concentration. The trend of low availability of Mn in the present study is in consistent with the findings from other researchers. Suthar (2009) have demonstrated that vermicomposting caused considerable reduction in concentration of DTPA extractable metals like Cu, Fe, Mn, and Zn during vermicomposting of sewage sludge spiked with sugarcane trash, which matches with our results.

3. Copper (Cu) (ppm)

We noticed that micro nutrients such as Cu are increased in IAS + JA+ VC (1.035±0.049497) than compare with other two treated soils that is IAS soil (0.9±0.141421) and IAS + VC (0.945±0.205061). The pre decomposes soil sample has 0.2ppm which is considerably less than compare with post treated soils. According to Baljeet Singh Sahara *et al.,(*2023) application of jeevamrutha improves soil properties such as OC, macronutrients and also micronutrients such as Zn, Fe, Cu and Mn also increased up to 98%,23%,62% and 55% respectively hence our result are in similar to his study.

4. Zinc (Zn) (ppm)

We noticed that micro nutrients such as Zn are increased in IAS+JA (9.075±0.1909188), IAS (9.07±0.381838) and IAS + VC (9.055±0.162635) compared with IAS+ JA+ VC (8.885±1.011163). The pre decomposes soil sample has 5.25ppm which is less in concentration than compare with post treated samples of soil. The results are matching with (Aulakh et al- 2018; Yoga Nanda, Thimmegowda, and Shruthi 2020) The naturally fermented organic inputs (jeevamrit) are rich sources of micro flora, essential macro and micronutrients, vitamins, and plant hormones like indole acetic acid and gibberellic acid. The results are in contradiction with (Sharma, Bali, and Gupta 2001) the increased availability of micronutrients in bioorganically treated plots may be due to chelating agents released from microbial disintegration of farmyard manure, compost, and fermented organics (jeevamrit) which might have prevented the precipitation, oxidation, and leaching of micronutrients.

CONCLUSION:

In the work of two months of decomposition of Industrial area sewage soil (IAS). Where it is observed that increased level of nutrients (micro nutrients) in post decomposition samples than compare with pre soil samples, where macro nutrients are decreased in post samples except P and Ca. It is noticed that within the post samples the increased level of Physical parameters (pH and EC) in vermicompost and jeevamrutha, Primary Macronutrients such as N P K in vermicompost, secondary macronutrients (Ca, Mg, S) in vermicompost and jeevamrutha. Micronutrients such as (Fe,Mn Cu, Zn) are increased in control, combined and jeevamrutha. Therefore the study suggests that the inoculation of Vermicompost and earthworm *(Eudrilus eugeniae)* to the IAS soil shows better result than inoculation of Jeevamrutha and combined (Vermicompost + Jeevamrutha).

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