IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# "Solid Waste Management for N.P.Nilanga City by Vermicomposting"

[1]Gavane Pramod B, [2]Prof.Farooq Chavan

[1]Student, [2] Professor

Civil Engineering Department

Shramsadhana Bombay Trust's College Of Engineering & Technology, Bambhori,Jalgaon, Maharashtra

*Abstract*: Municipal solid waste (MSW) refers to the materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport and final disposal. MSW encompasses household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris.

*Index Terms* – solid waste, vermicomposting.

## INTRODUCTION

Management of Municipal Solid Wastes (MSW) continues to remain one of the most neglected areas of urban development in India. The 23 metro cities in India generates about 30,000 tones of such wastes per day while about 50,000 tones are generated daily from the Class I cities. Piles of garbage and wastes of all kinds littered everywhere have become common sight in our urban life.

**Solid Waste (SW)**

Solid wastes are unwanted materials disposed of by man, which can neither flow into streams nor escape immediately into the atmosphere. These non-gaseous and non-liquid residues result from various human activities. These cause pollution in water, soil and air (Misra and Mani, 1993). Waste is an unavoidable consequence of satisfying man's needs for food, water, air, space, shelter and mobility. In any material process, by product recovery or recycling can substantially alter waste quantity and quality, but all processes eventually produce some waste (Swarup et al, 1992). Though generation of SW is not a new phenomenon, it has acquired a danger status of being "third pollution" after air pollution and water pollution with progress in industrialization and population explosion. Earlier the major constituents of SW were domestic wastes and agricultural residues which are both biodegradable. Since there was much fallow land, SW could be conveniently disposed of on ground or in pits covered with layers of earth. However, since 1960s, not only has the quantity of SW increased but its quality has also changed. Though rural wastes continue to be mainly made of domestic and agricultural wastes, wastes from urban areas and the industrial units contain diverse types of materials which include toxic and hazardous materials. SW is generated because of human activities. Depending upon their origin, the wastes could be grouped under four heads namely agricultural wastes, domestic wastes, municipal wastes and industrial wastes.

**literature review**

In view of the growing awareness about vermicomposting technology in recycling different types of organic wastes, this study was conducted to investigate the effect of initial substrate pH on vermicomposting. The substrate pH and ash content were evaluated as a function of time. The data showed an exponential relationship between substrate pH and time of vermicomposting while a phase Bode plot of a single zero system relationship between the ash content and time of vermicompositng. The model parameters of these relationships also had very good correlation with the initial substrate pH. On the basis of obtained correlation between model parameters and initial substrate pH, generalized predictive models for the substrate pH and ash content have been evolved in terms of the duration fo vermicomposting and the initial substrate pH. Plots on the predictive and experimentally observed values indicated a high robustness of predictive models. The study also revealed that the earthworm specie Perionyx excavates performs well in a wide range of substrate pH. Near neutral initial substrate pH was found to be optimal for stabilization of waste with minimal processing time. The substrates having strong acidic initial pH were found to be les suitable for vermicompsoting. (N.B. Singh, A.K.Khare 2005)

In India million tons of livestock excreta, agro and kitchen wastes are produced every year which are serious problems or society. This work to evaluate the potential of an epigeic earthworm Eisenis foetida to convert the different combination of variety of wastes in to rich nutrient vermicompost/vermiwash and pre and post chemical analysis of feed mixtures. Vermicomposting results in significant decreased in pH, Total organic carbon (TOC), electrical conductivity (EC) and C:N ratio while significant increase in total Kjeldohl nitrogen (TKN) available phosphorus, exchangeable potassium and calcium in vermicomposts/vermiwash. The increased level of plant nutrients in final products in different organic resources demonstrated that the vermicompost/vermiwash for these wastes will be a valuable biofertilizer for sustainable land restoration practices. This study clearly indicates that vermicomposting of animal, Municipal Solid Waste Management for Nilanga City by Vermicomposting.

Vermicompost has been identified an alternative fertilizer to increase soil fertility and crop production in agriculture. The present study was evaluate the effects of municipal solid waste Vermicomposting (MSV) as organic fertilization on the growth characteristics, phonological stages, and yield of isabgo (Plantage ovate Forsk) and cumin (Cuminum cyminum) under field condition. The experimental design was a ha-1 (on the dry weight basis) that were applied with four replications. The experiment was conducted in 2009 at the Zabol University research farm in Zabol, south Iran. Application of MSV had no significant impact on phonological cycles of both crops. Crop development was completed in 117 to 124 days equivalent to 1878 to 1927 degree-days in the isabgol and 111 to 113 days equivalent to 1192 to 1224 degree-days in cumin. Results indicated that applications of MSV significantly increased growth and yield of both crops only at the 10 t ha-1 rate. At rates higher than 10t ha-1, yield rate decreased significantly. These stimulations were attributed to the presence of high level of essential nutrients as N, P, and organic matter in MSV. These results suggested that MSV, in amounts of about 10 t ha-1, could be utilized efficiently as an important source of nutrients, and did not have any significant harmful effect on crop productivity. In contrast, the nutrients proved beneficial to soil fertility and isabgol and cumin productivity. (Mohammad R. Asgharipour 2012)

**I.Methodology of proposed work:**

**1. Present of Solid Waste Management In The Nilanga city**

The solid waste generated in the city mainly consists of domestic refuse (including slum area ), wastes from commercial area fruit markets, slaughter houses, bio - medical waste , waste from hotels and restaurants and industrial solid wastes. The waste generation is large in the high - income groups followed by middle and low income group. The municipal area has been subdivided in to fifteen health units for collection purpose Waste generation accounts for about 230.04 tones/ day, the average per capita o.491kg/day and the collection is 100% LMC currently provides Door to DOOR Collection System only for some parts of the city . Presently 763 sanitary workers are working in sweeping collection & transport activities . The collection wastes is being transported through 55 vehicles to dumping ground. The present status of the MSW management in the N.P. Nilanga city is out line in the questionnaire form The status covers sweeping of rods , public awareness efforts , collection and transportation of waste prohibition of littering and manual handing of waste , processing and finally disposal of waste ,all in relation to the MSW Rules 2000. Gaps between the desired levels as per MSW rules and the present systems have been analyzed .The outcome of the analyzed The outcome of the analysis focuses on the all remaining aspects of MSW management since a new collection and transportation system compatible to the Rules is proposed . The areas now need attention are

**2. Drawbacks in the Present System:**

**2.1 No Storage of Waste at Source in segregated way.**

There is no practice of storing the waste at source in a scientifically segregated way. Residents store their house hold waste in plastic or in plastic bags or in plastic tub and they dump to waste in mixed form into well made of concrete and bricks up to 4 meter depth which is nearer to every type of colonies e0 g. Ganesh colony , Addarsh Nagar and Mohan Nagar

**2.2 Irregular Street Sweeping.**

Even street sweeping is not carried out on day - today Nilanga city Generally important roads are prioritized and rest of the street is Swept occasionally .Generally , no sweeping is done on Sundays and public holidays.

**2.3 Waste Storage Depots.**

As waste is collected through tractors/ tricycles that can carry only a small quantity of waste at a time there is a practice to set up depots for temporary storage of waste to facilitate transporation through motorized vehicles . Generally open sites or round cement concrete bins , masonry bins or concrete structure are used for temporary bulk storage , which necessitates multiple handling of waste often spill over , which is both unsightly as well as unhygienic.

**2.4 Transportation of Waste.**

Transportation of waste from the waste storage depots to the disposal site is done through tractors They are usually loaded manually There are no provision for safety of workers.

**2.5 Disposal of Waste.**

The waste loaded on tractor and finally dumped to Avhane shivar point on out skirts of the city Here open dumping takes place which does not follow any rules or Standards provided by CPCB. Disposal of waste is the most neglected area of Swm services and the current practices are grossly unscented Almost all N.P. authorities deposit solid waste at a dump- yard situated within or outside the city haphazardly and do not bother to spread and cover the waste with inert material .These sites emanate foul smell and become breeding grounds for flies, rodent and pests. Liquid seeping through the rotting organic waste called leachate pollutes underground water and poses a serious threat to health and environment. Landfill sites also release landfill gas with 50 to 60 per cent methane by volume. Methane is 21 times more potent than carbon dioxide aggravating problems related to global warming.

**2.6 Lack of Awareness**

Although there are bins at every place .e.g, in institutional, residential and commercial areas (shops on the campus) to store the waste and also colour coded as prescribed by Central Pollution Control Board.

**3. Waste Management by Vermicomposting**

Vermiculture technology is emerging as an “environmentally sustainable”, “economically viable” and “socially acceptable” technology all over the world. 1) Vermi-composting Technology (to manage most organic wastes); 2) Vermi-filtration Technology (to treat N.P. & several industrial wastewater); 3) Vermi-remediation Technology (to treat & clean up contaminated lands); 4) Vermiagro – production Technology (to produce chemical-free organic foods by worms & vermicompost); 5) Vermi – industrial production technology (to produce valuable industrial raw materials from worms). The use of earthworms as “soil managers” for efficient “composting of food and farm wastes” and as “soil managers” for “fertility improvement” and enhanced “farm production” were known or ages but now it is being more scientifically and also commercially revived. The other uses of earthworms for the benefits of environment and society (wastewater treatment, land rededication & production of valuable medicines even to combat cancer and heart diseases; raw materials for rubber, lubricant, soap, detergent & cosmetic, industries and

protein rich feed materials for fishery, dairy & poultry industries are some "new discoveries" Aristotle called worms the "intestines of the earth" and stated that there may not be any other creature that has played so important a role in the history of life on earth. Earthworms constitute a large part of biomass (living bodies) inhabiting soil. In recent years efforts have been made to sue to potential of earthworms in recycling of nutrients, waste management and development of vermicomposting systems at commercial scale. These are also called as "Ecosystem engineers" as the increase the numbers and types of microbes in the soil by crating conditions under which these creatures can thrive and multiply. The objective of this article is to present an overview of the vermicomposting technology. In India, the integration of crops and livestock and use of manure as fertilizer were traditionally the basis of farming systems. But development of chemical fertilizer industry during the green revolution period created opportunities for low-cost supply of Plant nutrients in inorganic forms which lead to rapid displacements of organic manures derived from livestock excreta. The deterioration of soil fertility through loss of nutrients and organic matter, erosion and salinity, and pollution of environment are the negative consequences of modern agricultural practices. In India, millions of tons of livestock excreta are produced annually (Table 1). Odor and pollution problems are of concern. Currently the fertility values of animal dung are not being fully utilized resulting in loss of potential nutrients returning to agricultural systems. The potential benefits of Vermicomposting of livestock excreta include control of pollution and production of a value added product. Vermicomposting of different livestock excrete and poultry dropping has been reported. Organic wastes can be ingested by earthworms and egested as a peat-like material termed "Vermicomposting". Recycling of wastes through Vermicomposting, the important plant nutrients such as N, P, K, and Ca, Present in the organic waste are released and converted into forms that are more soluble and available to plants. Vermicomposting also contains biologically active substances such as plant growth regulators. Moreover, the worms themselves provide a protein source for animal feed.

### 3.1 Vermicomposting process

It is an aerobic, bio-oxidation, non-thermophilic process of organic of waste decomposition that depends upon earthworms to fragment, mix and promote microbial activity. The basic requirements during the process of Vermicomposting are
a] Suitable bedding b] Food source c] Adequate moisture d] Adequate aeration e] Suitable temperature f] Suitable pH

### 3.2 Potential Benefits of Vermicomposting

1. Vermicompost appears to be generally superior to conventionally produced compost in a number of important ways.
2. Vermicompost and vermiculture offer potential to organic farmers as source of supplemental income. Vermicomposting has the following advantages over chemical fertilizers
3. Provides major and micro-nutrients to the plants.
4. Improves soil texture and water holding capacity of the soil

### 3.4 Parameters for Vermicomposting

| Sr. No. | Parameters | Vermicaser Normal Range |
|---|---|---|
| 1 | Ph | 6.5 |
| 2 | Organic Carbon (%) | 20 - 35 |
| 3 | Nitrogen (%) | 1.8 - 2.5 |
| 4 | Phosphorus (%) | 1.5 - 2.5 |
| 5 | Potassium (%) | 1200 - 2500 |
| 6 | Carbon : Nitrogen | 14-15:1 |

### 3.5 Population and Sample

Nilanga is a Municipal Council city in district of Latur, Maharashtra. The Nilanga city is divided into 19 wards for which elections are held every 5 years. The Nilanga Municipal Council has population of 36,172 of which 18,673 are males while 17,499 are females as per report released by Census India 2011. Population of Children with age of 0-6 is 4692 which is 12.97 % of total population of Nilanga (M Cl). In Nilanga Municipal Council, Female Sex Ratio is of 937 against state average of 929. Moreover Child Sex Ratio in Nilanga is around 923 compared to Maharashtra state average of 894. Literacy rate of Nilanga city is 79.97 % lower than state average of 82.34 %. In Nilanga, Male literacy is around 85.84 % while female literacy rate is 73.71 %.
Current population (Year 2021) of N.P.Nilanga is 47524.

### 3.6 Daily collection of Solid waste from Nilanaga City

| Prabhag no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solid Waste collected in Tons/day(including residential, commercial zones | 1.2 | 0.9 | 1.4 | 1.2 | 1.7 | 0.6 | 0.8 | 2.1 | 1.7 | 1.9 | 1.8 | 1.9 | 2.6 | 1.4 | 1.6 | 1.2 | 0.7 | 0.8 | 1.6 | 1.3 | 28.35 |

### 3.7 Harvesting the Worms Compost

**Method 1** : Place food scraps on only one side of worm bin for several weeks and most of the worms will migrate to that side of the bin. Then we can remove the vermicompost from the other side of the bin where we have not been adding food scraps and add fresh bedding.Report this process on the other side of the bin. After both sides are harvested, we can begin adding food scraps to both sides of the bin again.

**Method 2** : Empty the contents of worm bin into a plastic sheet or used shower curtain where there is strong sunlight artificial light. Wait 20 - 30 minutes and then scrape off the top layer of vermicompost. The worms will keep moving away from the light so we can scrape more compost off every 20 minutes or so. After several scrapings, we will find worms in clusters; just pick up the worms and return them to the bin in fresh bedding

### 3.8 Composite Sample

The compost sample was prepared by collected about 5kg MSW from each income group total mass of sample collected was nearly 15kg. The five types of composts for experiments which as 1:5, 1:10, 1:15, 1:20, 1:25

### 3.9 Instrument Used for testing.

Digital pH Meter, Fuming Chamber, Electric Shaker, Flame Photometer, Oven.

## 4.0 RESULTS AND DISCUSSION

### 4.1 Physio-chemical Characteristics of Vermicompost (MSW + Worm) after 45 Days

| Parameter | LMW-1 (1:5) | LMW -2 (1:10) | LMW -3 (1:15) | LMW -4 (1:20) | LMW-5 (1:25) |
|---|---|---|---|---|---|
| pH | 7.26 | 7.24 | 7.19 | 7.1 | 7.09 |
| Organic Carbon ( c) | 28.87 | 26.44 | 26.5 | 26.92 | 27.4 |
| Total Nitrogen (N) | 1.34 | 1.38 | 1.49 | 1.53 | 1.58 |
| C/N Ratio | 21.54 | 19.59 | 17.78 | 17.59 | 17.34 |
| Total Phosphorous (P) | 0.73 | 0.76 | 0.78 | 0.78 | 0.79 |
| Total Potassium (K) | 1.18 | 1.68 | 1.68 | 1.89 | 1.98 |
| Moisture Content | 59.06 | 56.12 | 53.74 | 52.32 | 51.34 |
| Organic Matter | 49.77 | 45.58 | 45.68 | 46.41 | 42.23 |
| Temperature | 32 | 33 | 33 | 34 | 34 |
| C/P Ratio | 39.50 | 34.78 | 33.97 | 34.51 | 34.68 |

### 4.2 Physicochemical Analysis of Soil before Sowing and after use of vermicompost.

| Parameters | pH | Temp. | C | N | P | K | C/N Ratio | C/P Ratio | Ca | Mg | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Before sowing | 7.3 | 28 | 0.65 | 0.02 | 0.2 | 0.6 | 32.5 | 3.25 | 1.0 | 0.12 | 2.0 | 2.8 |
| After use of vermicomposting | 7.3 | 32 | 20.80 | 1.3 | 0.9 | 0.4 | 17.33 | 23.11 | 4.2 | 0.5 | 0.03 | 0.5 |

The vermicomposting experiments were performed in five worm-bins provided 1m2 of exposed top surface. The waste used in this study was biodegradable fraction segregated from the House hold waste sample. The ratio of waste and worms used of 1:5, 1:10, 1:15, 1:20, 1:25 moisture on dry basis content mixed with cow dung slurry of 70% percent moisture content to provide a suitable C/N ratio. The species of worm E. foetida used for this purpose. After 15:30 & 45 days was analyzed for pH, Moisture content, organic carbon, organic matter and micronutrient (NPK). Food. Typical soil air and fertility of the soil. In different parts of the world positive correlation between the amount of organic carbon and soil fertility has been proved. Indian soil ecosystem are very dynamic due to its sub-tropical climate, resulting rapid degradation of organic matter in these soils.

## CONCLUSION

The result of the present investigation of MSW Management by Vermicomposting can be Summarized to following conclusion.

1) There is a significant increase in N,P,K & significant decrease in TOC, C/N Ratio & Moisture content. The sample RDP 4, RDP 5 was suitable composition for Vermicompost of MSW.

2) Vermicomposting is one more economic, eco-friendly waste management technology for recycling of waste production for biofertilizer from MSW & bioconversion from MSW to wealth

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