Study of Conversion of Solid Waste into Organic Soil by Micro Organism

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Abstract:
In the modern life, we are daily using different type of materials in that, some of our decayed and are some non-decayed. In country like India total solid waste production is 1.45.626 million tonnes/day, In Karnataka total solid waste production is 10,000 million tonnes/day, In Hubballi total solid waste production is 10.29 lakhs tonnes/day. In this way we can make the total solid waste production of world is 2.01 billion tonnes/day, for this one square-kilometre of additional land is required for every year. However government has many policies to restrict uses of non-decayed materials like polythene bags, plastic bottles and etc. But peoples are only concern about their comfortness and luxury life instead of concerning the environment. In daily life whatever the materials which are used, after use they are throwing to dustbin. The municipal has regular collection of dustbin and they are throwing to the place called dumping yard. The excess use these materials in huge quantity making the insufficient place for dumping the solid waste. With regards the municipal has certain policies to reduce solid waste like 3R concept (Reduce, Recycle and Reuse) segregation of waste and etc.

Keywords: Municipal Waste, Plastic, compost, Soil fertility, Organic soil.

I. INTRODUCTION

Around the world, waste generation rates are rising. In 2016, the world’s cities generated 2.01 billion tonnes of solid waste, amounting to a footprint of 0.74 kilograms per person per day. With rapid population growth and urbanization, annual waste generation is expected to increase by 70% from 2016 levels to 3.40 billion tonnes in 2050. Compared to these in developed nations, residents in developing countries, especially the urban poor, are more severely impacted by unsustainably managed waste. In low income countries, over 90% of waste is often disposed in unregulated dumps or openly burned. These practise create serious health, Safety and environmental consequences. Poorly managed waste serves as a breeding ground for disease vectors, contributes to global climate change through methane generation, and even promotes urban violence. Managing waste properly is essential for building sustainable and liveable cities, but it remains a challenge for many developing countries and cities. Effective waste management is expensive, often comprising 20% to 50% of municipal budgets. Operating this essential municipal service requires integrated systems that are efficient, sustainable and socially supported.

II. LITERATURE SURVEY

“Conversion of solid organic waste into composting using Trichoderma”
This study was conducted to evaluate the potentiality of Trichoderma species as a bio-conversion agent for composting of solid organic waste and examine the effects of produced composts on the growth of two types of vegetables. The experiments were conducted both in vitro and in vivo processes. In vitro conversion of solid organic waste, the highest height and weight losses were found 42.64 and 31.45%, respectively using Trichoderma harzianum after 30 days of composting. In vivo conversion of solid organic waste for the same strain under aerobic condition, the highest height and weight losses were 33.22 and 61.25%, respectively.

“Bio-conversion of organic solid waste into biofertified compost using a microbial consortium”
The study was taken up to recycle the organic solid waste into effective compost using a microbial consortium. Methods Bacterial consortia were developed using antagonism assay. Concomitant enzyme production by the consortia was determined. The best consortium was further employed for degradation of 30 kg of organic solid waste. Compost analysis of 30 kg of wastes was done to determine the level of C, N, K, P and S. Results In this study, of the four consortia proposed, consortia no. 2 had the highest degrading capability. It exhibited consistent degrading capabilities of 30 kg waste. The volume of the waste was reduced to 82%, with a reduction in mass and moisture content to 65 and 42%, respectively, after 30 days of degradation study. The compost produced after 30 days had a dark color and grainy texture without any crustacean population and lacked foul

III. METHODOLOGY

Collection of material:

Solid waste:

Figure 1. Solid waste
20 kg of Solid waste is collected from dumping land Ayodya nagar near Hubballi, Dharawad dist. Karnataka.

Bio product powder:

![Bio product power with micro-organisms](image1.png)

The bio product powder contains micro organisms and contains Aspergillus, Phanerochate, Tricodarma and Pleurotus bacteria which helps in degradation of organic materials present in soil.

Selecting and excavating the land:

![Selection and excavating land](image2.png)

Select the land of size 1m*1m and it is excavate about 10cm deep and the excavated soil should be weighted. We can excavate 80 kg of soil.

Mixing of soil and solid waste:

![Mixing of soil and solid waste](image3.png)

The collected soil and solid waste will be mixed up by layer by layer.

Mixing and spraying of compost culture:

![Mixing of compost culture](image4.png)

![Spraying of compost culture](image5.png)

The bio-product powder will be mixed up with water and sprayed on the soil and solid waste mixture for each layer.

Watering the land:

![Watering the land](image6.png)

After this watering can be done for maintaining the moisture content and screening of micro-organism which are present in the bio-product powder.

Inter changing the layer:

![Inter changing the layer](image7.png)

![Inter changing the layer](image8.png)

![Inter changing the layer](image9.png)
Collection of organic soil:

Figure.10. Collected organic soil

Tests Conduct:
The following parameters are tested for collected soil sample.

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>SAMPLE 1</th>
<th>SAMPLE 2</th>
<th>SAMPLE 3</th>
<th>SAMPLE 4</th>
<th>SAMPLE 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>0.9</td>
<td>1.32</td>
<td>1.92</td>
<td>2.08</td>
<td>2.06</td>
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<tr>
<td>Electrical conductivity (GC)</td>
<td>1.4</td>
<td>0.389</td>
<td>0.470</td>
<td>0.407</td>
<td>0.404</td>
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<tr>
<td>Organic carbon (OC) %</td>
<td>1.009</td>
<td>1.313</td>
<td>1.40</td>
<td>1.312</td>
<td>1.704</td>
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<tr>
<td>Nitrogen (N) kg/ha</td>
<td>103.98</td>
<td>215.21</td>
<td>178.64</td>
<td>192.09</td>
<td>204.42</td>
</tr>
<tr>
<td>Phosphorus (P) kg/ha</td>
<td>10.36</td>
<td>27.115</td>
<td>77.4</td>
<td>68.41</td>
<td>77.90</td>
</tr>
<tr>
<td>Potassium (K) kg/ha</td>
<td>4.04</td>
<td>9.50</td>
<td>10.53</td>
<td>9.28</td>
<td>8.16</td>
</tr>
<tr>
<td>Sulphur (S) kg/ha</td>
<td>115.75</td>
<td>97.39</td>
<td>152.85</td>
<td>142.32</td>
<td>73.00</td>
</tr>
<tr>
<td>Calcium (Ca) mg/100g</td>
<td>202</td>
<td>32</td>
<td>29.0</td>
<td>20.0</td>
<td>28.2</td>
</tr>
<tr>
<td>Magnesium (Mg) mg/100g</td>
<td>8.2</td>
<td>44</td>
<td>7.6</td>
<td>7.8</td>
<td>7.2</td>
</tr>
<tr>
<td>Zinc (Zn) ppm</td>
<td>18.75</td>
<td>59.93</td>
<td>55</td>
<td>50.5</td>
<td>131.4</td>
</tr>
<tr>
<td>Iron (Fe) ppm</td>
<td>4.714</td>
<td>5.281</td>
<td>4.831</td>
<td>39.57</td>
<td>5.01</td>
</tr>
<tr>
<td>Manganese (Mn) ppm</td>
<td>2.862</td>
<td>0.526</td>
<td>10.02</td>
<td>7.326</td>
<td>1.720</td>
</tr>
<tr>
<td>Copper (Cu) ppm</td>
<td>0.216</td>
<td>8.761</td>
<td>14.2</td>
<td>12.41</td>
<td>7.632</td>
</tr>
</tbody>
</table>

Calculation for percentage of solid waste converted in soil:
- Total Collected municipal solid waste = 20kg
- Total kg’s of soil for project = 80kg
Therefore solid waste + stones removed = 1.586kg
Therefore solid waste converted into soil = Total solid waste – (Plastic waste + stones removed)
= 20 - 1.586
= 18.41kg.
Therefore percentage of solid waste converted into organic soil
= \( \frac{18.41}{20} \times 100\% \)
= 92.05%

IV. CONCLUSION

With above project results we can concluded following conclusion:
- We can convert 92.05% of solid waste into organic soil.

- With reference to the results that pH of soil is continuously increasing this represents the salinity of soil this can reduced by repeated irrigation.
- These are the properties which are useful for the plant.
Nitrogen: it is essential for photosynthesis – by this process it is increased 37.20%.
Phosphorus: It is play a role in photosynthesis, respiration and cell division – by this process it is increased by 17.92%.
Potash: It help for synthesizing plant sugar for use as food and production of more flowers - by this process it is increased 49.50%.
Iron: It helps in producing chlorophyll, which gives oxygen to plant and healthy green color - by this process it is increased 92%.
Manganese: It is essential for photosynthesis - by this process it is increased 77.3%
Copper: It helps in lignin synthesis also helps in photosynthesis, respiration - by this process it is increased 3.07%.
- These are the properties which are harmful for the plant.
Sulphur: Excessive sulphur lowers the soil pH making soil more acidic - by this process it is decreased by 63.06%.
Magnesium: To much magnesium can bring side effects including nausea, cramping, and diarrhea - by this process it is decreased by 87.80%.
- This process is eco-friendly with environment and helps in reducing municipal solid waste by micro-organisms

V. REFERENCES

[2]. Payelsarkarsnd Rounakhchourasia