

AN ANALYTICAL APPROACH OF REACTOR: A NEW WAY TO TREAT COMPOST

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ABSTRACT

This paper presents the new analytical approach to generate compost by using a manual reactor. This system aims at using the shredded garden waste to generate compost by using a manual reactor so that the garden waste can be furtherly used as low cost fertilizers. After gardening a lot of residue is left in the gardens in India which can be brought into use by making their compost. It will make the poor farmers and gardeners to be self-dependent & will certainly reduce the expenses on the chemical fertilizers.

The composting process happens due to the activity of micro-organisms (bacteria) and other larger organisms like worms and insects. These need certain conditions to live. These include moisture and air. To make the best possible compost, the micro-organisms must be able to work optimally. This can be achieved if the following factors are combined to the best advantage: Particle Size, Aeration, Moisture, Temperature and C/N ratio.

Keywords:-Reactors, garden waste, compost, low-cost fertilizers, micro-organisms, aeration, moisture, temperature, C/N ratio.

I. INTRODUCTION

Green waste is biodegradable waste that can be composed of garden or park waste, such as grass or flower cuttings and hedge trimmings, as well as domestic and commercial food waste. The differentiation green identifies it as high in nitrogen, as opposed to brown waste, which is primarily carbonaceous. Green waste is often collected in municipal curbside collection schemes or through private management contractor businesses and subject to independent audit. Biogas captured from biodegradable garden waste can be used as biofuel. Garden waste or green waste dumping is the act of discarding or depositing garden waste somewhere it does not belong.

Garden waste is the accumulated plant matter from gardening activities which involve cutting or removing vegetation, i.e. cutting the lawn, weed removal, hedge trimming or pruning consisting of lawn clippings, leaf matter, wood and soil. The composition and volume of garden waste can vary from season to season and location to location.

Garden waste may be used to create compost or mulch, which can be used as a soil conditioner, adding valuable nutrients and building humus. The creation of compost requires a balance between, nitrogen, carbon, moisture and oxygen. Without the ideal balance, plant matter may take a long time to break down from other sources,

reducing nitrogen availability to existing vegetation which requires it for growth. The risk of dumping garden waste is that it may contain seeds and plant parts that may grow (propagules), as well as increase fire fuel loads, disrupt visual amenity, accrue economic costs associated with the removal of waste as well as costs associated with the mitigation of associated impacts such as forest fire, threat to biodiversity.

A. Making Compost

To make traditional compost, an alternate different type of shredded plant materials in 6- to 8-inch layers is done. Layering helps compost reach the correct nitrogen balance, waste fodder etc. 2-inch layers of fine materials are used & processed through a machine shredder. Traditional composting includes soil as one of the layers. Water is added to the compost after every few layers of material. Livestock manure also can be added which supplies some nitrogen. The microbes that are naturally found on the plant waste ultimately cause decomposition

B. Need of Reactor or Chopping Machine

It has been realized that large quantity of agricultural and garden wastes remains being unutilized because handling, storage and management related difficulties. The reasons are their low bulk density, large area/volume for storage. Thus the green waste burning phenomena is being repeated every year. In order to use these wastes for some economical benefits, so the necessity of such machine was felt to utilize garden waste after shredding, which could be economical and practicable. Therefore, the reactor was developed considering the physical properties of garden wastes like length, top width, root/stem, moisture content, bulk density, chopped density etc. By shredding the storage volume could be reduced approximately 5.0 times as then the storage volume of whole stalks for concerned wastes. The shredded wastes can be utilized for industrial purpose as production of corrugated boards boxes, pulp paper, lignin and in animal feeds. There is a fair scope for production of organic manure, as small process can easily be decomposed.

Thus in order to have adequate disposal, size reduction of the crop residues is an important step for recycling in garden wastes. It has been established fact that finer particles (4 to 5 cm) decompose faster as compared to large particles. This needs pulverizing, which increase the surface area of the waste materials several thousand folds, thus exposing very large areas for micro organic reaction. Shredder is ideal for disposal of course leaves garden and agricultural wastes. Such as twinges, small branches, flower stalks straw, tree pruning etc. The finally ground wastes mixed with grass, logs and leaves, produce a light compost that encourages improvement of soil. It provides more oxygen and more energy for all the organisms involved in soil fertility process.

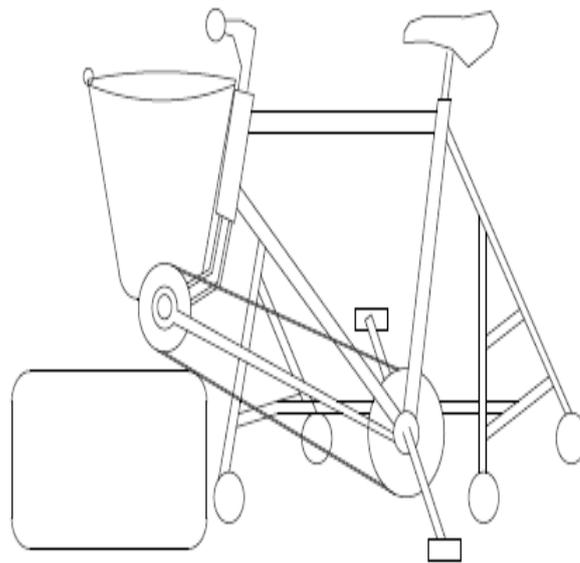
II. RESEARCH METHODOLOGY

- Gathering information on the necessity of the manual reactor or chopping machine.
- Collecting data from literature review for development of specific mechanism.
- Segregation of garden waste according to the reactor's capacity.
- Shredded garden waste along with cow dung and soil will be mixed in different proportion for vermicomposting.
- Composting will be done for 15 to 30 days.
- Comparison between compost using shredded and non-shredded organic waste will be done by comparing the parameters like efficiency, time period, quantity, moisture content.

III. OBJECTIVE

- To make the reactor portable and available at low cost so as to make it affordable to the farmers and gardeners.
- To make sustainable nature of agricultural & rural waste.
- Shredding or grinding organic materials helps speed composting by increasing the surface area of the compostable, making them accessible to decomposers.
- To increase the efficiency.

CONCEPTUAL DESIGN OF THE REACTOR-



Dimensions:-

- Size of basket-(0.61*0.61*0.61)m.
- Total height of the grinder- 0.74 m.
- Size of the tray-(0.4*0.3)m.
- Ground clearance- 0.13m.
- Slope- 0.152 m.
- Material used-scrap steel or mild steel.

DISCUSSION

Since the experimental work has not yet started, we have not concluded with the Results in this paper.

Under ideal conditions, composting proceeds through three major phases:-

- An initial, mesophilic phase, in which the decomposition is carried out under moderate temperatures by mesophilic microorganisms.
- As the temperature rises, a second, thermophilic phase starts, in which the decomposition is carried out by various thermophilic bacteria under high temperatures.

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•As the supply of high-energy compounds dwindles, the temperature starts to decrease, and the mesophiles once again predominate in the maturation phase.

Composting is generally done in two ways- Continuous composting and Batch Composting. When a continuous composter fills up, it is often converted into a batch composter. As the ingredients compact down, the compost can be left alone (batch composting) or new ingredients can be added as space permits (continuous composting).

REFERENCES

- [1.] Ajinkya S.Hande et al. “Methodology For Design & Fabrication of Portable Organic Waste Chopping Machine To Obtain Compost -A Review” IJIRST –International Journal for Innovative Research in Science & Technology Volume1, Issue 7,December 2014 ISSN (online): 2349-6010
- [2.] Puneeta Dandotiya1, O. P. Agrawal “Domestic Method of Kitchen and Garden Waste
- [3.] Management” International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064, Volume 3, Issue 6, June 2014,pp.1322-1327.
- [4.] Books- The International Journal of Recycling of Organic Waste in Agriculture.
- [5.] Waste Reduction, Reuse and Recycling Pamphlets Informational Material Links
- [6.] Waste Reduction Materials NYSDEC,Bureau of Waste Reduction & Recycling 625 Broadway Albany, NY 12233-7253(518) 402-8706
- [7.] A.D.Karve,“Biomass as energy source(appropriate rural Technology)”, India, August 27,2005