

# **A Review on Preparation of Compost Using Bio-Culture from Different Organic Wastes and Assessment of Growth of Vegetable Plant**

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**ABSTRACT:** Proper management of vegetable market waste is a serious issue in most of the metropolitan areas. Composting is one of the oldest and easy methods of organic waste stabilization. It is a naturally occurring biological conversion, which produces suitable end products such as fertilizers and BIO-GAS (methane). If these wastes are decomposed in landfills, it generates greenhouse gases, thereby polluting the surrounding environment. Adopting alternatives such as composting and reusing the waste or burning it to generate energy, reduce both pollution and the amount of land devoted to waste disposal. Composting of vegetable market waste is the best option as it can be used in agriculture. The main objective of the research is to make ready to use compost bags having compost made from different organic waste for growing different types of vegetables. Compost will be made from organic waste which includes vegetable waste and bulking agents like rice husk, coconut coir, dry leaves. Finally, the compost will be packed in a UV treated polybags.

**KEYWORDS:** Composting, Organic Waste, Physical Properties, Chemical Properties, UV treated Poly bags.

## **I. INTRODUCTION**

Several environmental problems arise from municipal solid waste (MSW) as they are not being properly managed. The major portion of Indian MSW includes vegetable waste. The vegetable waste in MSW is mainly provided by waste from vegetable markets, restaurants, canteens, juice centres and household kitchens. All cities, towns, districts have vegetable markets producing significant quantity of waste. At present, there is a big problem regarding collection, transportation and disposal of waste. The main methods of disposal includes dumping, heaping, land filling and burning and the main problems are environmental pollution, leachate, foul smells, green house gases, spread of diseases and other health hazards. We are facing environmental and socio- economic problems in dealing with current and future planning of disposal and management of fruit and vegetable market waste. Though, proper legislative rules and Standards regarding waste disposal have been made which are not strictly obeyed and waste stuffs are not properly handled and they often pollute the environment. Hence more sustainable and eco-friendly waste management systems are to be made and adopted.

India produces about 50 million tons of municipal solid waste every year from cities. Due to quick development of cities and migration of people from rural to urban, there is the increase in generation of MSW. Over 90 % of these wastes are used for unscientific land-filling or uncontrolled dumping outskirts of towns and cities, which have serious indications of global warming. Presently available MSW management system in India, which includes storage, collection, transportation, segregation, processing & disposal of waste, is not properly developed.

Markets produces fruits and vegetable wastes in massive quantities and result into a noticeable and odour nuisance in municipal landfills because of their high biodegradability. In India, fruit and vegetable waste generates about 5.6 million tonnes annually and presently, these wastes are disposed of by dumping on the outskirts of cities.

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Considering India's present urban population to be 330 million, it has an estimated potential of producing 4.3 million tons of compost each year. However, inappropriate solid waste management technique is the main control in production of good quality compost. Improper classification of the MSW at source leads to mixed wastes being composted together and inferior quality product being generated which finds no takers in the market. Composting of vegetable waste results into several benefits such as increased soil fertility and soil health thereby increased agricultural productivity, improved soil biodiversity, reduced ecological risks and a better environment. It destroys harmful pathogens and reduces the volume of waste.

Composting is the process in which aerobic micro-organisms converts organic matter into hygienic, biostable product by thermophilic. This natural process is affected by some environmental conditions like temperature, moisture content, pH and aeration and substrate characteristics like C/N ratio, particle size, nutrients contents and free air space. During degradation of organic matter, moisture content influences the changes in physical and chemical properties of waste material. MSW has high proportion of moisture (80-90%) and organic matter (70-80%) that give raise the odor during decomposition. When the optimum moisture level 60%, is not easily attainable to the micro-organisms, then microbial activity decreases the composting process and temperature 40-70 °C will not be accomplished. Most successful moisture level for biodegradation of different compost mixture differs from 50% to 70 %. The presence of more moisture content of MSW, results in significant leachate formation during composting which leads to reduction in porosity and O<sub>2</sub> availability.

The composting process may be more fruitful when the carbon to nitrogen ratio and the moisture content will be specific according to the material of compost. For maintaining the moisture and carbon to nitrogen ratio the bulking agents play a very vital role in the composting. The bulking agents are very effectual to control the air supply, moisture and other important composting parameters.

Bulking agents are usually used to create inter- particle voids, providing air- space in composting materials and controlling the water content of waste. Wood chips, straws, saw dust, rice husk and peanut shells are some bulking agents, which have been mixed with waste materials to alter moisture content, C/N ratio, and void spaces between particles.

Bulking Agent	Function
Sugarcane trash	Regulates carbon content, pH, moisture
Sawdust	Regulates moisture, pH , aeration, bulk density, temperature
Poultry waste	Regulates carbon content, bulk density
Cow dung	Regulates carbon content, bulk density, pH
Rice Husk	Regulates moisture, temperature
Coconut coir	Regulates pH, temperature

**Table 1: Various types of bulking agents and their function**

In the present study, the vegetable wastes along with bulking agents like rice husk and coconut coir are composted in a drum. Aerobic process is carried out as the holes are drilled on the surface of the drum. The composted material is then packed in a UV treated bag. The bags are such that it can be opened and vegetables can be grown in that bag. The use of grow bag containing compost is more preferable because grow bag can be used even if there is less space, one could get home grown fresh vegetable, it takes less than 20 minutes to plant any vegetable especially those whose roots don't spread too much, it is very useful because plants may be infected by soil borne disease or the soil is contaminated.

## II. LITERATURE REVIEW

In the literature review, the study of various research papers and review papers focuses on the use of organic fertilizer along with addition of alternative substrate for the growth of different vegetables.

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Rodolfo Canet & Fernando Pomares (1995) studied a review on the changes of the different parameters during composting of municipal solid waste. The study was carried out in Valencia, Spain. They focused on the effect of the methods on the development of the process and final product characteristics. They identified the excessive large size and height of the piles at the Fervasa plant did not allow adequate oxygenation of the inner materials, giving rise to a very long process and slightly acid compost. The product showed high moisture, low pH and high content of calcium and iron.

Gabriela Neata et. Al. (2015) studied physio- chemical and micro-biological analysis of compost made from municipal waste. The study was carried out at Bucharest, Romania. They identified the differences in physical and chemical properties which indicates that coarse size material showed higher amount of N, P, K. the product resulted from composting of bio- waste can be used for potted ornamental plants and also for ecological restoration of degraded soils.

M.A. Vazquez et. Al. (2015) studied a review on the different characteristics of compost from decentralized composting programmes. They identified that decentralized composting are a suitable solution to the treatment of organic waste and all produce high quality compost, thus avoiding transport costs and reducing environmental charges.

Lucas Guidoni et al. (2017) studied a review on the negative environmental impacts connected with home composting which may be due to the absence of defined operation criteria for the degradation process. They found that rice husk can be used as a bulking agent in vegetable and fruit composting. Higher proportions of rice husk results in decreased generation of leachate, formation of bad odours and also the loss of nutrients. A more quantity of rice husk in relation to vegetable and fruit waste decreases phytotoxicity during the composting process.

Bijaya Adhikari et. Al. (2007) studied a review on the food waste characteristics and locally available bulking agents for optimizing compost recipes. They identified that based on the variable food waste characteristics and monthly production rates; the formulation of recipes indicates that compost facilities must be flexible enough to handle seasonal variation of as much as 50% by volume.

Muhammad Khalid Iqbal et. Al. (2009) studied a review on the characteristics of bulking agents and its effect on physical properties of compost. They found that physical properties are simple and practical tools to assess composting time, cost and conditions of the composting process.

Fan Yang et. Al. (2013) studied a review of composting kitchen waste with addition of bulking agent which showed decreased gaseous emissions. They have studied on the three bulking agents like cornstalks, saw dust and spent mushroom substrate. They identified that all the composts having bulking agents showed the required maturity level and the addition of spent mushroom substrate showed the highest maturity. The bulking agents also decreased the leachate production and CH<sub>4</sub> and N<sub>2</sub>O emissions.

Maciej Neugebauer et. Al. (2017) studied a review on the use of green waste to overcome the difficulty in small scale composting of organic household waste. They observed that in pits and bin piles were containing 100% bulking agent and in bin piles containing 60% bulking agent helped to reduce the odour of composting thus contributing to a cleaner production process.

Fabio Tatano et. Al. (2015) studied a review to contribute to the knowledge of the process evolution and compost quality that can be expected and obtained respectively. They identified that the monitored experimental composters showed overall decreasing profile versus composting time for moisture, organic carbon, and C/N, as well as overall increasing profile for electrical conductivity and total nitrogen which represented qualitative indications of progress in the process.

Linee Goswami et. Al. (2017) studied a review on the application of different types of solid wastes through composting for environmental sustainability and restoring soil quality. They observed that the use vermi compost and drum

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compost along with chemical fertilizer increased the growth of crop, storage longevity and product quality for both tomato and cabbage.

T. Getahun et. Al. (2012) studied a review on the effects of turning frequencies on composting of biodegradable municipal solid waste quality. They identified that the turning frequency affected temperature, pH, total carbon, total nitrogen, C: N ratio. Compost with higher turning frequency resulted in a product having lower amount of nitrogen and carbon as a result of volatilization of N as  $\text{NH}_3$  and C as  $\text{CO}_2$ . Therefore, turning, although providing the desired compost at a lower rate, is beneficial for plant growth in the eventual application.

### III.CONCLUSION

The composting of market vegetable waste along with bulking agents like rice husk, coconut coir is the best and eco-friendly method to reduce the organic waste from the source. This composted material influences the physical and chemical parameters of compost quality and it can be packed in a UV treated polybag for growing different vegetables. This study will be useful for decreasing leachate production and odour during composting process.

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