

REVIEW ON-MANAGEMENT OF HERBAL INDUSTRIAL WASTE THROUGH VERMICOMPOST

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ABSTRACT

Waste management is been vital environmental issue since last few decades. It has been seen that the generation of waste increases due to increase in population and industrialization and urbanization etc. among them herbal industrial waste are one such products generated during production of medicine. These wastes are known to contain some phytotoxic compounds which inhibit the plant growth. It can be decomposed and converted as vermicompost with vermin culture technology. This compost can be used as biofertilizer or as organic manure for plant cultivation. This compost enhances soil biodiversity by promoting the beneficial microbes which in turn enhances plant growth directly by production of plant growth regulating hormones and it controls plant pathogens and pests and thereby minimizing yield loss. Cultivation of medicinal plant is need of time to meet the growing demand of herbal drug requirement in the field of medicine. Vrikshayurveda, a branch of Ayurveda explained about liquid manure called *Kunapa Jala* way back in 1000AD, prepare by using both animal and plant source, it act as both pesticide and fertilizer.

Keywords: Waste management, Herbal waste, Vermicompost, Biofertilizer, *Kunapajala*

INTRODUCTION

Waste management is one of the challenges faced by India at present. Today the urban areas of Asia generate about 760,000 tons of municipal solid waste per day; in 2025 this amount will rise to 1.8 million tons per day¹. According to latest central pollution control board reports in 2016, India produced 52 million tons of waste each year². Pharmaceutical wastes are one among them. Indian herbal sectors reports say that there are more than 9000 registered

herbal industries in India at present, these manufacturing unit produce large amount of waste per year³. Solid waste generated from herbal medicine production is enormous in volume and needs proper disposal otherwise may lead to environmental problems. The general rule of waste management is the 3 R, Reduce, Reuse and Recycle, which has to be adopted for the scientific and appropriate waste management in future⁴. Vermicompost is one such eco

friendly technique to manage herbal industrial waste into vermicompost. This compost can be used as biofertilizer or organic manure in plant cultivation which will improve and conserve the fertility of soil. Kunapajala is liquid organic manure, which is mentioned in Vrikshayurveda by Surapala and Sharangadhara, it has been stated that kunapajala is very efficient and act as plant nutrient and nourisher⁵

MATERIALS AND METHODS

MATERIALS:

This article is based on the review of literature from the Ayurvedic texts like Vrikshayurveda of Surapala, Vrikshayurveda of Sharangadhara, Various information regarding the Vermicompost is collected from different modern text book journals and articles.

VERMICOMPOST

The compost prepared from herbal industrial waste using earthworm is called vermicomposting. It is an efficient nutrient recycling low cost and eco-friendly process due to richness in nutrient availability and microbial activity⁶. Vermicompost increases soil fertility, enhance plant growth and suppress the population of plant pathogens and pests.

Vermiculture is a cost effective tool for environmentally sound waste management. Earthworms are the crucial drivers of the process, as they aerate, condition and fragment the substrate and thereby drastically alter the microbial activity and their biodegradation potential⁷.

Biodegradable organic wastes such as crop residues, municipal waste, hospital and industrial wastes pose major problems in disposal and treatment. Release of unprocessed animal and herbal manure into agricultural fields contaminate ground water causing public health risk. Vermicompost is the best alternative to conventional composting⁸.

EARTHWORMS

Earthworm is called as Farmers friend and also 'Intestine of earth', as they could digest a wide variety of organic materials. It play an essential role in carbon turn over, soil formation, participates in cellulose

degradation⁹. They utilize only a small portion of these wastes for their growth and excrete large amount of wastes consumed in a half digested form. Earthworm intestine contains a wide range of micro organism, enzymes and hormones which aid in rapid decomposition of half digested material transforming into vermicompost in a short time¹⁰.

As the organic matter passes through the gizzard of the earthworm it is grounded into a fine powder after which the fermenting substance act on them further aiding their breakdown within the gut associated with microbes converting them into mature product, the vermicompost¹¹. Earthworms are classified into epigesic, anecic and andogeic species based on definite ecological and trophic function. Epigesic earthworms are smaller in size, with uniformly pigmented body, high reproduction rate and regeneration. They contain an active gizzard which aids in rapid conversion of organic matter into vermicomposts. Hence, it can be used for vermicomposting¹².

Vermicompost plays vital role in safe management of biomedical waste and solid waste such as herbal industrial waste.

KUNAPAJALA AS BIOFERTILIZER

Cultivation of plant species using organic manure has been explained during 1000AD In India. This biofertilizer named as Kunapajala, reference of which can be traced in manuscripts of Vrikshayurveda written by Surapala in 10th century¹³.Kunapajala is also explained by Acharya Sharangadhara in 13th century in his compilation called Sharangadhara paddathi, Upavanavinoda chapter.

Classical method of preparation of Kunapajala: Flesh of marrow of deer, pig, fish, sheep, goat, should be boiled in water, when properly boiled the mixture is transferred to an earthen pot. To this add milk, powder of *Tila*, *Masha*, *Makshika*, *Gritha* and *Ushna Jala*, *Kashaya* of *Dhanyas* and *Dhadi* is added. There is no mention of fixity of the quantity of ingredients. The pot is then kept in warm place for fortnight; the resultant solution is called *Kunapajala*, the liquid organic manure¹⁴.

By taking this as reference, the wastes obtained from herbal industries can be converted as organic compost or vermicompost. The current global scenario firmly emphasizes the need to adopt ecofriendly agricultural practices for sustainable agriculture. Chemical agriculture has made an adverse impact on the healthcare of not only soil also the beneficial soil microbial communities and plant cultivated in these soils and also affect the quality of herbal drugs, hence organic manure is need of time. Organic manure helps to improve and conserve the fertility of soil and enhance the water holding capacity of soil. *Kunapajala* are going to become inevitable resource for farmers of India in future. Many scientist have carried out extensive research work on *Kunapajala* with special emphasis on cultivation of medicinal plants and agriculture, based on *Kunapajala*, preparation *Kunapajala* modified by Asha (2006) using meat of Rat, Fish, Goat meat, Chicken and Goat blood, where the modified *Kunapajala* showed the presence of Nitrogen and Phosphorus¹⁵. Composting *Kunapajala* helps in breaking down the manure into simpler forms, making it available to plants faster than the traditionally applied organic manure.

DISCUSSION

Pharmaceutical waste is an attractive nutrient source for crop production. Its antimicrobial property is an added quality which reduces the population of plant pathogenic micro organisms. But its direct application seems to have phytotoxic effect, so complete decomposition of this waste is necessary¹⁶. The idea of converting waste into energy is gaining popularity nowadays. Studies suggest that composting is one of the cost effective disposal technique. Vermicomposting can be adopted as option for disposal of organic wastes from Ayurveda hospitals and pharmacy. Decomposition can be assessed by different assessment criteria like Physical, Chemical, and Biological properties¹⁷. Pharmacy waste which includes chemical and minerals, minerals should be excluded from herbal wastes because it won't decompose easily and its properties are harmful to plant growth. It's a non thermophilic, biooxidative

process. The biological organic waste decomposition process yields the bio fertilizer which is used for cultivation of plants. This compost is finely divided, peat like material with high porosity, good aeration, drainage, water holding capacity, microbial activity and, excellent nutrient status, which helps to increase soil fertility and plant growth¹⁸.

Recent researches suggest use of vermicompost as biofertilizer has been increasing due to its extraordinary nutrient status, and enhanced microbial and antagonistic activity. The use of vermicompost promotes soil aggregation and stabilizes the soil structure.

CONCLUSION

All the components of solid waste have some potential if it is converted or treated in scientific manner. Solid waste disposal is alarming issue today. This waste is creating problems to public health, so there is intense need for efficient waste management system, the system should adopt proper collection, storage and processing and disposal of waste so that the impact of waste can be minimized and quality of life can be improved. Herbal industrial waste can be converted as vermicompost with the help of vermi culture technique. With depleting natural sources, cultivation of medicinal plants becoming essential to meet the growing demands of herbal requirement, but using chemicals in the form of fertilizers may have undesirable impact on the quality of the plant as well as human health, hence organic manure is need of the time, as it helps to improve and conserve the fertility of soil. As *Surapala* and *Sharangadhara* explained in *Vrikshayurveda Kunapajala* plays an important role in cultivation of medicinal plants.

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