Research Journal of Family, Community and Consumer Sciences _____ ISSN 2320 – 902X
Vol. **1(2),** 18-21, April **(2013)** *Res. J. Family, Community and Consumer Sci.*

Vermiculture: Eco-Friendly Measure to Reduce Household Pollution through Standard Method of Garbage Disposal

Singh Pratiksha and Singhvi Ritu
Department of Family Resource Management, College of Home Science, MPUAT, Udaipur, Rajasthan, INDIA

Available online at: www.isca.in
Received 24th November 2012, revised 23rd January 2013, accepted 22nd April 2013

Abstract

Domestic solid waste disposal is a matter of every day discussion at local and global level yet the problem evades solution. The technique of vermin-culture, if utilized by every homemaker would certainly reduce the serious environmental and health problem the world over. There is an urgent need to develop proper waste management technique for recycling of organic waste created from kitchen, farms and water bodies. It is estimated that in cities a human being creates about 0.4kg waste per day. Thus by year 2000, when there will create city refuse of about 44 (0.4 kg X300m.X 365 days) million per year. The present practice is just a way to remove dispose-off garbage, no matter where it put off, but actually a standard method of vermin-composting technique is required there. The process of vermin-composting requires the individual to collect the kitchen and garden waste in a container rather than disposing it. So, the vermin-culture is an environmentally beneficial technique and it requires little investment of time and some inexpensive materials.

Keywords: Kitchen Waste, Indoor Environment, Eco-Friendly, Worms.

Introduction

The sustainable and eco-friendly development of human resources in a country is not possible without the preservation of clean environment. Many opportunities will be lost if urgent resource management and regeneration plan are not put into action. An improper handling or neglect of waste effects the environment and health of living beings whereas its appropriate management ensures conservation of environment and better health of living beings. The disposal of garbage from kitchen and garden is becoming an attention drawing problem in urban areas. We find heaps of garbage in many street corners and on road sides creating insanitary conditions. This results in an unhealthy environment.

India produces around 3000 million tones of organic waste annually. This huge volume of waste(s) comes from agriculture, urban and industrial sources and also from domestic activities. So there is an urgent need to develop proper waste management technique for recycling of organic waste created from kitchen, farms and water bodies. It is estimated that in cities a human being creates about 0.4kg[1] waste per day. Thus by year 2000, when there will create city refuse of about 44 (0.4 kg X300m.X 365 days) million per year.

A clean and green city is bound to be free of environment degradation. One of major aims of making a city environmentally safe is to rid of its garbage and particularly implement the concept of 'zero garbage' at least by road side. And therefore an eco-friendly way of disposing garbage must be given a thought to clean and beautify or cities.

The environment is very broad in itself, consisting of natural resources like air, water, soil etc. we are the only living beings to have such an environment which made life possible. Therefore, it becomes our prime duty to conserve our beautiful environment.

Process of Vermicomposting

The process of vermicomposting requires the individual to collect the kitchen and garden waste in a container could be a pit in the garden, a clay pot, a plastic tub or metal box with holes. The base of the bin is filled with small stone or slow degrading plant residue for about 5 cm to be covered with a 5-8 cm thick layer of cow dung. Over the cow dung put a thin layer of fresh vermin compost containing live adult earthworms. This layer is over layered by 15-20 cm thick layer of mixture containing cow dung, kitchen waste, garden waste etc. the surface should be covered with jute cloth and moist from time to time maintain a moisture of about 30 per cent. After about one and half months the entire processing is completed and the individual will get the natural manure which can be used in the garden.

So, the vermiculture is an environmentally beneficial technique and it requires little investment of time and some inexpensive materials. The present research endeavors to develop an integrated solid waste management project which is environmentally acceptable, financially affordable and people participatory.

Kitchen waste material was collect from houses, then air dried and grinded into small pieces. This grinded waste material was mixed with cow dung in the ratio of 4:1 (w/w) and was

subjected aerobic composting to initiate microbial activity. Moisture content of the was maintained to 60% to 70% and this mixture was then kept in plastic containers covered with paper having holes to facilitate aeration in order to get final composted material. This mixture was hand manipulated at regular time intervals and remoistened for sufficient microbial activity.

Vermicompost is the product or process of composting using various worms, usually red wigglers, white worms, and other earthworms to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast. Vermicast, also called worm castings, worm humus or worm manure, is the end-product of the breakdown of organic matter by an earthworm. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than do organic materials before vermicomposting.

'Vermiculture' literally means worm growing or worm farming. When earthworms are used primarily for the production of compost, the practice is referred to as vermicomposting

In late 1980s and early 1990s agricultural scientists in the world realized the limitations of chemical fertilizers used for fertility management. While on one hand research was initiated to improve the use efficiency of chemical fertilizers, on other hand alternative inputs were also considered. Organic matter recycling has been in use in India for centuries. In 19th and 20th century scientific methods for converting low value organic matter into high value organic composts were developed. The activities of earthworms for recycling of organic matter became the focus of attention by scientific community in mid-1990s. Initially vermiculture i.e. use of surface. Living earthworms was carried out at a very small scalemainly for management of kitchen wastes. In 1995 Morarka Foundation began with 100 earthworms of Eisenia foetida species to develop a commercial process of vermiculture. This pioneering effort enabled Morarka Foundation to become the single largest producer of vermicast in 1998, a position which it still enjoys[2].

Large scale vermicomposting occurs in many countries and the vermicompost may be used for farming, landscaping, making worm tea or for sale. Small scale vermiculture has become increasingly popular in the past few years as individuals become aware of the huge advantages of vermiculture and its environmental benefits. There are a number of small vermiculture systems available which makes starting a worm farm a simple exercise. A good worm farm will come with the information necessary to maintain the farm.

It was reported[3] that lysimeter studies concludes that when organic manure or organic wastes such as compost or sewage, sludge are applied on land, the organic matter of soil increases and slight change in pH of soil occurs.

Recycling[4] is a common term used now-a-days, described that recycling means use of materials either in original quality or changed quality for repetitive use. Recycling is mainly resorted to when the material is scarcely available or its cost is prohibitive, when the cost of disposal is prohibitive or banned by legislation, now-a-days, recycling is quite common on account of costly materials in use and the problems associated with disposal. In fact there are auxiliary industries based on recycled material viz. PVC, plastic, HDPE etc. which are used for recycling and cheaper materials are produced.

A pilot project[5] on community solid waste management in the city involving residents of Bangalore City Corporation was taken. This project covers around 200 households. Garbage generated is segregated into wet waste and dry waste at the house hold level. Dry waste is sent for recycling by vermicomposting and wet waste is dumped into a specially constructed pit for compositing to determine the quickest and most efficient method for compositing. Such efforts will not only keep the city clean and free from pollution, but also serve as an alternative source to chemical fertilizers if recycled and used properly.

Earthworms are truly amazing creatures that hold vast potential for addressing many of our current ecological concerns, including climate change and food security. Perhaps surprisingly, this is not breaking news. Earthworms aerate, till and fertilize the soil, breaking down organic waste into plant-available forms, improving the soil structure and nutrient and water-holding qualities of soil. In the past 50 years in particular, the use of chemical fertilizers, over-tillage of the soil and the use of pesticides have killed earthworms and other beneficial organisms, leading to poor soil fertility, loss of soil structure and soil erosion. At the same time, rotting organic waste dumped in landfills is polluting our underground water supply and releasing vast amounts of the greenhouse gases responsible for global warming.

While fertile soil has in the region of 5-million microbes per gram, worm castings have been found to contain up to 100-million microbes per gram - up to 20 times more! In the soil, these microbes continue to break down organic matter into plant-available forms, thereby enabling plant roots to take up nutrients that would otherwise have stayed bound in the soil. These beneficial organisms also suppress the growth of pathogens, which means healthy soil and healthy plants. Researchers have identified and named thousands of distinct species of earthworm, but to date only around six have been identified as useful in vermiculture systems. These species have the ability to tolerate a wide range of environmental conditions and fluctuations and they are not adversely affected by handling and disruption of their habitat. Other qualities that make these species suitable include relatively short life spans, and rapid growth and reproductive rates.

Earthworms eat organic waste and give us healthy soil and organic fertilizer in return. Put simply, it is a deal that humanity cannot afford to pass up. Researchers have identified and named

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Earthworm systems are typically managed for one of three reasons; waste management, production of worm biomass and production of castings (vermicomposting). FullCycle's interest in vermiculture primarily has to do with the promotion of environmentally sound waste management practices, but also the beneficial re-use of waste/resources through the production of solid (vermicompost) and liquid fertilizer (vermi-tea or worm tea).

It is evident by Alok Bharadwaj from the data that kitchen waste material (control) characterized with high values of pH (9.32), organic carbon (7.25%) and organic matter (12.49%). However, other nutrients such as total nitrogen (0.214%), available phosphorus (0.11%) and exchangeable potassium (0.086%) were found in very trace amounts. The vermicomposting activity significantly modified the physical and chemical properties of kitchen waste material that can be an important tool for organic farming. It is also indicated that during vermicomposting the pH declines (from 9.32 to 8.37) with the advancement of vermicomposting period (from 0 to 75 days). It might be on account of high mineralization of nitrogen and phosphorus into nitrates/nitrites and ortho-phosphate. Moreover, the organic carbon content, organic matter and C: N ratio of the kitchen waste material also showed the same pattern and decline gradually upto 75 days. The highest values of organic carbon, organic matter and C:N ratio were obtained in control (0 day) i.e. 7.25%, 12.49% and 30.08% respectively and lowest values were obtained after 75 days of vermicomposting i.e. 3.69%, 6.37% and 4.79% respectively.

The most common worms used in composting systems, redworms (*Eisenia foetida, Eisenia andrei,* and *Lumbricus rubellus*) feed most rapidly at temperatures of 15–25 °C (59-77 °F). They can survive at 10 °C (50 °F). Temperatures above 30 °C (86 °F) may harm them.This temperature range means that indoor vermicomposting with redworms is suitable in all but tropical climates. Other worms like Perionyx excavatus are suitable for warmer climates. If a worm bin is kept outside, it should be placed in a sheltered position away from direct sunlight and insulated against frost in winter. It is necessary to monitor the temperatures of large-scale bin systems (which can have high heat-retentive properties), as the feedstocks used can compost, heating up the worm bins as they decay and killing the worms.

Because of the benefits described above, and despite these drawbacks, farmers around the world have started to grow worms and produce vermicompost in rapidly increasing numbers. Warmer climes have tended to predominate so far, with India and Cuba being the leaders to date. Vermicomposting centres are numerous in Cuba and vermicompost has been the largest single input used to replace the commercial fertilizer that became difficult or even impossible to import after the collapse of the Soviet Union[6]. In 2003, an estimated one million tonnes of vermicompost were produced on the island. In India, an estimated 200,000 farmers practice vermicomposting and one network of 10,000 farmers produces 50,000 metric tonnes of vermicompost every month. In the past decade, farmers in Australia and the West Coast of the U.S. have started to use vermicompost in greater quantities, fuelling the development of vermicomposting industries in those regions. At the same time, scientists at several Universities in the U.S., Canada, India, Australia, and South Africa have started to document the benefits associated with the use of vermicompost, providing facts and figures to support the observations of those who have used the material.

Conclusion

Vermiculture is the best way of disposing waste coming from kitchen or kitchen garden. Through this process no chemicals; no any reaction needed to convert these wastes into manure. It is a proper method of handling of waste which appropriate management of these wastes and ensures conservation of environment and better health of living beings. Vermiculture production has now become a major component of agri-business models across the country. Vermicompost is richer in nutrients than the compost from a regular backyard composter. It is also performs better as a planting medium than a commercial potting mix with added nutrients. Worm castings, which are product from vermicomposting, also hold moisture better than plain soil and contain worm mucus which allows for the prevention of nutrients being washed away at first watering. In this way both the purpose of improved indoor climate as well as organic farming is achieved. So, the vermiculture is an environmentally beneficial technique and it requires little investment of time and some inexpensive materials.

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