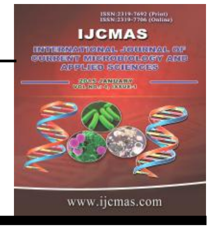
Int.J.Curr.Microbiol.App.Sci (2015) 4(3): 1098-1101



International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 4 Number 3 (2015) pp. 1098-1101**
http://www.ijcmas.com

Review Article

Improving Rural Livelihood through Vermicomopsting of Agro-industrial Wastes

Shweta Yadav*

Department of Zoology, Dr H S Gour Vishwavidalaya (A Central University), Sagar-470003, MP, India
**Corresponding author*

A B S T R A C T

Livelihood opportunities in dry tropical regions of India are often closely linked to soil fertility condition. Although farmers in specific localities have similar backgrounds and possess similar natural resources, there are often surprisingly drastic differences in their economic status. One of the factors determining the economic well being of farmers is soil fertility. The biological component of soil, living organism and dead organic matter, is the major factor limiting fertility of dry land soils .Therefore, improving the biological fertility is a priority of land development programmes, when activities designed for such purposes also provide livelihood opportunities, the potential benefits are much larger. Often their land is so degraded that these farmers are forced to seek a livelihood elsewhere as migratory laborers. Making them realize that the land they possess can be turned into valuable asset and encouraging them to return their farms was the primary objective the present study.

Keywords

Vermicomposting, Earthworms, *Eisenia foetida*

Introduction

The term *vermicomposting* refers to the use of earthworms for composting organic matter and the latest biotechnology which helps in giving biofertilizers in the term of *vermicompost*, for agricultural uses and a high priority protein (earthworm biomass) for supplementing the nutritional energy needs of animals or a faster rate. Vemicomposts especially, earthworms cast are the final product of vermicomposting. Vemicomposting is basically a process of composting with earthworms (*Eisenia foetida*, *Perionyx excavatus*, *Eudrilus eugeniae*) and can be done virtually anywhere either in indoor or outdoor conditions. Organic wastes used for composting animals dung (cattle dung, sheep dung, goat dung, and poultry droppings), mushroom agricultural wastes (after harvesting and threshing of the produce), forestry wastes(wood-saw, peels, saw dust leaf litter (mango, guava, oranges etc. from residential areas)paper and cotton clothes.

Indian Vemicomposting Worms

Indian earthworms fauna predominantly represented by native species, constitute

89% of total earthworm diversity in the country. Although the land area of the country is only two percent of the world's land mass but it supports about 10.5% of the total known species of the global earthworm diversity(Julka 1988). An extensive survey has been carried out to find more vermicomposting species. *Drawida willsi*, *Lennogaster pusillus* and *Perionyx cyclensis* and *Peronyx sansibaricus* have been added as potential species for vermicompostng in addition to common Vemicomposting worm (Singh *et al.,* 2011;Verma *et al.,* 2010).

Earthworm Activates Cellouloysis

The direct role of earthworms in cellulose decomposition observed negligible yet the worms constitute an important component to play a decisive role indirectly. The data obtained in our experimentation suggests there was a microbial succession during cellulose decomposition in vermireactors containing earthworms at the initial stage (first 7 weeks) during which fungi played an important role, triggering speedy cellulolysis and at a later stage bacteria acted as a principal decomposer (Shweta, 2012; Kumar *et al.,* 2010a).

Enzymatic Activities and Microflora of Earthworm gut as sensitive indicator

Hydrolases (β-gloucosidase, N-benzoyL-1-argininamide (BAA) hydrolyzing protease, urease, phosphatase, cellulase) and dehydrogenase activities of earthworm gut are sensitive indicators of a particular state and evolution of organic matters stabilization process. It was recorded that *Aspergillus flavus*, *A.fumigatus*, and *Streptomyces* aureus were not digested by earthworms due to production of antibiotic inhibitory substances or production of phyto-toxic metabolites. Further, the microbial population in the cast increases due to environmental conditions, prevailing microbial status in the gut of earthworm, or multiplication of microbes while passing through the gut of worms or large surface area of the casts ideally suited for better feeding and multiplication of microbes demonstrated the enhanced enzyme activity due to microbial flora (Kumar and Shweta, 2011a; Kumar *et al.,* 2011; Kumar *et al.,* 2010a). Finally, the dehydrogenase, hydrolytic activities and Microflora correspond with the production of maximum biomass of the worm from a maturation phase; this provides an indication of the dynamics of organic matter degradation and allows to distinguish the end of hydrolytic and maturation phase that could be useful in characterizing the status of vermireactors.

Pathogen Destruction

Small scale vermireactors indicated that human pathogens may not survive in vermicomposting (Kumar *et al.,* 2011; Kumar and Shweta, 2011a). It was observed that after 60 days of vemicomposting faecal coliform bacteria in biosolids dropped from 39000 MPN/g to 4000 MPN/g. In the same period *Salmonella* sp. dropped from <3 MPN/g to <1MPN/g. The study further suggests the way through which earthworms selectively inhibits the growth of bacterial pathogens present in the organic wastes. The presence of pathogenic organisms namely, *Shigella*, *Escherichia*, *Flexibacter* were observed at initial stage of waste and other vermistabilization, reduced to zero concentration. This amply demonstrated that these pathogens have been eliminated as they enter in food chain of earthworm. However, *Pseudomonas* and *Streptosporangium* seem to be responsible for reduction of pathogens and metabolization of other organics in waste degradation process and availability of nutrients, particularly solubilization of phosphorous to the soil, thereby, improvimg the quality of vermicompost.

Combining Microbial Composting with Vermicomposting

Recently, a technology has been developed to enhance lignocelluloses (especially wastes of sugar-mill and timber industry) degradation prior to vemicomposting with efficient microbes including P*hanerochete chrysosporium*, *Pleurotus sajorcaju*, *Trichoderma viridae* combining microbial activation with vemicomposting shorten stabilization time of waste degradation process and drastic increase in production of vermicompost with the limited number of earthworms (Kumar *et al.*, 2010b).

Nitrogen and Humification Process in Vermicompost

Total nitrogen at different times of vemicomposting was decreased being more marked at the final stage when earthworms activity was higher. The different nitrogen fractions followed a similar tendency to the total nitrogen. At the final stage of the process, when earthworms population was higher and active, important reductions of the organic nitrogen content and a higher nitrification was observed (Kumar *et al.*, 2010b). The nitrification was 50 to 65 percent higher in earthworm treatments. A decrease in the carbon from fulvic acids and an increase in the percentage of the carbon from humic acids were observed through the vemicomposting process; the latter was more conspicuous at the end of the process when there was a higher and active earthworm population. Through vemicomposting the humic substances increases from 40 to 60 percent which was higher than the value obtained for the composting process.

Plant Growth Promoters

Agro-industrial wastes can be broken down and fragmented rapidly by earthworms, resulting in a stable non-toxic material with good structure which has a potentially high economic value as soil conditioners for plant growth. Vermicompost is a finely divided peat like material with excellent structure, porosity, aeration drainage and moisture building capacity. This also supply suitable mineral balance and improves nutrient availability and could act as complex – fertilizer granules.

Livelihood Opportunity for Women

As the activity caught on, it was observed that in most farm-holdings, vermicompost had become the responsibility of women as it required continuous involvement without hard manual labor. The simple production process and flexibility in terms of time needed to attend the activity allowed the women to readily incorporate it in their routine of household chares. To take advantage of the skills of women in managing this activity and to convert the dung, leaves and other bio-wastes found littered in rural areas. The task of vermicompost making developed into an income –generating activity. In particular, it became an attractive opportunity for landless people in villages. Self help groups (where 10-20 likeminded women work together with a common aim) are actively associated in collecting and selling the vermicompost in western region of Uttar Pradesh. A good linkage has been developed in the village cluster for marketing the worms and compost produced through self help group.

An example of successful use of this technology is in Hussain development block of district Hathras (UP), where a group of farmers were also encouraged to adopt intensive rose cultivation with the application of vermicompost at the rate of 1-15 tons per hectare per year. In spite of heavy nutrient extraction through repeated harvests these farms have sustained their production during the past two years. The organic carbon content % has increased in the land with continuous application of the vermicompost the rose fields as the study revealed.

Traditional batch and bed vermicomposting systems may be an alternative way to meaningfully manage agro-industrial wastes produced at large scale in order to obtain valuable enriched organic fertilizer Vemicomposting either at small scale or large scale may have an important role to play in agro-industrial waste management and that both microbial composting and vemicomposting are not necessarily mutually exclusive but both systems could be used in sequence to take advantage of unique and valuable features of each.

Acknowledgement

Author acknowledges the financial support of the Department of Biotechnology, Ministry of Science and Technology, Govt. of India, New Delhi, to carry out this study.

References

Julka J.M., 1988. The Fauna of India and the adjacent countries. Megadrille : Octochaetidae (Earthworms) Haplot-axida, Lumbricina : Megascolecidae : Octochaetidae XIV. Records of Zoological Survey of India.pp. 400.

Kumar Rahul and Shweta, 2011a. Removal of pathogens during vermistabilization. International *Journal of Environ-mental Science and Technology*. dos#-7887/DOI: 10.3923/jest.2011.

Kumar Rahul and Shweta, 2011b. Enhancement of wood waste decomposition by microbial inoculation prior to vermicomposting. *Bioresource Technology* 102:1475-1481

Kumar Rahul, B. L.Singh and Shweta, 2010a. Enzyme activities and microflora of earthworm gut and vermireactors as indicators of the stabilization of wastes degradation process. *Bioremediation Journal* 14 (3): 150-157.

Kumar Rahul, Singh,S.K and Shweta,2011. Effect of Earthworms on Removal of Pathogens during Stabilization of Industrial Organics. *J. Life sciences* 5:794-844.

Kumar Rahul, Verma Deepshikha,Bhanu L.Singh, Umesh Kumar and Shweta, 2010b. Composting of sugar-canewaste by-products through treatment with microorganisms and subsequent vermicomposting. *Bioresource Techno-logy* 101: 6707–6711.

Shweta, 2012. Cellulolysis: A transient property of earthworm symbiotic/ingested microorganisms? *Int J Scientific and Research Publication* dos.www.jsrp.org/research paper-1112/ijsrp-p1134b.

Singh Gunjan, Verma Deepshikha and Shweta, 2011. Distribution earthworm resources of South –western Semi-dry region of Uttar Pradesh,India. Proceedings Conquering Impact of Climate Change on Agriculture Through Organic Farming – A Global Perspective (Eds. Shweta & V.K.Singh) D.S. College (Dr BRA University), Aligarh - 202001,UP,India pp151-156.

Verma Deepshikha, Bharti Shachi and Shweta, 2010. Biodiversity of earthworm resources in gangetic plain of Uttar Pradesh, India. *Tropical Natural History* 10(1): 53-60.