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Research Article

BIODEGRADABLE WASTE COMPOSTING IN SENAPATI, MANIPUR

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Abstract- Field experiment was taken up at Krishi Vigyan Kendra- Senapati, Manipur, India for conversion of bio-degradable waste materials of KVK-Senapati farm into usable organic compost through vermicomposting during the years 2012-13, 2013-14 and 2014-2015 respectively by using earthworm species *Eudrilus eugeniae* and *Eisenia foetida*. Vermipit of size (10x3x 2) ft of 10 numbers were constructed with concrete cement and silpauline sheet at the KVK-Senapati farm. About 12 tons of vermicompost and 450 litres of vermi wash were obtained from 50 tons of waste materials during the year 2012-13, 13 tons of vermicompost and 500 litres of vermiwash were obtained from 55 tons of waste material during the year 2013-14 and 14.50 tons of vermicompost and 600 litres of vermiwash were obtained from 60 tons of waste materials during the year 2014-15. A sum of Rs 188,250 (One lakh eighty eight thousand two hundred and fifty), 208,500 (Two lakh eight thousand and five hundred) and 239,000 (Two lakh thirty nine thousand) only were generated from 50, 55 and 60 tons of waste materials respectively. Thus the technology provides good self-employment opportunity and sound economy of the tribal farming community.

Keywords- Bio-degradable, Vermicompost, Vermiwash, *Eudrilus eugeniae* , *Eisenia foetida*

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Introduction

Bio-degradable waste material is the sustainable source for organic manure production for improving the livelihood of any farming community. Vermiculture converts farm wastes into organic fertilizer, making it an environment-friendly technology. Vermicompost is an efficient and eco friendly way to convert any biodegradable wastes into quality manure within relatively shorter period of time utilizing earthworm species. Composting through earthworm is advantageous in preventing the loss of nutrients, beneficial micro-flora and vitamins, as strong heat does not generate during the process. Vermicomposting is one of the ways to reduce this organic waste and it has been practically used all over the world. Vermes is Latin word for worms and vermicomposting is essentially composting with worms [1]. Vermiculture is basically the science of breeding and raising earthworms. It defines the thrilling potential for waste reduction, fertilizer production, as well as an assortment of possible uses for the future [2]. Vermicomposting is a process of utilizing earthworms and it is an eco-biotechnological process that transforms energy rich and complex organic substances into a stabilized humus-like product [3]. A wormery is a self-contained composting system that does not generate heat, retains most nutrients for reuse and properly maintained its odorless [4]. Vermicompost does not have any adverse effect on soil, plant and environment. It improves soil aeration and texture thereby reducing soil compaction. It improves water retention capacity of soil because of its high organic matter content. It also promotes better root growth and nutrient absorption and improves nutrient status of soil, both macro-nutrients and micro-nutrients [5]. Huge quantity of crop residues and weed biomass (5-50t/ha/year) generated in and around farmland may be a potential source of organic matter and plant nutrients if, properly utilized. Vermicompost are effective organic fertilizers and biocontrol agents [6,7]. Vermicompost can improve food quality without compromising with food safety [7]. Applications of vermicompost singly or in combination with either other organic fertilizers or chemical fertilizers have been proved effective to enhance growth and yield of various plants like Urad and Soyabean [8] and fruits like lemon [9].

The benefits of vermicompost to seedling vigor and plant health are attributed in large part to high concentrations of plant available macro- and micro nutrients, plant growth promoting organic acids and high microbial activity, all of which may confer tolerance to stress [10,11]. When the organic material passes through the gut of the earthworm it again increases the surface area of the material so that the microorganisms can break it down further. The undigested materials, or castings, are fertile and rich in nutrients readily available to plants [12]. The utilization of waste materials through the earthworm has given the concept of vermicomposting. The vermitech approach utilizes waste management process by involving earthworms [13]. Vermiculture is environment friendly since earthworms feed on anything that is biodegradable, vermicomposting then partially aids in the garbage disposal problems. No imported inputs required, worms are now locally available and the materials for feeding are abundant in the locality as market wastes, grasses, used papers and farm wastes. It is also highly profitable, both the worms and castings are saleable. The key objective of this investigation was to highlight the importance of vermicompost as an enterprise for improving the livelihood of young tribal farmers of Manipur and to standardize a robust procedure for conversion of organic waste materials into vermicompost using various strains of earthworms.

Materials and Methods

An experiment was conducted during 2012-13, 2013-14 and 2014-15 at Krishi

Vigyan Kendra- Senapati, Manipur, India with an objective of recycling bio-degradable farm waste materials into valuable organic manure (vermicompost) for income generation of tribal farming community in the hills.

Table-1 *The average N, P and K contents (%) of vermicompost obtained from KVK-Senapati farm waste under three seasons*

Sl. No	Season	N (%)	P (%)	K (%)
1	Rainy	1.86	0.60	0.88
2	Winter	1.72	0.55	0.84
3	Summer	1.40	0.50	0.83

The geographical area of the district is 3271 sq. km with 14.56% of the total geographical area of the state. The average temperature ranges from 4°C to 32°C and average annual rainfall varies from 671 to 1454 mm. It is located between 24° 30'N latitude and 93° 30'E longitude over the globe. The altitude of the district ranges from 800 to 4000 m above MSL. Senapati district has alluvium, lateritic black regur and ferruginous type of soil [14]. Vermipit of size (10x3x2) ft of 10 numbers has been constructed with concrete cement and silpauline sheet at the KVK-Senapati farm. A quantity of 50, 55 & 60 tons of waste materials of KVK farm has been cleaned and collected for vermiculture during the year 2012-13, 2013-14 and 2014-15 respectively. Two species of earthworms namely *Eudrilus eugeniae* and *Eisenia foetida* are commonly used [15]. The earthworms and vermicompost were harvested after 70-75 days during winter season and 60-65 days during summer season.

Results and Discussion

The vermicompost production was carried out at KVK farm using earthworm species *Eudrilus eugeniae* and *Eisenia foetida*. Earth worms have been used since ages for the conversion of garbage into useful manures [16,17]. The species of earthworms used in the present study have also been known for conversion of biological wastes in to valuable compost and have been reported in several other studies [18,15]. Earthworms excreta (vermicast) is a nutritive organic fertilizer rich in humus, NPK, micronutrients, beneficial soil microbes; nitrogen-fixing, phosphate solubilizing bacteria, actinomycets and growth hormones auxins, gibberlins & cytokinins.[19] The results from [Table-1] indicated that the vermicompost contents N, P and K (%) was high during the rainy season of farm waste materials as compared to other seasons of waste materials. Improvement of soil properties with the application of organic manures like vermicompost has also been demonstrated by [20] and [9]. The results from [Table-2] revealed that during 2012-13 a quantity of about 12 tons of vermicompost and 450 litre of vermiwash was produced from 50 tons of farm waste. Application of vermicompost has found to be effective in increasing yield of field crops like maize [21] and Soybean [22]**.** The conversion ratio of waste materials of compost was found to be 4.2:1. A sum of Rs. 188,250 , can be generated from 50 tons of waste materials. During 2013-14 a quantity of about 13 tons of vermicompost and 500 litre of vermiwash has been produced from 55 tons of farm waste. The conversion ratio of waste materials of compost during 2013-14 is found to be 4.2:1 ratio. A sum of 208,500 could be generated from 55 tons of waste materials. During 2014-15 a quantity of about 14.50 tons of vermicompost and 600 litre of vermiwash has been produced from 60 tons of waste materials. The conversion ratio of waste materials of compost during 2014-15 is found to be 4.1:1. A sum of Rs. 239,000 can be generated from 60 tons of waste materials. Such income generation and feasibility studies from waste management using vermicomposting have also been reported by [23] and [14]

Table-2 *Year wise data for collection of farm waste, amount of vermicompost, vermiwash and net income*

Year	Wt of farm waste collected for composting	Wt. of vermicompost	Amount of vermiwash	Cost of collection and hiring of labour	Gross income		Total gross income	Net income
	(ton)	(ton)	(litre)	(Rs)	Vermicompost	Vermiwash	(Rs)	(Rs)
2012-13	50	12	450	54,000	240,000	2,250	242,250	188,250
2013-14	55	13	500	54,000	260,000	2,500	262,500	208,500
2014-15	60	14.50	600	54,000	290,000	3,000	293,000	239,000

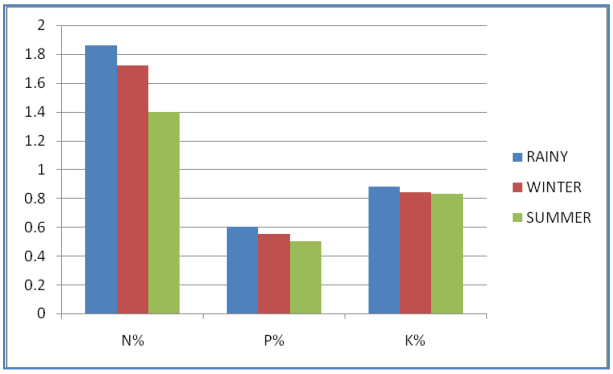

Fig-1 The average N, P and K contents (%) of vermicompost obtained from KVK-Senapati farm waste under three seasons (Rainy, Winter & Summer)

Conclusion

Vermicompost is an efficient and eco-friendly way to convert any biodegradable wastes into quality organic fertilizer within relatively shorter period of time. Vermiculture can be made into a livelihood program and become a source of extra income through selling the vermicast and also the vermi worms. It will provide good self-employment opportunity and sound economy of the tribal farming community. Huge quantities of domestic, agricultural and rural industrial organic wastes can be recycled for various usages. This also reduces pollution. Vermicompost wastes at source or place where one wishes or has facilities, compost can be more profitably utilised and commercialization for economic gains. Earthworms are one of the easily available biological indicators of soil activities and this natural facility need to be used for monitoring and maintaining the biological health of soil. The technology of utilizing farm waste materials for production of vermicompost needs to be popularized among the tribal farming community of the Senapati district, Manipur, India.

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