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Vermicomposting of the sugarcane trash using local earthworm species of Jammu

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Abstract

In the present investigation, an attempt has been made to vermicompost i)the sugarcane trash only and ii) sugarcane trash and cow-dung in ratio of (1:1) using local earthworm species viz. *Metaphire posthuma* (Vaillant), *Metaphire houlleti* (Perrier) and *Amynthas morrisi* (Beddard). Overall from study it is concluded that local species of earthworm particularly *M.posthuma* can be used to vermicompost sugarcane trash in combination with cow-dung in ratio of (1:1) so that the nuisance and environmental pollution due to unmanaged disposal of sugarcane trash can be reduced.

Keywords: *Vermicompost, sugarcane trash, cow-dung, local earthworm species*

Introduction

Vermitechnology is the process by which biological degradation of organic wastes takes place in controlled conditions due to earthworms feeding on the materials. There are mainly two approaches of vermitechnology: one is the process of vermicomposting resulting in the production of organic manure and aiding in waste management and the other is its application in the conservation processes of land or reclamation of waste lands (especially organic farming) (Abbasi and Ramasamy, 2001). Vermicomposting – is the bioconversion of organic waste materials through earthworm consumption (Gupta and Dwivedi, 2001).Sugarcane trash is the waste generated after extracting juice from sugarcane. Sugarcane juice is taken as a soft drink particularly in summer. In Jammu large number of sellers are involved in sugarcane juice selling and thus producing a lot of sugarcane trash which is either burnt or thrown into rivers or becomes breeding ground for flies, mites and microbes.

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If this is used as a raw material for production of vermicompost, it not only abates pollution load of this waste but also leads to conservation of resources. In present investigation, an attempt has been made to vermicompost i) the sugarcane trash only and ii) sugarcane trash and cow-dung in ratio of (1:1) using local earthworm species from Jammu.

Material and Methods

From the different parts of Jammu, three epigeic species of earthworm i.e. *Metaphire posthuma* (Vaillant), *Metaphire houlleti* (Perrier) and *Amynthas morrisi* (Beddard) were collected and got identified by Dr. J. M. Julka, former Jt. Director and Emeritus Scientist Zoological Survey of India, presently working as Director (planning) at Shoolini Institute of Life Sciences and Business Management, Solan (HP).The twenty four vermibed were prepared in wooden boxes of size 35 cm × 20 cm × 17 cm. At the bottom saw dust and paddy straw was placed and filled up to 3-4 cm, followed by 3 cm layer of fine sand and then 3cm layer of garden soil. Finally, 2-3 inches of a week old cattle dung was spread over the surface of soil as a bait to acclimatize earthworms. Three vermibeds were used as replicas for each species

of earthworm and thus a total of nine vermibeds (i.e. three sets for inoculation with specific earthworm species) for vermicomposting of sugarcane trash only and nine vermibed (i.e. three sets for inoculation with specific earthworm species) for vermicomposting of sugarcane trash and cow-dung (1:1) were used. Each vermibed was inoculated with approx. 100 gms. of specific earthworms species and the remaining six vermibeds with no inoculation of earthworms were set as control sets i.e. three vermibed with Sugarcane trash only and three vermibed with Sugarcane trash and Cow-dung (1:1).Sugarcane trash was chopped into smaller pieces dried and soaked at the rate of 100 gms / vermibed into water for 24 hours to be used as follow:

i) 100 gms (on dry wt. basis) Sugarcane trash only per vermibed for 12 vermibeds (i.e. nine experimental sets and three for control set).

ii) Sugarcane trash and Cow-dung in ratio of (1:1) i.e. 100 gms (on dry wt. basis) Sugarcane trash and 100 gms of dry cow-dung per vermibed for 12 vermibeds (i.e. nine experimental sets and three for control set).

After complete composting, the loose layer of soil along with decomposed organic material and worm casts was collected, dried in oven at 100^0C crushed and sieved. This was termed as vermicompost. After harvesting, fresh organic waste was again added twice to respective vermibeds to get IInd and IIIrd harvestings respectively. Number of days for completion of vermicomposting during each harvesting was also recorded. (Tables I and II).

Results and Discussion

The analysis of the data regarding Vermicompost production potential of *M.posthuma, M.houlleti* and *A.morrisi* on 100 % sugarcane trash revealed that *M.houlleti* vermicomposted on an average 21.7±0.9 % of Sugarcane trash in 52 days during 1st harvesting, 18.7±2.4 % of Sugarcane trash in 51 days during 2nd harvesting and 20.3±1.4 % of sugarcane trash in a period of 49 days during 3rd harvesting thereby exhibiting average vermicompost production potential of 20.23 % per harvesting in average number of 50.6 days per harvesting. The vermicompost production potential of *A.morrisi* during 1st, 2nd and 3rd harvesting exhibited values of 19.3±2.4 %, 21.3±1.4 % and 19.9±1.1 % respectively in a period of 54 days, 53 days and 51 days respectively with average vermicompost production potential of 20.17 % per harvesting in average number of 52.6 days per harvesting.*M.posthuma* vermicomposted on an average 19.0±1.8 % of sugarcane trash in 50 days during 1st harvesting, 16.2±2.1 % of sugarcane trash in 49 days during 2nd harvesting and 17.6±1% of Sugarcane trash in a period of 47 days during 3rd harvesting thereby exhibiting average vermicompost production potential of 17.6 % per harvesting in average number of 48.6 days per harvesting.The analysis of data regarding vermicompost production potential of *M.posthuma, M.houlleti* and *A.morrisi* on sugarcane trash and Cow-dung (1:1) revealed that the vermicompost production potential of *M.posthuma* during 1st, 2nd and 3rd harvesting exhibited values of 61.9±3.6 %, 67.6±4.2 % and 64.0±1.2 % respectively in a period of 45 days, 43 days and 42 days respectively with average vermicompost production potential of 64.5 % per harvesting in average number of 43.3 days per harvesting. *A.morrisi* vermicomposted on an average 61.3±4.8 % of Sugarcane trash and cow-dung (1:1) in 55 days during 1st harvesting, 56.5±1.8 % of sugarcane trash and cow-dung (1:1) in 53 days during 2nd harvesting and 59.3±2.6 % of Sugarcane trash and cow-dung (1:1) in a period of 50 days during 3rd harvesting thereby exhibiting average vermicompost production potential of 59 % per harvesting in average number of 52.7 days per harvesting. The vermicompost production potential of *M. houlleti* during 1st, 2nd and 3rd harvesting exhibited values of 57.4±2.8 %, 62.5±4.8 % and 59.52±2.8 % respectively in a period of 49 days, 48 days and 47 days respectively with average vermicompost production potential of 59.8 % per harvesting in average number of 48 days per harvesting.

From above analysis it is concluded that all the three local species of earthworm were observed to be inefficient for vermicomposting of exclusive sugarcane trash but all the three species were observed to be efficient for vermicomposting of sugarcane trash along with cow-dung in the ratio of (1:1). Muthukumaraswamy *et al.* (1997**)** composted sugar industry by products such as

Table 1: Vermicomposting potential of local earthworm species on 100% Sugarcane Trash

S. No	Name of species	Average % age of Sugarcane Trash vermicomposted per vermibed during					
		Ist harvesting	No. of days	2nd harvesting	No. of days	3rd harvesting	No. of days
1	*Metaphire posthuma*	19.0±1.8 (17.36-20.92)	50	16.2±2.1 (13.80-17.15)	49	17.6±0.99 (16.48-18.36)	47
2	*Metaphire houlleti*	21.7±0.9 (20.87-22.71)	52	18.7±2.4 (16.50-21.30)	51	20.3±1.4 (18.68-21.48)	49
3	*Amynthas morrisi*	19.3±2.4 (16.56-20.96)	54	21.3±1.4 (19.78-22.50)	53	19.9±1.1 (19.02-21.11)	51

Table 2: Vermicomposting potential of local earthworms' species on Sugarcane Trash and Cow-dung (1:1)

S. No	Name of species	Average % age of Sugarcane Trash and Cow-dung (1:1) vermicomposted per vermibed during					
		Ist harvesting	No. of days	2nd harvesting	No. of days	3rd harvesting	No. of days
1	*Metaphire posthuma*	61.9±3.6 (58.16-65.38)	45	67.6±4.2 (64.80-72.40)	43	64.0±1.2 (62.84-65.18)	42
2	*Metaphire houlleti*	57.4±2.8 (55.0-60.44)	49	62.5±4.8 (57.4-67.0)	48	59.52±2.8 (57.04-62.63)	47
3	*Amynthas morrisi*	61.3±4.8 (58.08-59.00)	55	56.5±1.8 (54.58-58.26)	53	59.30±2.6 (56.54-61.78)	50

press-mud and surplus bagasse through vermicomposting technique into a valuable organic rich vermicompost. They found this ecofriendly vermicompost superior to lignite in physical and chemical properties, higher density, porosity and water holding capacity and also in maintenance of bacterial population. Nogales *et al*. (1999) also observed that dairy biosolids were more effective in supporting earthworm growth and reproduction as compared to sheep manure. Sinha and Sinha (2000) also vermicomposted kitchen waste and garden waste alongwith cattle dung using *Eudrilus eugeniae, Eisenia foetida* and *Perionyx excavatus* and observed that the worms acted more faster during the summer days (June-August) than in winter days (January-March). *E.eugeniae* was found to have higher feeding growth and biodegradation capacity as compared to *E.foetida* and *P.excavatus*. Of all the three species *M.posthuma* was observed to be most efficient i.e. it vermicomposted 64.5 % of Sugarcane trash in 43.3 days in the mixture of Sugarcane trash and cow-dung (1:1), this was followed by *M.houlleti* which vermicomposted 59.8 % of Sugarcane Trash in 48 days and *Amynthas morrisi* which vermicomposted 59 % of Sugarcane trash in 52.7 days in the mixture of Sugarcane trash and cow-dung (1:1).Overall from above study it is concluded that local species of earthworm particularly *M.posthuma* can be used to vermicompost sugarcane trash in combination with cow-dung in ratio of (1:1) so that the nuisance and environmental pollution due to unmanaged disposal of sugarcane trash can be reduced or abated in an ecofriendly manner along with generation of vermicompost which can be used in agricultural fields or Kitchen gardens which would further cut down the use of chemical fertilizers.

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