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Comparative Study of Eisenia fetida and Eudrilus eugenie for Vermicomposting of Agricultural Waste

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Abstract: The present study was assigned to evaluate the vermicompost from agricultural waste by using earthworm species (Eisenia fetida and Eudrilus Eugenie). Two boxes of agricultural waste (2kg mixture /box) were prepared .These sets were inoculated with 10 numbers of earthworms. Before vermicomposting process parameters like N, P, K, pH, EC, Organic carbon, organic matter, were calculated .After 60 days vermicomposting is completed and same parameters were analyzed. The vermicompost using earthworm species Eudrilus eugenie shows higher nutrients and increase number of earthworm than Eisenia fetida.
The N, P, K after vermicomposting shows the higher values than before vermicomposting it also shows near to neutral pH and EC values. The C/N ratio is optimum for growth and reproduction of worms.

Key word: Vermicompost, Agricultural waste, Earthworm, Nutrient, comparison.

INTRODUCTION

Earthworm is invertebrates. There are 3600 types of earthworms in the world .They are mainly divided in two types burrowing and non burrowing. Eisenia fetida is one of such worm which has potential for converting organic waste into vermicompost.

Agricultural waste generated from agricultural activities include crop residue, animal excreta etc. which these waste after bio processing can supply nutrients to vegetative plants and also improve soil fertility vermicomposting is the simple biotechnological process of composting in which certain species of earthworm are used to enhance the process of waste conservation and produce a better product.

Vermicomposting is differs from composting in several ways (Gandhi et al., 1997)[1] these process is faster than composting. Compost and vermicomposting is the end products of aerobic composting process the later with using earthworm. Vermicomposting possessed higher phosphorous, potassium etc compared to substrate or underlying soil and normal compost.

Earthworms are one of the most important micro animals of soil, the importance of which has been recognized since time immemorial. The ability of earthworms is rapidly decomposing organic synthetic fertilizer.

METHODOLOGY:-

Agricultural waste is collected from the Loni village. Agricultural waste is easily available and decompose so agricultural waste is selected chopped in to small pieces .Earth worm species most often used is Eudrilus eugenie and Eisenia Fetida. The earth worm is collected from Krushi vidnyan Kendra Babhaleshwar.

Due to scarcity of area for convenient handling operation wooden boxes of size 50X25X20 cm were prepared for vermicomposting. The partially decomposed agricultural waste were subjected to preliminary treatment i.e. waste were sprayed in layer and exposed to sunlight for two to three days .This killed many unwanted insect, pest and reduced foul smell.

The agricultural waste along with three to four days old cow dung in proportion of 1:1 (i e 1kg waste and 1kg cow dung)were field in the wooden boxes . In each wooden boxes 2kg agricultural waste and 10 no of earth worm in inoculated .The earth worm species is selected is Eudrilus eugenie and Eisenia Fetida.

After the preparation of boxes daily monitoring for moisture content and no of earth worm .Regular watering was done to maintain optimum moisture level. After 60 days the earth worms were harvested, counted and weighted.

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ANALYSIS OF SAMPLE:-

After harvesting vermicompost Weighted for recovery of compost and was analyzed in laboratory for evaluating total nitrogen, phosphorous, potassium, organic carbon, organic matter, electrical conductivity. C: N ratio and pH according to the std A.P.H.A.methods.[2]

Table 1:- showing vermicompost bed information from initial to final stage

Sr no	Earth worm species	Type of material	Mixture of cow dung and material	No of EW added	Initial weight of EWS gms	Time taken for formation of compost days	Recovery of bed after 60 days	
							EWS	Eggs
1	Eudrilus eugenie	Agricultural waste	2.00	10	2.67	60	393	46
2	Eisenia fetida	Agricultural waste	2.00	10	2.71	60	185	28

Table 2:-showing the characteristics of agricultural waste before and after vermicomposting

Sr no	Characteristics	Before vermicomposting	After vermicomposting By Eudrilus Eugenie	After vermicomposting Eisenia Fetida
1	Total N%	1.400	1.780	1.680
2	Total P%	0.930	1.060	0.990
3	Total K%	1.470	1.760	1.720
4	pH	7.200	7.200	7.300
5	E.C.	0.225	0.227	0.227
6	Carbon %	42.987	33.514	32.899
7	Organic matter	74.110	57.779	56.719
8	C:N ratio	30.705	18.828	19.583

Graphical representation of analyzed data:-

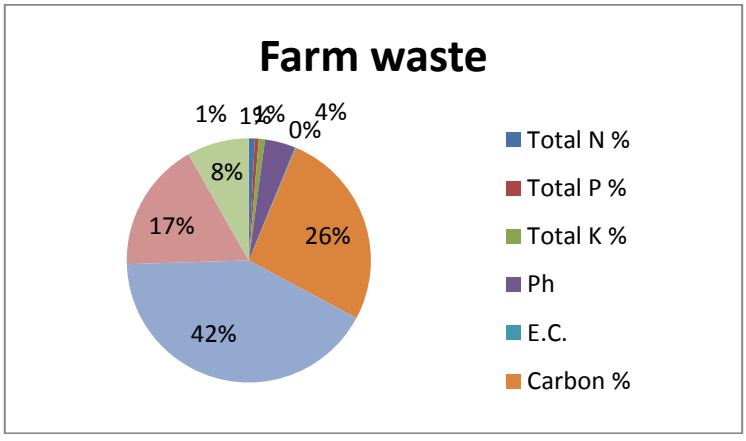

Figure 1:- Graph showing different composition for waste material before vermicomposting

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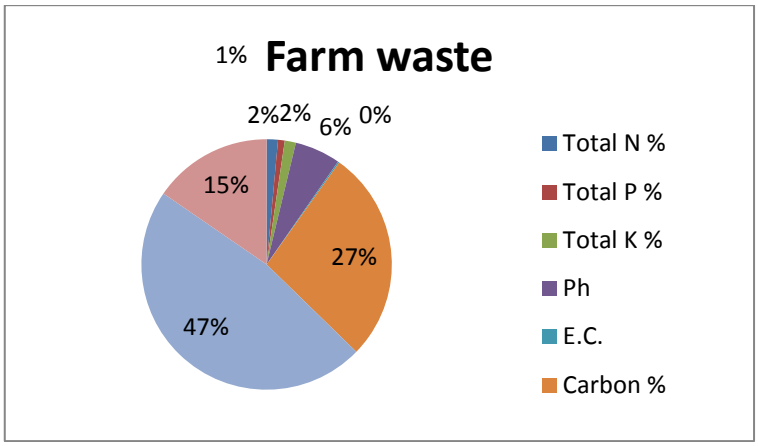

Figure 2:-Graph showing different composition for waste material after vermicomposting with worm Eudrilus Eugenie.

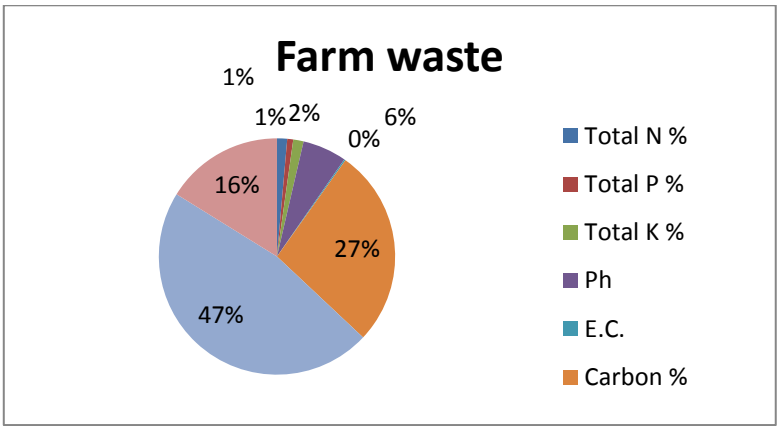

Figure 3:-Graph showing different composition for waste material after vermicomposting with worms Eisenia Fetida

RESULT AND DISCUSSION

From result tabulated in table no 1 it is observed that earthworm species Eisenia fetida and Eudrilus eugenie used for vermicomposting. For both species the agricultural waste is used. In each box 2kg mixture in1:1 proportion (i e 1kg cow dung and1 kg agricultural waste) and 10 no. of earth worm was added .The initial weight of earth worm for Eudrilus eugenie was 2.67 and for Eisenia fetida was 2.71 respectively .After 60 days the recovery of compost, number of earth worms and eggs for Eudrilus eugenie was 39 times multiple of original value and for Eisenia fetida it was 18times multiple of the original value. From this table it is shows that no. of earthworms and eggs after vermicomposting was more in Eudrilus eugenie than Eisenia fetida it may be due to maintain the moisture content, temperature, covering of beds during the process of vermicomposting. From the values it is reported that the rate of reproduction is higher in Eudrilus eugenie than Eisenia Fetida.

From table 2 shows the characteristics of agricultural waste before and after composting. The total nitrogen percentage before composting is in agricultural waste shows 1.40 %. The total percentage of phosphorous shows in agricultural waste is, 0.930%. The total K in agricultural waste is 1.570%.

The pH value shows 7.3, for agricultural waste. The percentage of carbon before vermicomposting is for agricultural waste 42.987, and for organic matter is 74.110, respectively. The C/N ratio before vermicomposting is having 30.705. The carbon contained present in the organics was utilized as source of energy for earthworms. The moisture content of waste material is calculated to maintain the moisture during the process of vermicomposting.

From table 2 it is shows that by using Eudrilus eugenie worms N, P, K percentage is increase than N, P, and K before vermicomposting. For agricultural waste the N percentage 1.780 for P % is 1.060 and for total K % is 1.760 respectively. The nutrient content of vermicompost is depending upon the quality of organic waste.

The total nitrogen content of vermicompost of the earth worm species was higher than that of compost and substrate .Earthworms can boost the nitrogen levels of the substrate during digestion in their gut adding their

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nitrogenous excretory products ,mucus, body fluid, enzymes ,and even through the decaying dead tissues of worms in vermicomposting system (Pattnaik and Vikram Reddy 2009).[3]

The enhanced P level in vermicompost suggests phosphorous mineralization during the process. The worms during vermicomposting converted the insoluble P into soluble forms with the help of P solubilizing microorganisms through phosphates present in the gut, making it more available to plant.(Ghosh, Chattopadhyay, and Baral,1999).[4]

The increase in K of the vermicompost in relation to that of the simple compost and substrate was probably because of physical decomposition of organic matter of waste due to biological grinding during passage through the gut coupled with enzymatic activity in worms gut ,which may have cause its increase .(.Rao, .Rao, Takkar1996)[5]

The pH and EC of waste material using worm Eudrilus eugenie ranges from 7.2and EC 0.225 s/m respectively. The pH affect the growth rate of worms during the vermicomposting process. pH also affecting the growth rate of during vermicomposting period. It was stated that pH near the neutral state are the best pH for vermicomposting .according to Hau et. al.[6] the optimum pH value was in range of 6.5-8.6. If the pH value that outside this range, the earthworms number decreased greatly died. The substrate EC increased from the initial value by the end of vermicomposting period due to loss of organic matter and released different mineral salts in available from (such as Phosphate, ammonium, potassium).

The carbon percentage was observed in table 2 for agricultural waste 33.514, organic matter 57.779 and C/N ratio 18.828 respectively. The carbon %, organic matter and C/N ration was decrease from initial value due to the carbon contained present in the organics was utilized as a source of energy for earthworms and simultaneously the nitrogen is being recycled in the compost. In this process the casting of earthworms in turn enriches the micro nutrient such as organic fertilizer. As per MSW standards the C/N ration is about 15-20:1 for good compost. But the C/N ratio depends upon the quality of raw organic waste used.

From table no 2 shows the characteristics of different waste materials using worms Eisenia fetida from this table it was observed N, P, K values for agricultural waste are for total N % 1.680, total P% 0.990, and total K% 1.720 respectively.

The pH and EC values show in table 2 for agricultural waste 7.3 and EC 0.227 respectively. From earlier discussed table it reported that the characteristics after composting (N, P, K, Organic carbon, Organic matter) is higher than before composting.

CONCLUSION:-

From the present study, it was evident that agricultural waste bedding material better in term of growth rate and biomass production of worms' .that gives better results in number of worms and cocoons formation .In the agricultural waste the earth worm species Eudrilus eugenie shows better results than Eisenia fetida. The N, P, K content of vermicompost prepared from agricultural waste using Eudrilus eugenie having maximum increase as compare to Eisenia Fetida. Eudrilus eugenie also showed good weight gain as well as reproduction performance .This also demonstrated that Eudrilus eugenie could be used efficiency for composting organic waste especially with the studied material.

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