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Potential of *Eisenia Fetida* and *Eudrilus Eugenie* in composting of Saw mill waste.

Zine Aruna Santosh*1, Deepak Janardhan Gadekar*2, Jadhav Vikrant Patilba*3, Priyanka Khandu Dighe*4, Gade Manisha Amit *5

*1 ,*3,PG Department Of Environment Science And Research Centre, Padmashri Vikhe Patil College of Arts Science & Commerce, Pravaranagar, Maharashtra, India 413713.
Affiliated Savitribai Phule Pune University Pune, India.

*2 Department Of Geography Padmashri Vikhe Patil College of Arts Science & Commerce, Pravaranagar A/P- loni Tal- Rahata ,District- Ahmednagar , Maharashtra, India, 413713.
Affiliated to Savitribai Phule Pune University Pune.

*4 Department of Soil Science and Agriculture Chemistry, College of Agriculture, Loni Maharashtra, India 413713.

*5 Padmabhushan Dr.Sukhatme Institute of Agriculture ,Phaltan Maharashtra, India

Corresponding Author: aruna.thorat@gmail.com

Abstract: This study investigates the efficiency of vermicomposting sawmill waste using two species of earthworms, *Eisenia Fetida* and *Eudrilus Eugenie.* Two boxes of saw mill (2kg mixture /box) were prepared .These sets were inoculated with 10 no 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 results indicate significant improvements in nutrient content and organic matter decomposition, with *Eudrilus Eugenie* showing superior performance in several aspects.

Introduction: Vermicomposting is a sustainable method of organic waste management that leverages the digestive processes of earthworms to decompose organic material and produce nutrient-rich compost. Sawmill waste, which is rich in lignocellulosic material, presents a unique challenge for decomposition. This study aims to evaluate the effectiveness of two earthworm species; *Eisenia Fetida* and *Eudrilus Eugenie*, in vermin composting sawmill waste.

Saw dust is a main organic waste in saw mill. It has variety of practical uses including as a mulch, and alternative to clay cat litter, a fuel, or for the manufacture of particle boards. Saw dust may collect in piles and at harmful leachates in to local water systems, creating an environmental hazard. The biggest concerns with saw dust are substances such as lignin's and fatty acids which protects trees from predators while they are alive, can leach into water and poison wide life. (Latifah Abd Manaf et. al. Jan 2009).

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 vermicomposting (Graff, 1974; Tsukamoto and Watanabe 1977; Hartenstein et al.1979)

Materials and Methods: Three types of waste materials were used: sawmill waste, farm waste, and garden waste. Each material was combined with cow dung in a 2 kg mixture per box, and 10 earthworms were introduced to each set. The vermicomposting process was conducted over 60 days. Parameters such as total nitrogen (N), phosphorus (P), potassium (K), pH, E.C., carbon content, organic matter, and C/N ratio were measured before and after vermicomposting.

TABLE 1: - Showing vermicomposting bed information from initial to final stage.

Sr. no	Earth worms species	Type of materials	Mixture of cow dung & material (K.gm)	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*	Sawmill waste	2.00	10	3.13	60	344	42
2	*Eisenia Fetida*	Sawmill waste	2.00	10	2.65	60	173	25

TABLE 2: - Showing Characteristics of sawmill waste before and after vermicomposting using the two different earthworm species.

Characteristic	Before Vermicomposting	After Vermicomposting with Eudrilus Eugenie	After Vermicomposting with Eisenia Fetida
Total N (%)	1.680	1.800	1.760
Total P (%)	0.560	1.280	1.080
Total K (%)	1.570	1.870	1.670
pH	7.300	7.900	7.800
E.C. (S/m)	0.220	0.236	0.221
Carbon (%)	45.080	34.129	34.590
Organic Matter (%)	77.718	58.839	59.634
C/N Ratio	26.833	18.961	19.653

Graphical representation of analyzed data:-

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

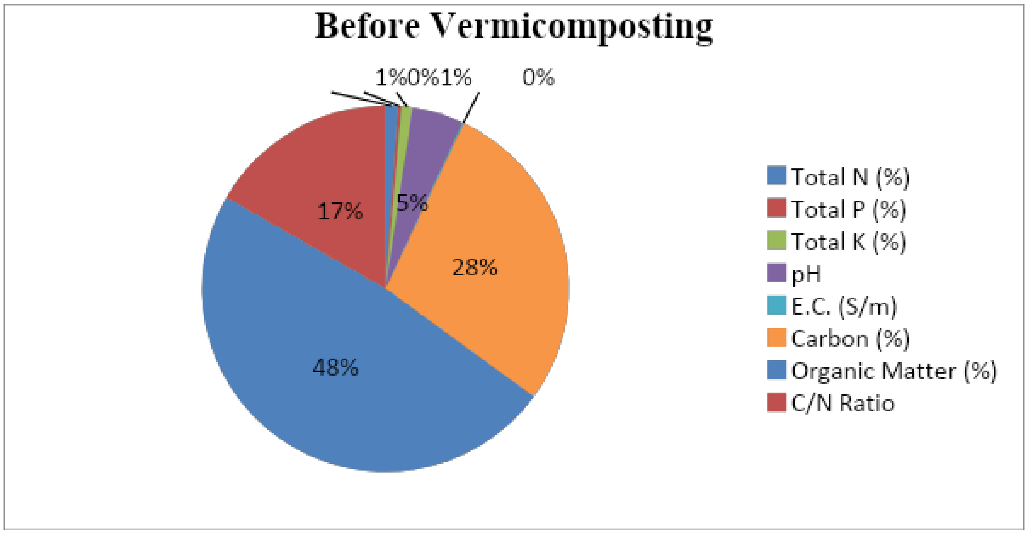

Figure 2:-Graph showing different composition for waste material after vermicomposting with worm *Eudrilus Eugenie.*

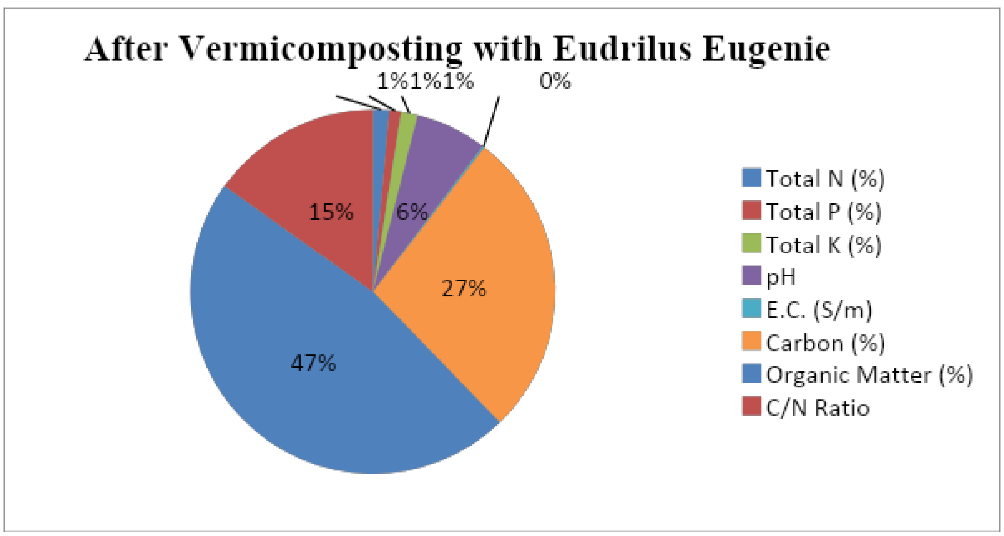

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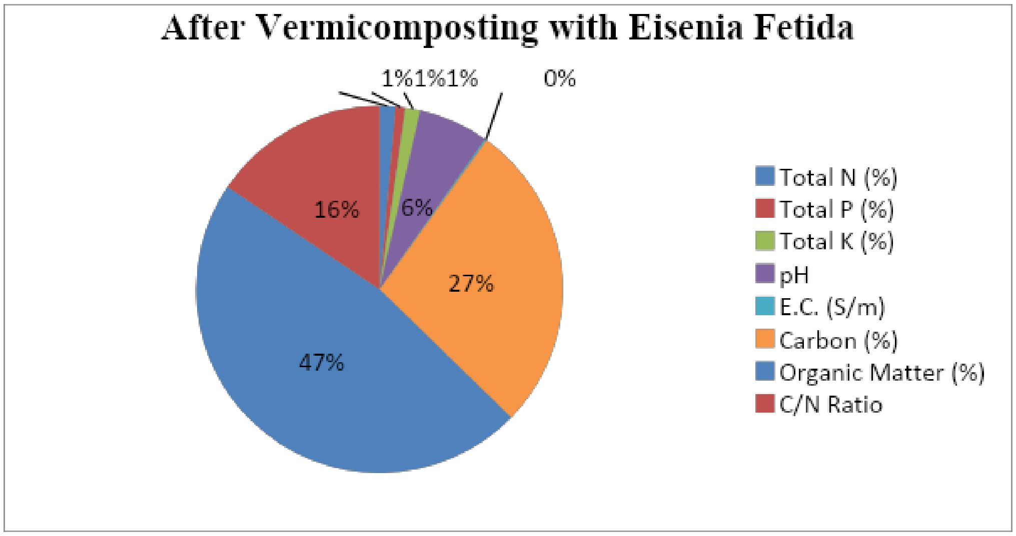
Figure 3:-Graph showing different composition for waste material after vermicomposting with worms *Eisenia Fetida*



Result and Discussion: From the results presented in Table 1, it is evident that both *Eisenia Fetida* and *Eudrilus Eugenie* were utilized for vermicomposting sawmill waste. Each box contained a 2 kg mixture in a 1:1 ratio of cow dung and sawmill waste, with 10 earthworms added. The initial weight of *Eudrilus Eugenie* was 3.13 g, and for *Eisenia Fetida*, it was 2.65 g. After 60 days, the compost yield, number of earthworms, and eggs for Eudrilus Eugenie increased 34 times the original value, while for *Eisenia Fetida*, the increase was 17 times. This indicates that the number of earthworms and eggs after vermicomposting was higher for *Eudrilus Eugenie*, likely due to better maintenance of moisture content, temperature, and bed covering during the process. The data suggests that *Eudrilus Eugenie* has a higher reproduction rate than *Eisenia Fetida.*

Table 2 shows that both species significantly improved the nutrient content and reduced the C/N ratio of the sawmill waste, enhancing its suitability as compost. The total nitrogen, phosphorus, and potassium levels increased, with *Eudrilus Eugenie* showing a greater increase in these nutrients compared *to Eisenia Fetida.* This is attributed to *Eudrilus Eugenie's* larger size, rapid growth, and higher reproduction rate, which facilitates more efficient organic matter decomposition.

The pH values for both species were close to neutral, optimal for vermicomposting. The electrical conductivity increased slightly, indicating mineral salt release during decomposition. The reduction in carbon content and organic matter percentage reflects the utilization of carbon by the earthworms as an energy source. The total nitrogen content in vermicompost from both species was higher than in the original compost and substrate. Earthworms enhance nitrogen levels in the substrate during digestion by adding nitrogenous excretory products, mucus, body fluids, enzymes, and decaying worm tissues (Aruna Thorat, 2022).

The increased phosphorus levels in vermicompost suggest phosphorus mineralization during the process. Earthworms convert insoluble phosphorus into soluble forms with the help of phosphorus-solubilizing microorganisms in their gut, making it more available to plants (M. Ghosh, G. N. Chattopadhyay, and K. Baral, 1999). The rise in potassium levels in vermicompost compared to simple compost and substrate is likely due to the physical decomposition of organic matter and enzymatic activity in the worms' gut, which enhances potassium availability (S. Rao, A. S. Rao, and P. N. Takkar, 1996).

The pH and electrical conductivity of the waste material using *Eudrilus Eugenie* were around 7.2 and 0.225 s/m, respectively. pH affects the growth rate of worms during vermicomposting, with values near neutral being optimal. According to Hau et al., the optimal pH range is 6.5-8.6. Outside this range, earthworm numbers decrease significantly. The substrate's electrical conductivity increased by the end of the vermicomposting period due to organic matter loss and the release of mineral salts such as phosphate, ammonium, and potassium, consistent with findings by Wong et al. (1997).

Conclusion:

The study concludes that *Eudrilus Eugenie* is more effective than *Eisenia Fetida* in vermicomposting sawmill waste, as evidenced by the higher nutrient content and better C/N ratio. The findings suggest that *Eudrilus Eugenie* could be a preferred species for the vermicomposting of lignocellulosic waste materials such as sawmill waste.

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