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A STUDY ON THE GROWTH AND COCOON PRODUCTION OF EUDRILUS EUGINEA CULTURED IN DIFFERENT THESPESIA POPULNEA LEAVES WASTE MEDIA

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ABSTRACT **:** Today researchers are searching for organic waste management technology which should be effective, ecological and sustainable without affecting the environment and very much beneficial to the agriculture. Vermiculture is the best technology for waste treatment which has a tremondous future in the field of organic waste management. This review focuses on vermiculture technology in which animal wastes and organic residues are used as substrate to produce vermicomposting. Organic wastes are converted into usable form of nutrients (vermicompost) with the help of earthworms and microorganisms. Vermicompost is highly rich in micro and macro nutrients and beneficial micro-organisms. Beyond this, during the vermicomposting process, a brown colored liquid is produced called vermiwash which also has high nutrients to promote the growth of plants. Thus the organic waste can be excellently recycled and converted into useful vermiproducts which has been proved undoubtedly as an essential product in plants growth, productivity and also maintaining health of the soil . Despite the major advances have been made in this technology, there is still a need and scope to undertake investigaion to identify a group of microorganisms which helps in maintaining health of the soil and good crop production.

Keyword*: *Vermiculture, Eudrilus Eugeniae, Thespesia Populnea, Vermicompost, Vermicast, Vermiwash

I.INTRODUCTION

Vermicomposting is described as "bioxidation and stabilization of organic material involving the common action of earthworms and mesophilic micro-organisms". Vermicompost produced by the exertion of earthworms is rich in macro and micronutrients, vitamins, growth hormones, enzymes similar as proteases, amylases, lipase, cellulose and chitinase and paralyzed microflora. The enzymes continue to disintegrate organic matter indeed after they've been ejected from the worms. Though there are so many benefits associated with vermicompost, its use isn't widespread yet.

In recent times, the organic wastes from domestic, agricultural and industrial sources has caused environmental problems and numerous different technologies to address this problem have been developed. The growth of earthworms in organic wastes by earthworms is known as vermicomposting (Edwards, 2004). There's a increasing trend towards the use of new technologies, for recycling and effective application of organic residues especially using biological process. Thus, it's possible to conserve the available natural resources and to recover the natural products, and in some cases, to combat the disposal problems and minimize the land pollution . Vermicomposting has been arising as an innovative biotechnology for the conversion of agro-industrial wastes into value added products, which can be used for perfecting the soil structure and fertility in organic farming (Garg and Gupta, 2009).

Reduced use of water for irrigation, reduced pest attack, reduced termite attack, reduced weed growth; faster rate of seed germination and rapid-fire seedlings growth and development; good number of fruits from single plant are some of the benefits of the vermicompost (Anonymous, 2009).

Pure vermicompost isn't so good for agriculture because it contains abundant of important nutrients (Olle 2016a, Olle, 2017). Environmental degradation is a major trouble is what the world is facing now, and the rampant use of chemical toxin contributes largely to

the deterioration of the terrain through reduction of fossil energies, generation of carbon dioxide (Co2) and there by polluting the water resources . It leads to loss of soil fertility due to imbalanced use of chemical fertilizers that has negatively impacted agricultural productivity and causes soil declination. Now there's a growing consummation that the relinquishment of ecological and sustainable husbandry practices can only reverse the declining trend in the global productivity and terrain protection(Aveyard 1988, Wani and Lee 1992, Wani *et al*. 1995).

In nature's laboratory there are a number of organisms (micro and macro) that have the capability to convert organic waste into precious fertilizers containing factory nutrients and organic matter, which are critical for maintaining soil productivity. Microorganisms and earthworms are important natural organisms helping nature to maintain nutrient overflows from one system to another and also minimize environmental declination.

1.1Importance of Vermicompost

Earthworms consume colorful organic wastes and reduce the volume by 40- 60%. Each earthworm weigh about 0.5 to 0.6 g, eats waste original to its body weight and produces cast original to about 50% of the waste it consumes in a day. These worm castings have been anatomized for chemical and natural parcels. The humidity content of castings ranges between 32 and 66 % and the pH is around7.0. The worm castings contains more percentage (nearly twofold) of both macro and micronutrients than the garden compost.

From earlier studies it's apparent that vermicompost provides all nutrients in readily available form and also enhances uptake of nutrients by plants and trees Sreenivas etal.(2000) studied the intertwined effect of operation of toxin and vermicompost on soil available nitrozen(N) and uptake of crest ground(Luffa acutangula) at Rajendranagar, Andhra Pradesh, India. Soil available N increased significantly with adding of vermicompost. also the uptake of N, phosphorus(p), potassium(K) and magnesium(Mg) by rice plant (Oryza sativa) was great when fertiliser was applied in combination with vermicompost(Jadhav *et al*. 1997).

1.2 Biology of Eudrilus Eugeniae

Eudrilus eugeniae, a species of earthworm native to tropical west Africa and now widespread in warm regions, both wild and under vermicompost, also called the African night straggler.

1.2.1 Growth

Fecundity, growth, development and biomass product were all significantly lesser at 25ºC than 15º, 20º or 30º(25ºC = 77ºF). The growth of individual earthworms increased the lower the population viscosity, but the topmost overall earthworm biomass product occurs at the loftiest population viscosity. The topmost number of cocoons per week and the number of hatchlings per cocoon are attained at 25ºC. Cocoon of *Eisenia fetida* incubated in only 12 days at 25ºC, the earthworms at these temperatures reached sexual maturity in as little as 35 days after setting.

1.2.2.Life Cycle

Throughout its life cycle, *Eudrilus eugeniae* grew much more fleetly than Eisenia fetida, in same environmental conditions. The West-African night straggler grows well at a temperature of 24- 30ºC(75- 86ºF). Maximum weight2.5 grams occurs within 8- 10 weeks. The African night straggler has a invariant grandiloquent- slate luster and the posterior parts are unevenly phased to a point. The parts of the Brandling worm (*Eisenia fetida*) alternate sanguine- orange and brown; the posterior parts don't taper, and the final member is blunt.

1.2.3 Types of Earth Worms

Earthworms are invertabrate. There are nearly 3600 types of earthworms in the world and they're substantially divided into two types;(1) burrowing; and(2)non-burrowing. The burrowing types like *Pertima elongata* and *Pertima asiatica* live deep in the soil. On the other hand, the non burrowing types Eisenia fetida and *Eudrilus eugenae* live upper surface of the soil. The burrowing types can grow upto 20 to 30 cm long and life span of these earthworms are around 15 years. The non burrowing types are red purple and 10 to 15 cm long but their life span is only 28 months.

The non burrowing earthworms eat 10% soil and 90% organic waste material; these convert the organic waste into vermicompost faster than the burrowing earthworms. They can tolerate temperature ranging from 0 to 40 ◦ C but the regeneration capacity is more at 25 to 30 ◦ C and 40- 45 humidity position in the pile. The burrowing types of earthworms come onto the soil face only at night. These make holes in the soil up to depth of3.5 m and produce5.6 kg casts by ingesting 90% soil and 10 %organic waste.

1.2.4 Earthworm Multipication

A trial was conducted at the transnational Crops Research Institute for the Semi-Arid Tropics(ICRISAT), Patancheru, Andhra Pradesh with three kinds of earthworm societies(Eisenia fetida, *Eudrilus eugenae* and Perionyx excavates) using wheat straw, chickpea straw, tree leaves in(Peltophorum sp) and Parthenium mixed with cow soil as feed accoutrements . There was an increase in earthworm population and size during incubation for 90 days. The three types of earthworms multiplied 12 to 18 times when growth collectively using legume tree leaves and cow soil admixture as raw material. still, mixed culture(of all three species) showed advanced multiplication rate(27times) also the individual species.

farther studies earthworm addition were also conducted at ICRISAT using tree leaves and Gliricidia stems mixed with cattle ordure as feed material. The earthworm population dropped when growth in admixture of Gliricidia stems and cattle ordure. These results indicated that Gliricidia loppings couldn't be used for addition of earthworms. Gliricidia dinghy is known to retain poisonous parcels poisonous parcels as it's used as rat poisoning bait..

1.3 THESPESIA POPULNEA

Bengali (palaopipal, dumbla, poresh, gajashuni, parespipal); Creole(grosmahaut, mahot, gwo maho, grand mahaut, gran maho, fey dayiti);

Medicinal value

The heartwood has a mending property useful in treating pleurisy and cholera, bellyache and high complications; it's carminative. The cooked fruit crushed in coconut oil painting provides a dressing, which if applied to the hair, will kill lice. The tire of the leaves and decoctions of utmost corridor of the factory are used externally to treat colorful skin conditions. Authorities from the pounded fruits mixed with pounded leaves are constituents of a cataplasm to treat headaches and itches. A decoction of the tangy dinghy is used to treat dysentery and haemorrhoids, and a maceration of it's drunk for snap. The fruit contains an antibiotic and the juice is used to treat herpes. Other extracts of the plant have significant antimalarial exertion. Leaf and dinghy decoctions are taken for high blood pressure. Leaf tea is taken for rheumatism and urinary retention. Seeds are purgative.

1.4 CONCLUSION

1.4.1 Objective of this Study

- ✓ This fashion also helps to conserve the bio diversity, which is the need of the hour. Other than employment openings for the weaker section, it also help in maintaining the environmental/ ecological balance.
- ✓ Effect of different *Thespesia populnea* leaves waste media on the growth,
- ✓ and cocoon production of *Eudrilus eugeniae.*

II.MATERIALS AND METHODS

2.1. Collection of Earthworm

Samples of adult earthworm, *Eudrilus eugeniae* were collected in the Periyar Maniyammai University, Vallam. They were kept in earthen pots with substrate medium containing 50% partly decomposed cowdung ,50% soil and were maintained under the laboratory condition for five days. Care was taken to see that the worms collected from the point, didn't witness any pesticide treatment and adult worms with the size16.5 to27.4 cm in length and 4.500-5.860 gm in weight were used for the present study.

2.2 Collection of Soil

Soil was taken from the Koranattukaruppur Village, Kumbakonam TK, Thanjavur District, for present study. It was manually grinded using stone and mortar.

2.3. Collection of Thespesia Populnea Leaves

The waste material of *Thespesia populnea* leaves were collected from Koranattukaruppur Village, KumbakonamTK, Thanjavur District, India.

2.4. Partial Decomposition of Organic Waste

The plastic pot a size of 54 cm in diameter and 35 cm in height was taken and used for the decomposition of *Thespesia populnea* leaves waste which was free from earthworm irruption. The tanks were filled with *Thespesia populnea* leaves waste and poured with sufficient water. The tanks were closed with polythene sheets in order to avoid water evaporation and a possible release of foul smell during decomposition. Water was poured regularly in the tank after removing the polythene sheets and the tanks were closed again with the same polythene sheets for proper decomposition. Once in three days the decomposing maerilas were completely mixed using rod so as to ensure uniform decomposition. Ideal semi decomposed *Thespesia populnea* leaves in the form of wet leaves can be attained only after 30 days decomposition. About 120 kg of dry semi composed *Thespesia populnea* leaves waste can be attained during one process. These materials was then manually powdered to particle size less than 1 mm as suggested by and stored in a polythene bag.

2.5. Preparation of Substrates For Cocoon Production Study

Six sets of Five media with Percent Substrate rates (PSR),, and 0 were prepared using dry soil and powdered *Thespesia populnea* leaves with volume by volume base and mixed well. 4kgs of substrate in each percent rate was taken in an earthen pot and sufficient volume of water was added into it to ensure optimum humidity condition as suggested. To assess the rate of cocoon product in the below said media, 12 adult earthworms were introduced into each pot. Six set of control(soil alone) as substrate trials with 12 adult earthworms in each were also maintained simultaneously along with these media. Regular watering is a must-have for this culture study to give optimum humidity condition to the earthworm cocoons produced by earthworms were collected and recorded once in a week for about a period of one month(01.02.2022 to 30.02.2022) survival of earthworms was also observed in the below said media during the course of study. Rate of cocoon product was calculated at daily as well as yearly base.

2.6.Calculation

The rate of cocoon production by earthworm was calculated and comparisons were made between control and experimental data.

III.RESULTS AND DISCUSSION

3.1Cocoon Production Study

The rate of cocoon product and weight gain/ loss of the epigeic earthworm Eudrilus eugeniae kept in the and 100 PSR(Present Substrate rate) media prepared from incompletely decompesed Thespesia populnea leaves waste with soil for 30 days were given in Table 1 and 2 independently.

TABLE -1

Rate of the cocoon production of epigeic earthworm *Eudrilus eugeniae* kept in different Percent Substrate Ratio (PSR) media of partly decomposed. *Thespesia populnea* leaves waste and vermicompost of the same for one month.

PSR	Total cocoons collected in6 pots	Total cocoons /pots	Cocoons/ day	Cocoon/day/worm
0%	25	4.16	0.83	0.011
25%	110	18.3	3.66	0.050
50%	158	26.3	5.26	0.073
75%	205	34.16	6.83	0.094
100%	124	20.3	4.06	0.056

TABLE -2

Values showing the changes of earthworm weight (gm) during cocoon production of *Eudrilus eugeniae* kept in different Percent Substrate Ratio (PSR) media of partly decomposed *B Thespesia populnea* leaves waste and vermicompost of the same for one month.

PSR	0 day	8^{th} day	15^{th} day	22^{nd} day	30^{th} day
0%	75.4	77.3	79.6	70.8	68.3
25%	70.8	78.1	76.4	84.8	77.2
50%	68.2	70.5	74.6	80.5	75.2
75%	70.8	72.5	76.5	84.5	71.6
100%	71.6	73.4	75.5	88.4	82.8

The worms kept in 50, 75 and 100 PSR media for 30 days showed a gradational increase in their body weight over to 22 days later, a gradational decline until the termination of this study. still, the worms kept in the same media(50, 75 and 100 PSR) after 30 days showed an increased value in their body weight over their separate original weight. On the negative, all the worms kept in 0 and 25 PSR media showed a gradational drop in their body weight until the termination of this study and their separate percent weight loss values were70.8 and84.8 (Table 2). The worms kept in soil alone for 30 day though showed 100 survival value, only 4 cocoons were laid during the course of study due to lower organic matters in the medium.

Though the worms kept in other PSR media for 30 days produced fairly more cocoons than the control, the worms in 75 PSR medium produced fairly more cocoons(6.83 cocoon/ day or0.094 cocoons/ day/ worm) than the worms kept in other PSR media(3.66 to5.26 cocoon/ day or0.050 to 0.073 cocoons/ day/ worm)(Table 1). The rate of the cocoon product observed in the present study irrespective of PSR media used wasn't in viscosity with the results observed by Ramalingam,(1997), Sathyaand Deivanayaki a and b(2015), Deivanayaki and Nanthini(2016), Bakthavathsalam and Ramakrishnan,(2004) in the same species independently dressed simply under press slush medium and 50 PSR cow soil medium, where they set up advanced values of cocoon product with ±0.4 and0.15 cocoon/ worm/ day independently. Kale etal.,(1981) have also observed lesser product of cocoons by Perionyxexcavatus using different organic wastes similar as cow soil, lamb soil, steed soil, flesh ordure and sludge from bio gas factory. Cocoon product of Lampito mauritii is generally high as in other species of Dravida willsii and Octochaetona surensis due to their face dwelling nature and their exertion confined to 20 cm depth during downtime and 30 cm during summer season gusto and Senapati(1980). The maximum rate of cocoon product by Eudrilus eugeniae was3.83 ±0.01 cocoons/ worm/ week in the feed Tendu splint. Kadam,(2015). Evans and Guild(1948) noted the product of 42- 106 cocoons in one time by face lodging. Under laboratory conditions. Evans and Guild(1947) set up that Lumbricu sterrestris produced cocoon at the rate of3.7 cocoon/ worm/ month and suggested thatL.terrestris and aboriginal earthworm species could be convinced to produce cocoons throughout the time. The present study demonstrated that Eudrilus eugeniae can also reproduce throughout the time as suggested Meinharlt,(1974) and Butt etal.,(1992). The earthworm culture study made by Subramaniyan,(2008) using paddy straw waste showed fairly analogous cocoon product value(0.126 cocoons/ worm/ day) over our present study with the Thespesia populnea leaves. The current results proved beyond any mistrustfulness that the culture medium containing Thespesia populnea leaves was the stylish one as far as cocoon product and growth of earthworm are concerned.

FIG.1. Shows The *Thespesia Populnea* waste, Before and After Compost.

(A)Before compost

(B) After compost

FIG.2. Shows the different thespesia populnea waste media used during the study

FIG 3. Shows the sample of cocoons obtained during the study

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