**Role of Vermicomposting in Organic Farming**

 ***Shalini Kotiyal1, Manjusha Tyagi 2and G.K. Dhingra***3

Research Scholar, Microbiology, SBAS, SGRR, University, Dehradun

Associate Professor, Microbiology, SBAS, SGRR, University, Dehradun

Professor of Botany, Pt.LMS Sri Dev Suman Uttarakhand University Campus, Rishikesh

*Email:* *kotiyalshalini10@gmail.com*

**Abstract**

Vermicomposting is a method of converting solid agricultural and kitchen waste into a stable form that is deeper in color and rich in macro and micronutrients by utilizing the action of earthworms. Vermicomposting is a proven method for reducing and managing pollution in the environment. Vermicompost has lately been identified as one of the suggested organic fertilizer alternatives to chemical fertilizers, based on numerous studies. Because it includes more NPK, minerals, and beneficial soil microbes, vermicompost is a superior growth promoter and protector for agricultural plants than compost (nitrogen fixing and phosphate solubilizing bacteria and actinomycetes). Vermicomposting has the advantage of being able to be carried both outside and inside a room, allowing for year-round composting. It also creates high-quality compost. Earthworms consume biomass (decomposing organic matter) and excrete it in the form of worm casts or worm dung, which is digested. Worm casts are known as "black gold".  In India nowadays, vermicomposting techniques for creating organic fertilizers are having a big impact on the youth. Along with this, opportunities for self-employment are available.

**Introduction**

In today’s scenario, organic farming is on popular among farmers. Due to its ecological friendly nature and healthful produce, organic farming or organic agriculture has been recognized as a new and sustainable agriculture technology. It is a cost-effective solution for preserving soil fertility and health, increasing crop output and quality, and lowering carbon levels in the atmosphere. Organic fertilizers are a variety of fertilizers made from plant, mineral, and animal matter, among other sources. Now researchers are focusing on vermicomposting techniques for the production of organic fertilizers to enhance sustainable organic farming.

Vermicomposting is a process that utilizes the work of earthworms to convert solid agricultural and kitchen waste into a stable form that is darker in color and rich in macro and micronutrients. Vermicomposting is one of the most effective ways to reduce and manage pollution in the environment. Many researches have recently been conducted to establish vermicompost as one of the recommended organic fertilizer alternatives to chemical fertilizers. Vermicompost is a better growth promoter and protector for agricultural plants than compost because it contains more NPK, micronutrients, and helpful soil microbes (nitrogen fixing and phosphate solubilizing bacteria and actinomycetes). The most advantageous aspect of vermicomposting is that it may be carried both outside and inside a room, allowing for year-round composting. It also provides a means for flat dwellers to produce high-quality compost. Vermicomposting allows for the development of considerable, biochemically and nutritionally developed plant growth factors for application in agriculture in a shorter period of time.

**Species of earthworms used in vermicomposting**

 Itis well known that earthworms take part in manure development. Vermicomposting is a procedure that employs earthworms to convert organic waste into vermicompost, which can be utilised as a fertilizer for crop cultivation . Vermicomposting is thus an intriguing possibility for both recycling and lowering the need of fertilizers as the amount of organic waste produced grows. Furthermore, using composts on a big scale is a good approach to improve the organic matter content of soils, which is important for their long-term fertility.

Vermicompost is made by epigeic earthworms, which live in the litter layer and the first few centimetres of soil, feeding on fresh organic matter. Here are a list of some species of earthworms that take part in organic matter decomposition.

**Table :1**

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Raw material** | **Earthworm species** |
| 1. | Agricultural residues | *Eudrilus eugeniae* |
| 2. | Agriculture waste and sugar cane thrash | *Eudrilus eugeniae, Perionyx excavates* |
| 3. | Board mill sludge | *Lumbricus terrestris* |
| 4. | Canteen waste & vegetable waste | *Eisenia foetida* |
| 5. | Cattle manure | *Eudrilus eugeniae* |
| 6. | Deciduous forest waste, cow-dung | *Eisenia foetida*, *Perionyx excavatus* and*Dicogaster bolaui* |
| 7. | Different mammalian animal waste | *Eisenia foetida* |
| 8. | Domestic waste + cow-dung | *Perionyx excavates, Perionyx sansibaricus* |
| 9. | Fly ash + cow dung | *Eisenia foetida* |
| 10. | Gaur gum | *Eudrilus eugeniae* |
| 11. | Grass clippings, cow dung | *Eisenia foetida,* |
| 12. | Green waste | *Eisenia Andrei* |
| 13. | *Imperata cylindrica* grass | *Perionyx excavatus, Eisenia foetida* |
| 14. | Municipal solid waste | *Eisenia foetida, Eudrilus eugeniae* |
| 15. | Municipal, agricultural and mixed solidWaste | *Eudrilus eugeniae*, Perionyx excavates |
| 16. | Onion residue/waste | *Eisenia foetida, Eudrilus eugeniae* |
| 17. | Organic matter, moistened peat moss,crushed leaves, dried yard waste | *Eisenia foetida*, *Lumbricus rubellis* |
| 18. | Organic wastes | *Lumbricus rubellus, Eisenia jetida, Eisenia**andrei, Dendrobdena rubida, Eudrilus**eugeniae, Perionyx excavatus* and *Eiseniella**tetraedra.* |
| 19. | Paper mill sludge | *Lumbricus rubellus, Eisenia foetida* |
| 20. | Pig manure, food wastes, leaf wastes,yard wastes, bark wastes, chickenmanure | *Eisenia foetida* |

Source- From Sobana *et al*. (2016)

Because of their high litter consumption and reproduction rates, waste converters include *epigeic* species such as *E. eugeniae*, *E. foetida, P*. *excavatus*, *P. sansibaricus*. and *Eisenia andrei* are the most commonly employed species for vermicomposting. Vermicomposting is a technique to take advantage of earthworms to enhance the nutritional properties of soil.

**Methods of vermicomposting**

There are two methods of vermicomposting which will be done in small scale known as **bed method** and in large scale known as **pit method**.

in bed method, vermicomposting is done on the pucca / kachcha floor by producing an organic mixed bed (6x2x2 feet). This strategy is simple to follow and put into practice.

In pit method, vermicomposting takes place in 5x5x3 foot concrete holes. Thatch grass or any other locally accessible materials are used to cover the unit.

Vermicomposting unit can be made in simple pots, gunny bags, and wooden boxes also. The raw materials includeing decomposable organic wastes such as animal excreta, kitchen trash, farm residues, and forest litter. The main source components are animal excrement, primarily cow dung, and dried chopped crop leftovers. The quality of vermicompost is improved by mixing leguminous and non-leguminous crop leftovers.

**Importance of vermicomposting**

Vermicomposting is one of the most straightforward processes for recycling agricultural waste and producing high-quality compost. In the decomposition process, the earthworm works as an aerator, crusher, and mixer, as well as a chemical degrader and biological stimulant. Earthworms devour biomass (decaying organic matter) and excrete it as worm casts or worm manure, which in a digested form. Worm casts are commonly referred to as "black gold." Vermicompost has high potential for plant nutrients, plant growth promoters, helpful soil microflora, and pathogenic microbe-inhibiting qualities. Vermicompost has the potential to be 1000 times more microbially active than traditional compost. As a result, most of the beneficial features (to soil health and crop production) of black gold are inherited by the organic endproducts created by the usage of earthworms, i.e. vermicompost. Vermicompost increases soil quality by acting as an organic amendment. Vermicompost is an organic soil additive that enhances soil health in three dimensions (physical, chemical &amp; biological properties). Vermicompost improves soil quality by enhancing its physicochemical and biological qualities when applied.

Nutrient parameters of vermicompost are:

 Parameters Content

 pH 6.8

 OC% 11.88

 OM% 20.46

 C/N ration 11.64

 Total Nitrogen (%) 1.02

 Available N (%) 0.50

Available P (%) 0.30

 Available K (%) 0.24

 Ca (%) 0.17

 Mg (%) 0.06

Many researches confirmed that Vermicompost treated plots registered high availability of K compared to FYM treated plots.

**Conclusion**

Nowadays in india, the techniques of making organic fertilizers through vermicomposting are affecting the youth a lot. Along with this, self –employment opportunities are also being provided. Hence, Vermicompost is a low-cost, simply adopted nutrient supplement for organic food production that is both economically viable and environmentally safe.

**References**

* Abdul Kareem, Zia Ur Reheman Farooqi, Amina Kalsom,Waqas Mohy-Ud-Din, Muhd. Mahroz Hussain,Mohsin Raza,Muhd. Moaz Khursheed ( 2021). Organic Farming for Sustainable Soil Use, Management, Food Production and Climate Change Mitigation. In: Bandh S.A. (eds) Sustainable Agriculture. Springer, Cham. <https://doi.org/10.1007/978-3-030-83066-3_3>
* Ahmad, A., Z. Aslam, K. Bellitürk, N. Iqbal, S. Naeem, M. Idrees, Z. Kaleem, M.Y. Nawaz, M. Nawaz, M. Sajjad, W.U. Rehman, H.N. Ramzan, M. Waqas, Y. Akram, M.A. Jamal, M.U. Ibrahim, H.A.T. Baig and A. Kamal (2021). Vermicomposting methods from different wastes: an environment friendly, economically viable and socially acceptable approach for crop nutrition: a review. Int. J. Food Sci. Agric. 5:58-68.
* Domínguez J andGómez-Brandón M, (2013). The influence of earthworms on nutrient dynamics during the process of vermicomposting. *Waste* *Manage Res* **31**:859–868
* Jaybhaye, M. M., & Bhalerao, S. A. (2016). Vermicomposting- a sustainable approach for management of agro-industrial waste (Bagasse). Galaxy International Interdisciplinary Research Journal, 4(4), 27–34.
* Munnoli, P. M., Da Silva, J. A. T., & Saroj, B. (2010). Dynamic soil, dynamic plant. In Dynamics of the soil-earthworm-plant relationship: A review (pp. 1–21).
* Nagar,R, ,Titov,A and Bhati,P.(2017).Vermicomposting of leaf litters : way to convert waste in to best.INT J CURR SCI 20(4):E 25-30.
* Nithya, G., & Lekeshmanaswamy, M. (2010). Production and utilization of Vermicompost in agro industry. Journal of Phytology, 2(2), 68–72.
* NRAES (1992), On-farm composting ( Ed. Rynk, Robert) Natural Resource, Agriculture and Engineering Service, Cooperative Extension, Ithaka, New York, USA.
* S Gajalakshmi and S A Abbasi (2004) Earthworms and vermicomposting Indian Journal of Biotechnology .Vol 3, pp 486-494
* Sobana, K., Agnes Sharmila, M. and Jegadeesan, M. (2016). A review on vermicomposting of bio waste using different earthworm species. Journal of Environmental Science, Computer Science and Engineering & Technology Sec. A, 5(1): 193–200.