Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 04, Issue: 03 (MAY-JUNE, 2024)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Role of Vermicompost for Agriculture

(*Neeraj Kumar[1], Chetan Kumar Dotaniya[1], Atul Dhakad[1], Sudhir Kumar[2] and Mohit Kumar[3])
[1]Government Agriculture College, Todabhim, Gangapur City-321611 (Rajasthan)
[2]Shri Vinayak College of Agriculture, Nayla, Jaipur-303012
[3]Ranjeet Singh Memorial (PG) College, Dhampura, UP-246761
*Corresponding Author's email: neerajkumar32598@gmail.com

Vermicomposting is the product of the decomposition process that uses various insect species (mostly red worms, white worms, and other soil animals) to create a mixture of decomposed vegetables or food waste, garbage, and earthworms. This method is called vermicomposting, and growing worms for this purpose is called vermiculture. We all know very well that earthworms found in the land are very useful for humans. Their importance for humans was first told in 1881 by the world-famous biologist Charles Darwin after his 40 years of study. Subsequent studies have proved the usefulness of earthworms more than Darwin had ever imagined. Earthworms founds in the land eat the plant residues and organic matter lying in the field and convert them into small tablets, which acts as native manure for the plants. According to the NC State Extension, organic waste from food is the second biggest source of methane gas, a contributor to climate change, in landfills. Vermiculture, the process of using worms to turn food and garden waste into compost, creates vermicompost, a vital soil enhancer. Of the 9000 types of earthworms, only seven are suitable for composting. ***Eisenia fetida*** (red wigglers), available from earthworm growers, is the most common. The growth of earthworms in organic wastes has been termed vermiculture and the processing of organic wastes by earthworms is known as vermicomposting (Markam 2021).

Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible. Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them [Dotaniya *et al.*, 2019]. Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities. Organic farming was capable of sustaining higher crop productivity and improving soil quality and productivity by manipulating the soil properties on long term basis [Dotaniya *et al.*, 2023]. It was reported that organic and low-input farming practices after 4 years led to an increase in the organic carbon, soluble phosphorus, exchangeable potassium, and pH and also the reserve pool of stored nutrients and maintained relativity stable EC level. Worms eat a lot of waste and reduce their volume by 40-60%. Each animal weighs approximately 0-5 to 0-6 grams, feeds on waste equal to its own body weight, and produces feces equal to 50% of the waste it eats in a day. Worm waste contains more (almost twice) more macro and micronutrients than garden compost. Hidalgo *et al.* (2006) earthworm castings increased plant (together with root) growth stems diameters, and flower numbers. Actually, one hand there is increasing interest in the potential use of vermicomposts as plant growth media and soil amendments Chamani et al. (2008). On the other hand, vermicomposting can be an economical alternative for livestock waste management Peyvast *et al.* (2008) in order to reduce their negative effect on underground water quality.

One earthworm can tillage 36 ton soil/year. To tillage this same amount of soil by tractor, you need ~10L of Diesel.

Apart from this, earthworms also do good plowing in the field with tractor, which is not possible by other methods without harming the plants. Fertility of the land by earthworms. It helps in maintaining productivity and the physical, chemical and biological properties of the land biological properties of the land for a long time. Some species of earthworms often use only bio-degradable organic wastes as food. 5to 10 percent of the total amount of these organic substances ingested in the form of food is absorbed by the calls of the body and the rest is excreted in the form of excreta which is called vermin-cast. They say Vermi-composting and earthworm rearing is a mixture of vermin cast and earthworm dead remains, eggs, cocoons, micro-organisms, etc., produced by feeding wasted organic matter to earthworms under controlled conditions. The method is called vermiculture.

Materials and methods

Collection of wastes: Animal wastes (Cow, Buffalo, Sheep, Goat dung) were collected from different farm houses of these animals of Todabhim city. Partially decomposed mixture of animal's wastes was used for improvement of vermicomposting efficiency. The animal dung /wastes were exposed to sun light for 5 to10 days to removing the various harmful organism and noxious gases, before the preparation of vermin beds.

Collection of earth worm: Earthworms ***Eisenia foetida*** an epigeic species were collected from Todabhim. The collected earthworms cultured in laboratory conditions.

Experimental setup for vermicomposting: Vermicomposting was conducted on cemented earth surface. There are 15 vermibeds were formed by arrangement of different animal wastes in 1:1 ratio. The size of each vermibed is 9m length × 2m Width × 1m Hight. After formation of vermibeds moisten it and inoculated 1kg of cultured ***Eisenia foetida*** in every bed. The beds were covered the bed by useless jute pockets and moist the bed daily up to 40 to 45 days for maintaining the moisture content. Weds were physically turned over at each week interval up to 3 weeks. After 40 to 45 days granular tea like vermicompost appear on the upper surface of beds. Best colour of vermicompost Tea leaf and black brown colour. These vermicomposts were used for extraction of vermiwash.

General View of college farm

Chemical composition of Vermicompost

The chemical composition of vermicompost (Table no. 1) mainly depends on the type of waste material used, their source and method of manufacture. In general, it contains almost all the nutrients required by the plants in a balanced quantity and in a smooth state.

Vermicompost contains 5 times Nitrogen, 8 times Phosphorous, 11 times Potash and 3 times Magnesium and their micro- nutrients are found in balanced amounts as compared to Dung Manure (FYM).

Table no. 1 Chemical composition of vermicompost

Sr. No	Standard	Quantity
1.	pH	6.8
2.	Nitrogen	0.50-10
3.	Phosphorus	0.15-0.56
4.	Potassium	0.06-0.30
5.	Calcium	2.0-4.0
6.	Sodium	0.02
7.	Magnesium	0.46
8.	Iron	7563ppm
9.	Zinc	278ppm
10.	Manganese	457ppm
11.	Aluminum	7012ppm
12.	Copper	27ppm
13.	Boron	34ppm

Implication of Vermicompost

1. In rural areas, the production of vermicompost can provide livelihood care to the unemployed.
2. Vermicompost acts as a soil conditioner and improves the biological, physical and chemical properties of the soil.
3. Vermicompost enriches the soil with microbes.
4. Vermicompost benefits in improving soil texture, aeration and increases water retention capacity.
5. Vermicompost improves the recycling of soil.

Advantage of vermicompost

Pathogen suppression: Studies suggest vermin compost does not kill pathogens in the soil, but rather keeps the pathogens from becoming virulent and attacking your plants.

Nutrient Delivery: Vermi compost, in comparison to conventional compost, normally possesses higher levels of plant-available nutrients, particularly nitrogen and phosphorus.

Water Retention: You will probably be surprised at how dense vermicompost is, thanks to its impressive water retention capabilities. In areas with depleted – or depleting – water sources and/or soil heavy in sand or clay, adding vermin compost or worm castings to the soil will help keep the water in the soil and conserve that precious resource.

Increased Microorganism Populations: Vermi compost *can* be a thriving microbial community, full of beneficial fungi and bacteria that aid in soil health. Healthy soil is said to consist of around 5% organic material, but in over-farmed soil, that number has fallen to 1%. Introducing vermin compost to soil can help restore that balance.

Pest Suppression: Similar to its effect on pathogens, vermin compost does not kill or repel pests, but can help stave off attack.

Plant Growth Regulation and Higher Yields: Studies abound that show that vermin compost or worm castings application results in a higher yield with crops ranging from strawberries to tomatoes to peppers and more. Some vermin composts can also feature hormones that regulate and promote plant grow

Polluted Soil Remediation: It's far beyond the scope of this article (and my own knowledge) to explain *how*, but countless studies indicate earthworms and the microbes found in lively vermin compost are shown to remediate soil contaminated with hydrocarbons, agrichemical pollutants, heavy metal free radicals, and more.

Disadvantage of vermicompost

Cost: Vermicompost setup is costlier than other methods like composting. You have to use specialized containers and buy earth and other several worms, which can be a costly affair. On the other hand, composting hardly requires any material or expense.

Care: Unlike compost, vermicompost requires extra attention and care. The worms need food, stable temperature, and consistent moisture to thrive easily and help create compost.

Space: Vermicompost requires more space to produce the exact yield as the regular compost. It may also require more than one bin to generate ample compost.

Time-Consuming: The worms may take anywhere from 3-6 months to turn the organic matter into usable vermicompost. The time it takes may vary according to factors like the number of worms, the temperature of the bin, and how frequently the content is stirred.

Pests: Vermicompost bins can encourage the growth of bugs. As it requires a cooler temperature to help earthworms survive, it also attracts other pest issues.

Epilogue: Vermicomposting is a natural process whereby earthworms convert waste material with rigid structures into compost. The compost produced in this green process is traditionally and popularly used as natural fertilizer for enhancing plant growth.

References

1. Chamani, E., Joyce, D.C. and Reihanytabar, A. (2008). Vermicompost Effects on the Growth and Flowering of Petunia hybrid, Dream Neon Rose, American-Eurasian J. Agric. Environ. Sci., 3(3):506-512.
2. Dotaniya, C.K., Lakaria, B.L., Dotaniya, M.L., Doutaniya, R.K., Dixit, H.C., Niranjan, R.K., Kumar, U., Mohbe, S., Sanwal, R.C. and Singh, J. (2023). Integrated nutrient management of fenugreek in Bundelkhand region. Book Chapter in 6th International Conference on strategies and challenges in agricultural and life science for food security and sustainable environment (SCALFE-2023) Shimla HP. Pp 1-7.
3. Dotaniya, C.K., Niranjan, R.K., Kumar, U., Lata, M., Regar, K.L., Doutaniya, R.K., Mohbe, S. and Jadon, P. (2019). Quality, yield and nutrient uptake of fenugreek as influenced by integrated nutrient management. International Journal of Plant & Soil Science, 29(3): 1-7.
4. Hidalgo, P.R., Matta, F. B. and Harkess, R.L. (2006). Physical and Chemical Properties of Substrates Containing Earthworm Castings and Effects on Marigold Growth. Hort Science, 41:1474-1476.
5. Markam, S. (2021). Vermicompost, its importance and benefit in agriculture. The Pharma Innovation Journal, 10(12): 3163-3167.
6. Peyvast, G., Ramezani, Kharazi, P., Tahernia, S., Nosratierad, Z. and Olfati, J.A. (2008). Municipal Solid Waste Compost Increased Yield and Decreased Nitrate Amount of Broccoli (Brassica oleracea var. Italica). Journal of Applied Horticulture, 10(2):129-132.