



# **Environment and Sustainable Development**

Problems, Prospects and Mitigation

**(ESDPPM)**

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## Effects of Vermiwash on Plants

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### ABSTRACT

The use of various pesticides reduces the quality of the soil. Plant growth hormone, pesticides, fertilizers etc. As a result, soil quality is unsuitable for agricultural management. Decreased fertility, reduced production, increased health risks and increased pollution result from poor soil quality. Therefore, organic approaches should be used to prevent soil degradation and maintain high soil quality. Vermiwash is an organic approach that can be used to prevent the use of some pesticides by acting as a plant growth promoter and foliar spray. Vermiwash is an effective fertilizer that contributes to plant growth and yield when sprayed directly or mixed with a specific proportion of fertilizer or fertilizer. It was also found that plants treated with vermiwash had a low number of pests.

**Keywords:** Earthworm, Decomposition, Vermiwashh, Agriculture, Environment.



## 1 INTRODUCTION

In the twenty-first century, India's agriculture development plan must focus on raising the productivity of the area under cultivation while lowering production costs and boosting input efficiency without compromising environmental quality. The primary requirement is to promote the health of the soil-plant-environment system so that it is not subjected to economic exploitation due to misuse. Nowadays, the world, farmers utilize large amounts of chemical fertilizers and pesticides to increase the output of various crops. These fertilizers like chemicals and insecticides reduced soil fertility and caused consumer health issues. Organic matter, such as animal manures, human waste, food wastes, yard wastes, sewage sludge, and composts, has long been recognized in agriculture as advantageous to plant growth and productivity, as well as soil fertility maintenance. (Follet *et al.*, 1981).

Organic changes have been shown to improve soil structure, increase soil fertility and increase crop yields through new agricultural practices. Organic matter is an excellent source of nutrients available to plants and can be added to the soil to maintain healthy microbial populations and activity. Earthworms support plant growth and production. By using brand new soil vermicompost technology, it is possible to achieve a rapid transition to sustainable agriculture. Vermiwash is a product that commercial pest breeders have just begun to promote. This worm rinse contains enzymes and earthworm secretions that not only increase plant growth and yield but also create resistance to sprayed plants. Vermiwash is an excellent plant fortifier that can be sprayed on the leaves. It is the liquid extract that is collected after the water has passed through the various layers of the worm culture unit. The soup contains earthworm secretions, that is, earthworm droppings.

The coelomic fluid pours through the dorsal pores, mucus, enzymes released by the worm and microorganisms, and plant nutrients, vitamins, and chemicals secreted by the worm and microorganisms. The earthworm's coelomic fluid is known as vermiwash. Vermiwash manufacturing has lately piqued the interest of commercial vermiculturists due to its rich organic content. The earthworm's long tubular body contains coelomic fluid, which is secreted by the organism and keeps it working. Auxins, cytokinins, bacteria, fungus, calcium, phosphorus, potassium, and other nutrients are measured. The amount contained in vermicompost depends on the raw materials used to make the vermicompost. Vermiwash supports root initiation, root growth, plant growth, accelerated growth,



increased crop yields, and higher crops by increasing soil organics and increasing the levels of nutrients readily available to the plant. Brings yield. Vermiwash and Vermiprotein have a wide range of applications in agriculture, aquaculture, and poultry. According to Kobatke (1954), the coelomic fluid from the earthworm's body was antibacterial. Studies on the effects of spraying vermiwash on vegetables have shown significant improvements in yield quality and quantity.

Vermicompost, farmyard manure, press mud, and coir pith compost are just a few of the organic fertilizers that have helped to boost production and quality. In recent years, foliar sprays of liquid fertilizers have grown increasingly common. The benefits of employing liquid fertilizers, particularly liquid seaweed fertilizers, have prompted the development of numerous such compounds for use as foliar sprays. Vermiwash is a liquid fertilizer used in organic farming as a solid substitute and supplement, as well as for its unique ability to supply nutrients quickly and effectively. One of the plants, *Hibiscus sabdariffa*, was used in studies on the use of plant growth regulators to improve bast fibers (Fathima and Balasubramanian, 2006). The efficiency of vermiwash as a biofertilizer in organic farming has been demonstrated by Lalitha *et al.*, (2000), Zambare *et al.* (2007), Ansari and Ismail (2001), and Shivasubramanian and Ganeshkumar (2004).

## 2. PREPARATION OF VERMIWASH

### 2.1. Materials Required

For preparation, 250L barrel or small bucket, Broken stones, Coarse sand, Garden soil, Earthworms, Cattle dung, Straw, and Water is required. Earthworms play an essential role in plant growth. 10g of earthworms were dipped in 25ml warm water and left at room temperature for 30 minutes. The insoluble materials were removed from secreted enzyme extracts by centrifugation at 3000 rpm for 10 minutes. 0.2 membrane filtration was used to remove cells from the filtrate (Zambare., *et al.*, 2008). 10% of Soil was mixed with water and filtered using ordinary filter paper. The filtrate was sterilized and used to make soil extract agar medium with 2.5 percent agar. Filter-sterilized vermiwash was added to the sterilized extract at a rate of 5% (v/v) (Zambare., *et al.*, 2008). The earthworms create burrows in worm-worked soils. These burrows, also known as rhizospheres, are teeming with bacteria. The nutrients from these burrows are washed to the roots by the water traveling through these passageways, where they are absorbed by the plants.



### 3. EXTRACTION OF VERMIWASH

To facilitate collecting vermiwash easier, place the drum or barrel on a couple of bricks with an outlet. Fill in the layers with stones, coarse sand, soil, earthworms, cattle dung, and straw. Make sure the soil is adequately moistened. Introduce native earthworms to the soil and provide them with cattle manure and straw as a source of nutrition. Allow 15 days for acclimatization. Allow the outlet's dilute water to flow. Day 16, place a drip bucket on top of the container and fill it with water (1 liter per 50 liters), then close the outlet. The next morning, open the outlet and collect the vermiwash. add the feed to the worms when required. Continue this process every day to collect vermiwash. There are many different types of barrel designs according to the usage of conveniences such as old waste barrels, plastic barrels, large pots, flower pots, etc. Drops of water are permitted to fall into the vermicomposting system from a pot suspended above the barrel. However, barrels are not required for the manufacture of Vermiwash. Vermiwash systems can be built in barrels, buckets, and even small earthen pots (Sonu, 2018).

### 4. USING VERMIWASH AS A SPRAY

Vermiwash is liquid-type fertilizer that can be used as a foliar spray. Drilosphere is a word used to describe tunnels created by earthworms in cultivated soil to support healthy plant growth. Water flowing through these tunnels flushes nutrients from ducts to roots for uptake by plants (Somani., Et al., 2008). This principle is used in the manufacture of Vermiwash. before spraying the vermi wash dilute it with water likely 10% and then make them soak the soil before spraying on the plants which can comparatively reduce the infection in the soil. Seedlings are steeped in vermiwash solution for about half an hour before being transferred, after diluting it with water (5 times). Mix vermiwash with cow pee and dilute it with water to serve as a pesticide and foliar spray (1 liter vermiwash+1 liter cow urine+8 liters water).

Vermiwash is a superior alternative for growth and production when combined with neem-based insecticides. Vermiwash, which is created from buffalo dung and vegetable wastes and coupled with neem oil, is an exceptionally effective soybean growth and production combination. It may also be argued that foliar sprays of vermiwash derived from vermicomposts of buffalo dung and agro/kitchen wastes can promote crop growth, blooming, and production while reducing pest infestation. (Nath and Singh, 2011). It can be



used in compost pits to speed up the decomposition process (Das *et al.*, 2014). The main nutrients in vermiwash include soluble plant nutrients including N, P, K, and Ca, as well as micronutrients. Many beneficial microbes such as heterotrophic bacteria, fungi, and actinomycetes are found in the vermiwash, including nitrogen-fixing bacteria such as *Rhizobium* spp., *azotobacter* spp., *agrobacteria* spp., *Rhizobium* spp., phosphate solubilizers, and enzyme cocktails such as proteases, amylases, urease, and phosphatase (Das *et al.*, 2014).

## 5. EFFECTS OF VERMIWASH ON AGRICULTURAL PRODUCTIVITY

Organic formulations might be an effective way to boost soil fertility (Verma *et al.*, 2017). The combination of vermicompost and vermiwash had a significant influence on the soil's biochemical features, resulting in a significant rise in soil micronutrients and a higher quality improvement in the soil's physical and chemical qualities (Ansari and Sukhraj, 2010). Vermiwash has the potential to be employed in agro-biotechnology for sustainable development because of its origin, cost-effectiveness and simplicity of availability, time savings, repeatability, dependability, and eco-friendliness (Zambare *et al.*, 2008). It may be used as a fertilizer to improve germination and seedling survival rates in agricultural plants growing in low-nutrient soils, opening the way for organic farming to become more sustainable (Mujeera and Malathy, 2014).

*Vigna mungolia* was abundant in growth and yield (Subha *et al.* (2003). Using biological inputs and organics to improve crop quality and productivity without expanding cultivated land is water. It is a difficult problem in hydroponics, also known as soilless cultivation. We used soil beds. Demonstration controls included fertilizer vermiwash, mixed vermiwash, fertilizer compost tea, and mixed compost tea. With the exception of the data, the data showed that the nutrient solution had a significant effect on all attributes, as well as the interaction of the cultivated varieties and nutrients.

## 6. EFFECTS OF VERMIWASH IN PREDATORY INSECTS

The usage of a combination of vermicompost and vermiwash (5 or 10%) resulted together in a 24.26 percent reduction in pest infestation in vegetable peas compared with the control group (Mahto and Yadav, 2005). Nath & Singh, 2015 state that For the growth, production, and management of *Lucinodes orbitalis* infestation on brinjal crops, biopesticide along with vermiwash was



the best option. The foliar spray of vermiwash provides the nutrients required by the developing plant for elongation, early blooming, and fruiting. Biopesticides which is a good source of best fertilizers and pesticides for decreasing *Lucinodes orbitalis* populations to enhance the fruit yield since they were more effective against fruit and shoot borer larvae and caterpillars without damaging fruits. Vermiwash with bio-pesticide is a superior solution to chemical fertilizer and pesticides for the control of *Leptocoryza varicosis* and rice crop output. Vermiwash is a mild biopesticide that has a synergistic impact on the population of *Leptocoryza varicosis* when mixed with plant allelochemicals, resulting in enhanced output (Mishra et al., 2015).

## 7. BENEFITS OF USING EARTHWORMS IN SOIL

- Improves soil aeration.
- Makes soil to be Enriched with beneficial micro-organisms (which add some enzymes like cellulose and phosphatase).
- Microbial activity is an important one. In vermicompost 10 to 20 times higher than in the soil and organic matter that the worm ingests.
- And it attracts mainly deeply burrowing earthworms which already living in that soil.
- Water holding capacity gets increased.

### 7.1. Plant growth

- It can improve the germination process and also improves plant growth, mainly in the crop yield.
- Not only improves plant growth but also root growth.
- For plant growth soil enrichment is important which can improve by this vermiwash.
- It adds some plant hormones such as auxins and gibberellic acid.

### 7.2. Economic uses

- Conversion of biowaste minimizes waste flow to landfills.
- Removing biowastes from the waste stream helps to minimize contamination of other recyclables gathered in a single receptacle (a common problem in communities practicing single-stream recycling).
- Local low-skill occupations are created.
- Vermicomposting is feasible in less-developed agricultural regions due to low initial investment and very simple processes.



**7.3. Environmental uses:**

- By recycling garbage on-site, it helps to reduce the "metabolic gap."
- Temperature control and mechanical harvesting are common in large systems, but other equipment is basic and does not wear out rapidly.
- Methane and nitric oxide emissions are reduced as a result of production (produced in landfills or incinerators when not composted).

**8. ADVANTAGE OF USING VERMIWASH ON PLANTS**

- It's a biofertilizer, or environmentally friendly natural fertilizer, that's fully organic and made from decomposing organic waste. It is natural content fertilizer.
- When diluted to 20-30%, it gives resistance to a range of illnesses by suppressing the growth of the disease-causing fungus's mycelium.
- It provides resistance against many pests when diluted with 10% cow urine and neem extract.
- As a result, it's a biopesticide that doesn't hurt the environment.
- Because of the high organic matter concentration of the vermiwash, it enhances soil physicochemical properties such as texture and aeration.

**9. CONCLUSION**

The vermiwash is effective manure that contributes to the growth, and the yield of plants. When sprayed directly or blended with a certain ratio of fertilizer or manure. It was also discovered that plants treated with vermiwash had a lower population of insect pests. Vermiwash, a liquid type fertilizer that can be used as a foliar spray for crop plants and has high efficiency for plant growth can help to decrease the disease from using chemical fertilizers. The results of the many experiments demonstrate that vermiwash and vermicompost can be used as a substitute for commercial fertilizers on the market, but the impact of other variables must be investigated.

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## 11. REFERENCES

1. Allahyari, S., Honarmand, S. J., Khoramivafa, M., & Zolnorian, H. (2014). Effect of vermicompost extracts (compost tea and vermiwash) on the vegetative growth of tomato (*Lycopersicon esculentum* Mill) under hydroponic conditions. *International Journal of Biosciences (IJB)*, 4(11), 171-181.
2. Ansari, A. A., & Sukhraj, K. (2010). Effect of vermiwash and vermicompost on soil parameters and productivity of okra (*Abelmoschus esculentus*) in Guyana. *African Journal of Agricultural Research*, 5(14), 1794-1798.
3. Coyne, Kelly and Erik Knutzen. *The Urban Homestead: Your Guide to Self-Sufficient Living in the Heart of the City*. Port Townsend: Process Self Reliance Series, 2008.
4. Das, S. K., Avasthe, R. K., & Gopi, R. (2014). Vermiwash: use in organic agriculture for improved crop production. *Popular kheti*, 2(4), 45-46.
5. Edwards, C. A., Dominguez, J., & Arancon, N. Q. (2004). 18. The influence of vermicomposts on plant growth and pest incidence.
6. Mahto, T. P., & Yadav, R. P. (2005). Effect of vermicompost alone and in combination with chemical fertilizer on stem fly incidence and yield attributes in vegetable peas under Bihar conditions. *Journal of Applied Zoological Researches*, 16(1), 70-72.
7. Mishra, K., Singh, K., & Tripathi, C. P. M. (2015). Organic farming of rice crop and management of infestation of *Leptocoryza varicornis* through the combined effect of vermiwash with biopesticides. *Research Journal of Science and Technology*, 7(4), 205-211.
8. Mujeera, F., & Malathy, S. (2014). Studies on growth-promoting effects of vermiwash on the germination of vegetable crops. *International Journal of Current Microbiology and Applied Sciences*, 3(6), 564-570.
9. Nath, G., & Singh, K. (2011). Effect of foliar spray of biopesticides and vermiwash of animal, agro and kitchen wastes on soybean (*Glycine max* L.) crop. *Botany Research International*, 4(3), 52-57.
10. Paper on Invasive European Worms. Retrieved 2009-02-22. Ndegwa, P.M.; Thompson, S.A.; Das, K.C. (1998). "Effects of stocking density and feeding rate on vermicomposting of biosolids" (PDF). *Bioresource Technology*. 71: 5-12. doi:10.1016/S0960-8524(99)00055-3.
11. Pilot studies for vermifiltration of 1000m<sup>3</sup>day of sewage wastewater. [www.academia.edu](http://www.academia.edu). Retrieved 2016
12. Somani, L. L. (2008). *Vermicomposting and vermiwash* Agrotech Publishing Academy, Sonu, S. (2 Apr. 2018). Vermiwash Liquid Fertilizer. Uttaranchal (P.G.) College of Bio-Medical Sciences & a m p ; Hospital. BLOGS, <https://blog.ucbmsh.org/department/vermiwash-liquid-fertilizer>.



13. Subha, R., Ganesh, P., Mohan, M., SHEIK SALEEM, S., & Vijayalakshmi, G. S. (2003). Effect of vermiwash on the growth of black gram (*Vigna mungo*). *Geobios*, 30(1), 77-79.
14. Todkari, M. (2001). Effect of vermiwash prepared by two methods on growth characteristics, yield and nutrition of three flowering plants. M. Sc. (Agri.) Thesis, Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (India).
15. Tharmaraj, K., Ganesh, P., Kolanjinathan, K., Suresh Kumar, R., & Anandan, A. (2011). Influence of vermicompost and vermiwash on physicochemical properties of rice cultivated soil. *Current Botany*, 2(3).
16. Verma, S., Singh, A., Pradhan, S. S., Singh, R. K., & Singh, J. P. (2017). Bio-efficacy of organic formulations on crop production-A review. *International Journal of Current Microbiology and Applied Sciences*, 6(5), 648-665.
17. Vitthalrao B. Khyade (2005). Vividh Vanaspathi Arkancha TutiReshim Kitak Sangopanasathi Upyojan. Influence of mealybug infestation on mulberry leaves on the silkworm, *Bombyx mori* (L). *Krishi Vidnyan* 4: 18-22.
18. Vitthalrao B. Khyade (2009). Sporulation & expression of parasporal delta. Endotoxin gene of *Bacillus thuringiensis* (L) in sporogenic & asporogenic strains of *Bacillus cereus* (L). Proceedings of National level conference on new horizons in insect pest management (6-7 March 2009) (Gudleppa Hallikeri College, Haveri, Karnataka State, India.): 14-152.
19. Xing, Meiyang; JianYang, null; Wang, Yayi; Liu, Jing; Yu, Fen (2011-01-30). "A comparative study of synchronous treatment of sewage and sludge by two vermifiltrations using an epigeic earthworm *Eisenia fetida*". *Journal of Hazardous Materials*. 185 (2-3): 881-888. doi:10.1016/j.jhazmat.2010.09.103. ISSN 1873-3336. PMID 21041027.
20. Zambare, V. P., Padul, M. V., Yadav, A. A., & Shete, T. B. (2008). Vermiwash: biochemical and microbiological approach as an eco-friendly soil conditioner. *ARNP Journal of Agricultural and Biological Science*, 3(4), 1-5.