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Vermiwash: An Eco-Friendly Liquid Fertilizer

(*Narne Kavya[1], J.P. Purwar[2], S. Dilip Kumar Reddy[3] and Ashish Kumar[4])
[1]Ph.D. Scholar, Department of Entomology, GBPUAT, Pantnagar, Uttarkhand
[2]Professor, Department of Entomology, GBPUAT, Pantnagar, Uttarkhand
[3]Assistant Professor, Department of Plant Pathology, JCDR Agricultural College, Tadipatri
[4]Project Assistant, Department of Entomology, GBPUAT, Pantnagar, Uttarakhand
*Corresponding Author's email: kavyanarne22@gmail.com

The extensive use of inorganic fertilizers, herbicides and pesticides in modern agriculture presents a significant threat to the sustainability of soil and water resources. Although these chemicals are often viewed as an easy solution to the challenges faced by farmers, they can negatively impact soil health, water quality and the health of farmers, leading to long-term consequences for the ecosystem and human health. In light of this critical situation, it is essential to explore alternative solutions that are both effective and environmentally friendly. Vermiwash presents itself as a viable solution, providing an affordable and organic alternative. It serves as a sustainable and eco-friendly replacement for chemical inputs (Gudeta *et al*., 2021).

Vermiwash is a liquid biproduct derived from vermicompost, which is produced with the help of earthworms and organic waste. Earthworms play a vital role in converting organic waste into nutrient-rich manure called vermicompost. The liquid extract produced from this process, known as vermiwash, acts as a powerful organic liquid fertilizer. It is rich in enzymes, plant growth hormones, vitamins, as well as micro and macronutrients (Ghosh *et al*., 2018). This combination boosts crop resistance to various pests while promoting growth and increasing crop productivity.

Vermiwash contains excretory products from earthworm secretions, including coelomic fluid released through dorsal pores, mucus, enzymes from the worms and microorganisms, plant nutrients, vitamins, and growth-promoting substances. This mixture, known as vermicasts, is rich in nutrients, especially soluble potassium, calcium, and magnesium, which are absorbed into the vermiwash. It also includes plant growth hormones like auxin and cytokinin, as well as nitrate-fixing and phosphorus-solubilizing bacteria.

Process of making Vermiwash

To prepare Vermiwash, a container with a capacity of around 250 liters is required. The container size can be adjusted depending on the farm's size, but a 250-liter container is generally recommended for research purposes. The materials needed for this process include broken brick pieces, stone pebbles, sand, coal, cattle dung, organic waste and earthworms. Two species of red earthworms viz., *Eisenia foetida* (Red Wiggler) and *Lumbricus rebellus* (Red worm) are commonly used for commercial composting or worm farming because of their high tolerance to environmental changes:

The process for preparing Vermiwash involves the following steps:

1. **Drilling and Tapping**: Begin by drilling a hole at the bottom of a bucket, doko, or any locally available container, then attach a tap. This setup will enable the collection of Vermiwash as it begins to drain or leach.
2. **Creating a Drainage Layer**: Fill the bottom of the container with a 10 cm thick layer of broken bricks, followed by stone pebbles and coal. This forms a drainage system for excess water.
3. **Adding a Sand Layer**: Add a 2-3 cm thick layer of sand on top, which will act as a filter for the vermiwash.
4. **Introducing Earthworms**: Place about 1 kg of earthworms into the container along with vermicompost, right after the sand layer.
5. **Adding Cow Dung**: Layer approximately 2 kg of two-week-old cow dung over the earthworms and vermicompost. This serves as food for the earthworms.
6. **Adding Organic Waste**: Add around 20 kg of organic waste on top of the cow dung layer. This can include biodegradable materials such as kitchen scraps, garden waste, or agricultural residues, chopped or shredded into small pieces to facilitate earthworm feeding.
7. **Moistening the Waste**: Sprinkle or pour water over the organic waste to moisten it to around 60% moisture content. Farmers can assess moisture through visual inspection, touch and feel, weight change methods, moisture meters or the squeeze test. For accuracy, using a moisture meter designed for liquids and maintaining records of ingredient quantities can help control moisture levels effectively.
8. **Covering the Container**: Cover the container with a lid or mesh to prevent flies and pests from entering.
9. **Vermicast Production**: The earthworms will begin feeding on the organic waste, producing vermicast, their nutrient-rich excreta, which contains beneficial nutrients and microorganisms for plants. The water that passes through this vermicast becomes Vermiwash.
10. **Collecting Vermiwash**: After 7-10 days, Vermiwash will start draining from the tap at the bottom of the container. This system can yield about 35-40 litres of vermiwash every 15 days, which can be stored in bottles or cans with lids for later use.
11. **Replacing Organic Material**: After 35-40 days, the organic waste and cow dung need to be replaced, while keeping all other materials in place. By this time, the earthworms will have converted the organic waste into vermicompost, and fresh feed for the earthworms will be required (Patnaik *et al*., 2022).

Composition of Vermiwash

Composition	Quantity
pH	7.48
Organic carbon	0.008 %
Nitrogen	0.01 %
Phosphorous	1.69 %
Potassium	25ppm
Calcium	3 ppm
Sodium	8 ppm
Ferrous	0.06 ppm
Copper	0.01ppm
Magnesium	158.4ppm
Zinc	0.02ppm
Manganese	0.58ppm

Application of Vermiwash

To use Vermiwash as a liquid fertilizer, it should be diluted with water at a ratio of 1:5 to 1:10. For young or sensitive plants, a more diluted solution (1:10) is recommended to prevent nutrient burn or shock. In contrast, mature or larger plants may benefit from a slightly stronger solution (1:5) to meet their nutrient requirements. For foliar spraying or general soil application, a 1:10 dilution is typically advised. However, for plants that need more nutrients or show signs of deficiency, a 1:5 dilution can be applied to the leaves or roots once or twice a week.Itcan be applied to plants using a watering can, spray bottle, or drip irrigation system

Conclusion

In a nutshell, Vermiwash offers a sustainable and eco-friendly alternative to chemical fertilizers which has gained considerable momentum among farmers in many areas.This organic fertilizer has proven to be a cost-effective and efficient solution, enhancing soil health, boosting crop yields and minimizing environmental impact. By adopting this innovative method, one can able to reduce input costs, improve crop quality and support a more sustainable and environmentally friendly agricultural system. Its widespread adoption could lead to improved livelihoods, increased food security and environmental conservation.

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