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# VERMIWASH: ECOFRIENDLY INITIATIVES TOWARDS ORGANIC FARMING AND REMUNERATIVE ENTERPRISE TO FARMERS

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**ABSTRACT:**

The main objectives of the organic farming are to maintain healthy environment, economic profitability and social as well as economic equity. The application of vermiwash definitely playing an important role in ensuring these objectives as it contains mucus, micronutrients, growth hormones, vitamins, enzymes and amino acids and it is applied as biofertilizer by directly adding it into soil and as a liquid spray overall part of the plant body to prevent fungal, bacterial pathogen, and pests as biopesticide. Bioactive macromolecules found in the coelomic fluid, mucus, and skin secretion of earthworms are very important to act against pathogenic soil microbe and pests.

The present study from January 2019 to December 2021, investigated in situ effects of vermiwash foliar spray on ornamental *Caladium hortulanum* elephant ear plant, *Corline fructicosa* ti plant and medicinal *Abrus precotoris* rosary pea, *Piper betle linn.* Betle leaves showed beneficial effect in controlling weevils, bugs, fungi and bacteria, and promoted the growth and development of all the plants. It should be noted that vermiwash serve as a good biopesticide, biofertilizer and also increases disease resistant power of the plants intern it reduced the cost of farmers on routine or synthetic fertilizers and pesticides.

**KEY WORDS:** Ecofriendly**,** Vermiwash, Vermicompost, Vermiculture, Agriculture, remunerative.

**INTRODUCTION:**

In the recent decade some of the farmers, gardeners, nurseries and farming system turning towards organic farming, zero budget natural farming, integrated farming and sustainable farming system because of changing government policies. Whereas, in conventional agricultural green revolution system, agricultural fertilizers and pesticides increased tremendous pressure on farm land such as over intensive monoculture cropping resulted into loss of fertility, micro-fauna and nutrient of the soil, which created serious problems on agro-ecological sustainable balance and nutrient cycles of the soil. Besides, there is continuous fall in land holdings of farmers, combined with

dry-land, rain-fed areas, large family size, shrinkage of natural resources, increasing input cost of farming system and low net returns from the conventional agro system made the agriculture uneconomical, leading to replacement of conventional into modern organic farming, zero budget natural farming, integrated farming and sustainable farming system. One of the most important outputs of organic farming, integrated farming and sustainable farming system is vermicompost and vermiculture, during the study period from January 2019 to December 2021 in addition to vermicompost, it also produced vermiwash as a byproduct honey brown coloured liquid.

Vermiwash is the watery extract of Vermicomposts, extracted in the presence of rich population of earthworms. It contains several enzyme, plant growth hormones, vitamins along with micro and macronutrients (Nandana et al, 2020, Shield and Earl, 1982 ) which increases the resistance power of crops against various diseases and enhance the growth and productivity of crops (Anand et al 1995; Pathak and Ram 2004; Suthar et al 2005; Umamaheshwari et al 2003, Yadav et al 2005). Vermiwash is rich in many different nutrients, vitamins, growth hormones, which acted as disease and pest suppression agents (MacHfudz et al 2020). According to Gudeta et al (2021) Vermiwash is the by-product of vermicompost applied as fertilizer by directly adding it into soil and as a liquid spray overall part of the plant body to prevent fungal, bacterial pathogen, and pests. Bioactive macromolecules found in the coelomic fluid, mucus, and skin secretion of earthworms are very important to act against pathogenic soil microbe and pests. The metabolites produced as a vermicomposting product applied to promote growth of plants and create an unfavorable condition for soil dwelling pathogens. As earthworm survives in soil, full of pathogenic microorganisms, and evolves cellular and humoral defense mechanisms protecting them from infection. Their cellular defense mechanism fight against pathogen by phagocytosis. They also defend themselves against pathogenic microbes and pests through their humoral defense mechanism which includes bioactive molecules such as lysenin, cytolytic eiseniapore, fetidin, hemolysin, lysozyme, Lumbricin I, Lumbricin-PG coelomic cytolytic factor, OEP3121, bacteriostats obtained from coelomic fluid, mucus and skin secretion of earthworm. Other metabolites such as hormones, enzymes, vitamins, proteins, different macro and micronutrients, and a massive amount of microbes facilitate a conducive environment for the growth of a plant by reducing stress conditions and create unfavorable condition for pathogenic soil microbes and pests. Furthermore, the exponential multiplication of soil microbes around earthworm in vermicompost / vermiwash competed and defended the disease-causing. Therefore, application of vermiwash / vermicompost as fertilizer adding into soil or spraying on the surface of plants significantly suppress a pathogen and pest.

**MATERIALS AND MEHTODS:**

Vermiwash is a honey brown coloured liquid organic pesticide and fertilizer obtained from vermicompost cum vermiculture unit through the drain pipe. There is no any special device essential to collect the vermiwash except drain pipe fitted at the bottom of vermin bed unit (Fig. 2e). The bottom of the tank is made to slope like structure to drain the excess water from vermicompost unit. A small sump is necessary to collect the drain water as well as Vermiwash 12 hours after draining excess water during peak period of worm culture. During the period of normal management of vermiculture water is sprayed regularly to maintain adequate moisture (60 - 80%) for the worms to grow and multiply and 12 hours after the drainage of excess water vermiwash collected as a byproduct liquid extract. whereas, Kale (1998) advocated artificial method by releasing 1 kg of earthworm in lukewarm (37$^{o}$C – 40$^{o}$C) 500 ml distilled water for 2 minutes, again into another 500 ml distilled water at room temperature after that all the worms released into vermitanks,

Nayak et al (2019) suggested another method for the preparation of vermiwash within a plastic container of 15 to 20 liters capacity at base of the container tap is fitted to collect the watery worm extract. The container is filled with different succesive layers. First base layer, medium sized bricks or stones up to a height of 10-15 cm filled. Above the base layer a layer of coarse sand (up to 6 inches) and fine sand (5 inches) are spread. Introduction of locally available earthworms (*Eisenia foetida*) mixing with fertile soil applied. After that, a layer of partially decomposed cow dung (20-25 cm) and organic residues of 40-45 cm were poured. All the layers in the container is moistened by sprinkling water over it. Container is sprinkled with approx 2 L water per day. After 16 to 20 days preperation of vermiwash in the unit begains. Everyday about 1-2 L of vermiwash will be collected.

**RESULT AND DISCUSSION:**

Vermiwash is a natural product formed by vermicomposting of organic matter from rich population of earthworms (Thakur and Sood, 2019). As compared to application of solid vermicompost, its liquid form vermiwash is more suitable due to its bioavailability to reach quickly to targeted area around the roots of plants (Sulaiman and Mohamad, 2020). As shown in Fig. 1 for a single pair of vemibed, collection of vermiwash was on an average 19 ltr per month and in peak period from july to October at maximum up to 30 ltr per month and it was found very effective in situ against mealy bugs ( Fig. 2 a and b) of ornamental *Caladium hortulanum* commonly called as elephant ear plant add beauty to any backyard or home space which work as flowerbed backdrops, ornamental centre piece in room, border edges, perennial, tropical, thrive well in partial shade, blazing sun in rich and moist soil, sometimes exposed attack of mealy bugs. It was very effective in situ against aphids and mites of another ornamental *Corline fructicosa* ti plant ( Fig, 2c and d) is of great cultural importance evergreen flowering, decorative plant commonly grown as a house plant in temperate climate, mostly infested by pests like aphids and mites that feed on leaves and cause holes, or sometimes it is due to manganese deficiency.

Nath and Singh (2009) Potential of vermiwash was carried out to evaluate the impact of vermiwash on the growth, flowering and productivity of okra (Abelmoschus esculantus), lobia (Vigna unguiculata) and radish (Raphnus sativus). Vermiwash was extracted from different vermicompost which was composted from different animal agro and kitchen wastes through earthworm Eisenia foetida. It was observed that treatment of vermiwash shows significantly increased in growth and productivity and decreased flowering period.

During the study potential of vermiwash carried out against weevils of medicinal Abrus precatoris commonly known as rosary pea or jequirity bean (fig, 2f and g) herbaceous flowering plant, slender perennial climber long, pinnate leafleted leaves that twines around support like trees, shrubs hedges or wire fencing. Tea made from leaves used against fevers, cough and cold; and leaves are also used against swellings, as well as leaves with honey said to be promoter of hair growth and used as an ingredient in hair products. This medicinally important plant infected by weevils that eat the leaf, shoot tips causing immense damage, which is controlled by vermiwash foliar spray. As well as Khan et al (2014) investigated the effect of a vermiwash foliar spray on the response of bhut jolokia (Capsicum assamicum) exposed to two different arbuscular mycorrhizal fungi (AMF: Rhizophagus irregularis, RI and G. mosseae, GM) in acidic soil under naturally ventilated greenhouse conditions. The VW spray significantly influenced the growth of plants receiving the dual treatment of AMF+VW. One of the commonly used medicinal *Piper betle L* betel leaves is a great source of antioxidant that fight against oxidative stress by scavenging free radicals, lowers high blood glucose levels and helps in the management of diabetes. It also lowers cholesterol levels anticancer agents, helps in wound healing and gastro protective aryuvedic plant, undergoes infection by fungal

diseases that produce wet rot symptoms on leaves causing betelvine diseases or some times by bacteria causing bacterial leaf (Fig 2 h and i) blight anthracnose both these treated by vermiwash foliar spray.

Vermiwash was found very effective against weevils and bugs. Jayabhaye and Bhalerao (2015) opined that the vermiwash is a honey brown coloured liquid extract of organic composts, generally the wash of earthworms Present in the medium collected after the passage of water through the different layers of worm culture unit. Nayak et al (2019) reported the effect of vermiwash on the plants and soil; it was found that vermiwash seems to possess an inherent property which acts not only as a liquid organic biofertilizer which promote growth of plants and yield but also as a mild biopesticide. So, it can be used as a potent input in organic farming and sustainable crop production for both, soil health and insect, pest and disease management. Jaikishun et al (2014) studied the effect of vermiwash in controlling fungal diseases and growth of tomato and mentioned that it is beneficial to get rid of pathogens and promote growth of the plant.

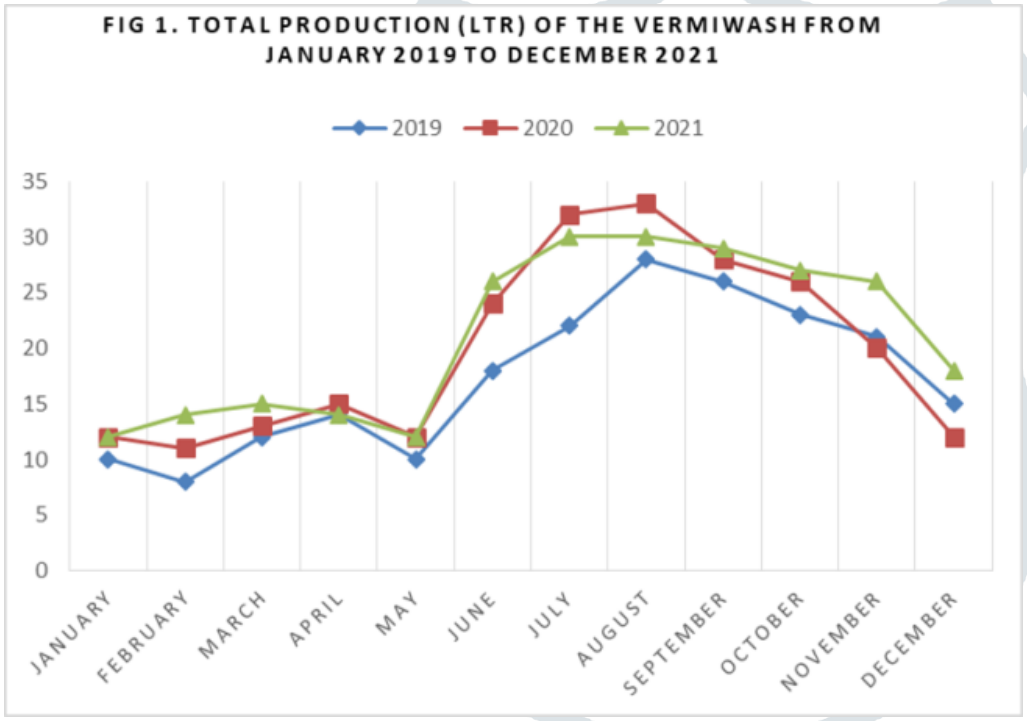


FIG 1. TOTAL PRODUCTION (LTR) OF THE VERMIWASH FROM JANUARY 2019 TO DECEMBER 2021

Fig. 2. a) *Caladium hortulanum* attacked mealy bugs
b) *Caladium hortulanum after vermiwash foliar spray*
c) *Corlins fructicosa infected by* aphids and mites
d) *Corlins fructicosa cured by vermiwash foliar spray*
e) Collection of vermiwash from vermicompost
f) Abrus precatoris infected by weevils
g) Abrus precatoris treated with vermiwash
h) *Piper betle showing* bacterial leaf blight
i) *Piper betle treated by vermiwash foliar spray.*

## CONCLUSION:

Present study tried to motivate the farmers for the collection and use of vermiwash as biofertilizer and biopesticide instead of chemical fertilizers and chemical pesticide, in turn it also reduces cost on maintenance of the farming system as well as it is eco-friendly, economic, remunerative and profitable to the farmers. As a result application of vermiwash as fertilizer adding into soil or spraying on the surface of plants significantly suppress a pathogen and pest, which retaining and enriching the fertility of the soil.

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