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Vermicompost to Save Our Agricultural Land

Shrivastava Sheela and Singh Khimiya
M.L.C. Govt. Girls' P.G. College, Khandwa, MP, INDIA

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Abstract

India produces about 3500 Million tones of waste biomass annually comes from urban and industrial sources, agriculture and domestic wastes are the main sources of organic material and their use for productivity is important for both economical and environmental reasons. There are several methods have been adopted to prepare organic manure from agro-waste. Vermicomposting is one of the important method converts wastes to wealth by using earthworms. The earthworms are cosmopolitan and their contribution to soil fertility is valuable. They converting clay into rich living earth. Earthworms live mostly underground and creating complex burrow network. They eat soil and crunching in muscular stomach digesting organic material and mixed in with minerals and ejecting the rest. This dump waste on the surface called vermicasts. Earthworms used for vermicomposting improve water filtration rates and absorption helping the soil to drain better.

Keywords: Agricultural and domestic waste, vermicast, vermiculture, vermcompost, vermitechnology, organic manure.

Introduction

Vermicompost is the product of Composting using various worms usually red wigglers, white worms and other species to create a heterogenous mixture of organic wastes like domestic, industrial, commercial and agricultural waste[1]. Disposal and management of these materials is a burning global problem[2]. The problem becomes more complicated due to insufficient sanitary and hygienic conditions in developing and underdeveloped countries. These wastes are usually dumped as heaps in the outskirts of the city[3]. Vermicast also called worm casting containing water soluble nutrients, vermicompost is an excellent, nutrient rich organic fertilizer and soil conditioner.

According to habitat earthworms are of two types: i. Epigeic (feed on the surface and eat plant residues) and ii. Endogeic (feed in the subsurface and eat their way through the subsurface loosing aerating and improving soil structure), There are about 490 species are earthworm found in India, Earthworms are poikilothermic animals (cold blooded) live in moist place, with food, moisture, oxygen and favourable temperature, Worms have no arms, legs and and eyes, Earthworms respire through their integument, Vermicasts of earthworm is rich source of macro and micronutrients, enzymes, vitamins, antibiotics, growth harmones and immobilized microflora.

Importance of earthworms: i. Biopotential of earthworm is used in waste management and to prepare bio-fertilizer through vermicomposting. ii. Vermicompost is used to minimize environmental pollution and provides good organic fertilizer. iii. Earthworm tissue has high amount of protein, 50 to 60% of dry weight. iv. Earthworms feed on pig and poultry farms. v. Earthworms are capable of accumulating toxic residues mainly metals agrochemicals. vi. Presence of earthworms in soil is an indicator of soil fertility. vii. Dried earthworms are used as medicine for the treatment of wound, piles, chronic boils, sore throat, hernia, respiratory ailments, jaundice, and rheumatic arthritis. viii. Large population of earthworms suppresses weed growth. ix. Presence of earthworms in the soil improves physical properties of soil and improves soil fertility. x. Presence of earthworms in the soil stimulates plant growth and good plant health as soil having earthworms, has less harmful Nematodes. xi. Detoxification of toxic chemicals –According to some researchers bacteria living in the gut of earthworm detoxify many toxic chemicals such as hexachlorocyclohexane. xii. Microbes living in the worms also breakdown complex molecules such as cellulose and lignin. xiii. Earthworms prevent soil erosion. By preventing soil erosion earthworms increase water holding capacity of soil. The castings of earthworms form aggregates in the soil that are resistant to erosion. xiv.Creates low skill jobs at local level[4].

Breeding and rearing of earthworm under controlled conditions is vermiculture. By providing artificial favourable conditions multiplication of earthworm can be done in short time and period.Through vermiculture we can get enormous earthworms for vermicompost. With the help of vermiclture organic wastes like kitchen wastes, cattle dung, industrial wastes can be used to prepare organic fertilizer. Vermiculture is a very easy method can be done by women and children. Raw material for vermiculture is easily available from farmers[5]. No need of more money.

Vermiculture

Requirement for vermiculture: i. Earthworm, ii. Water, iii. Agricultural wastes, iv. A place under shed, v. Cattle dung, vi. Organic and biodegradable materials.

Composting worms require following features: i. Short life cycle, ii. High capability to consume all types of organic waste. ii. Capable of tolerate fluctuations in environmental conditions. iii. High rate of cocoon formation[6].

Figure-1
Nadep-A vermicompost unit

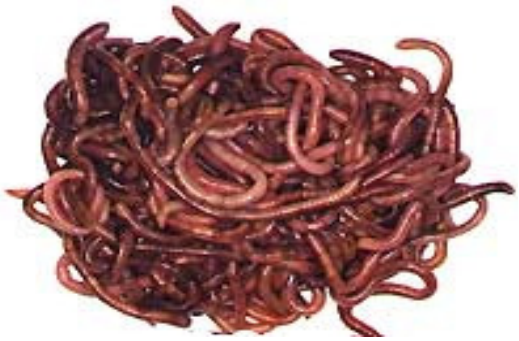

Figure-2
Red worms

Vermicomposting: Conversion of organic waste into organic manure is known as vermicomposting. Vermicomposting is bio-oxidation process of organic materials

Figure-3
Harvested vermicompost

Steps in vermicomposting: Raw material ⟶ Spread 1-2 days ⟶ Cuts into small pieces with FYM ⟶Moist with water for 7 days⟶ Partially decomposed wastes ⟶Inoculation of earthworm⟶ Vermi compost⟶ Separation of vermin compost and earthworms.

Vermitechnology

Vermiculture and vermicomposting are the two steps of vermitechnology. Vermitechnology mainly comprises of following steps: i. Solid material is used as bedding material, ii. For feeding of earthworm addition of organic material is required, iii. Separation of vermicompost product, iv. Production and separation of earthworms for further use.

Benefits of using vermicompost: i. Enriches soil with micro-organisms. ii. Microbial activity in worm casting is 10 to 20 times higher than in the soil and organic matter that the worm ingests[7]. iii. Enhances germination, plant growth and crop yield. iv. Improves root growth and structure, v. Biowastes conversion reduces waste flow to landfills. vi. Elimination of the biowastes from the waste stream reduces contamination of other recyclables collected in a single bin[8]. vii. Low capital investment and relatively simple technologies make vermin composting practical for less-developed agricultural regions. viii. Helps to close the "metabolic gap" through recycling waste on –site. ix. Large systems often use temperature control and mechanized harvesting. x. Production reduces green house gas emissions such as methane and nitric oxide. xi. Vermi compost can be mixed directly into the soil or seeped in water.

Conclusion

Use of vermicompost is a must for agriculture because- Compost is more than a fertilizer, more than a soil conditioner. It's the symbol and means of a continuing life. Compost improves soil texture and structure, qualities that enable the soil to retain nutrients, moisture, and air for the support of healthy crops. By increasing the soil's moisture-holding capacity, compost helps control erosion and otherwise would wash topsoil into waterways. Compost is the best recycler of biological wastes, turning millions of tons of our refuse into a sustainable and resilient food-growing asset. Compost provides and releases plant nutrients, protects against drought, controls pH, supports essential bacteria, feeds helpful earthworms, stops nutrient loss through leaching, acts as a buffer against toxins in the soil, controls weeds, and conserves a nation's nonrenewable energy resources[9]. Composts help build good structure that encourages optimum fertility and resist erosion. Compost is an excellent vehicle for carrying nutrients to your soil and plants. In a well executed compost, your garden will need no other form of fertilization. Naturally occurring nutrients in compost are released slowly at a rate which the plants can use them most profitably for optimum growth. Chemical fertilizers release their nutrients all at once and are leached off by water; they are available for a very short period of time.

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