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Bio-Digestor and Vermi-Wash for Management of Sericulture Crop

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INTRODUCTION

A bio-digestor is a chamber or vault that facilitates the anaerobic degradation of blackwater, sludge, and/or biodegradable waste. It also facilitates the separation and collection of the biogas that is produced. A bio-digestoris a system that biologically digests organic material, either anaerobic (without oxygen) or aerobically (with oxygen). Microbes and other bacteria break down organic materials in a biodigester. Most food, including fat, greases, and even animal manure, can be processed in a biodigester. Vermiwash is a liquid that is collected after the passage of water through a column of worm action and is very useful as a foliar spray. It is a collection of excretory products and mucus secretion of earthworms along with micronutrients from the soil organic molecules.

BIO-DIGESTOR:

Anaerobic digestion produces biogas from the fermentation of organic waste in a tank called digestor. Production of biogas takes place in the process and hence the digestor is called bio-digestor. It is a closed system; therefore, it gives off no odour from food waste; this will eliminate flies and rodents from the facility, increasing hygiene. Also, eliminating food waste on-site saves money by reducing hauling costs. The capacity of food a biodigester can process depends on the size; larger the digester more food it can handle. Bio-digesters are a living system and do require maintenance. However, they are easy to use and maintain.

Biogas digesters can solve a variety of energy, environmental, and health issues in rural communities. Bio-waste—animal and sometimes human excrement, along with weeds or other biological waste—are placed in the digester. As the material decomposes, it produces gas that can be pumped out and used as cooking fuel and to heat homes. The remaining waste can be used as a fertilizer for local farms and gardens.

This gas reduces the amount of wood burned, therefore reducing deforestation and exposer to the toxic smoke and fumes produced by traditional wood-burning stoves, in turn reducing respiratory problems. Therefore, the use of natural gas from biogas digesters contributes to environmental sustainability and the health of rural communities.

All anaerobic digestion systems adhere to the same working principle.

1. **Loading**: The particles of solid or liquid matter are crushed to obtain a homogenized substrate that is fed by a hopper into an anaerobic, or oxygen-free vessel of cylindrical form. Feedstocks include grains (the most efficient), molasses, animal fat, cattle and chicken manure, household waste and sewage sludge.
2. **Fermentation**: The biomass is heated to approximately 37°C to 38°C (sometimes more than 50°C) and stirred continuously. After at least 20 days and a series of bacteria-induced chemical transformations, the fermented biomass produces biogas. The biogas contains 40% to 70% Methane (CH_4), the same as natural gas from a hydrocarbon deposit. The remaining gas is carbon dioxide plus small amounts of sulphur.
3. **Biogas:** Thebiogas may be used on-site in a cogeneration engine for producing heat and power or it can be purified with membranes to extract the methane for injection into the public natural gas network or for use as transportation fuel.
4. **Removal**: The digestate or material left over following the conversion of the substrate, is typically used as fertilizer for crops.

In addition to the digester, a biogas plant includes a facility for storing and sorting the waste material, a gas holder for storing the gas, a cogeneration unit for producing heat and power and a control room for monitoring the various operations.

USE OF BIO-DIGESTOR

- Provide a source of fuel for cooking and lighting, reducing the need for fuelwood and the work of collecting it. This is particularly important for women and children. In addition, cooking with biogas leaves cooking utensils much cleaner, and the absence of smoke improves the health of women andchildren who spend much of their time in the kitchen and often suffer from respiratory problems as well as eye irritations.
- Improve the quality of the manure that is fed into the biodigester, resulting in high-quality fertilizer for crops, as well as for water plants or fish cultivated in ponds.
- Improve the sanitary conditions of the farmyard and reduce the spread of parasites and potentially harmful bacteria, by removing and de-contaminating manure and other organic waste matter from the farmyard.
- Improve the environment by reducing dependence on fuelwood, leading to less deforestation. If the biogas is used this also reduces the emission of methane into the atmosphere.

BIO-DIGESTOR USE IN SERICULTURE

- Contents of cellulose & Lignin in mulberry leaves are decomposed in bio-digestors
- Fermentation of silkworm excreta gives 167.32m^3/Mg of methane and 331.97m^3 of biogas.
- Fermentation of silk waste gives 256.59m^3/Mg of methane and 489.24m^3/Mg of biogas.

In view of the increasing demand of organic agriculture, utilization of waste and environmental protection, sericulture focuses

not only on the cocoon production, but also on other ways that can benefit the farm's economy. It is necessary to find new sources of income for small-scale farmers not only through cocoon selling, but also by the multiple uses of by-products. Insect farming technology provides a cheap source of biomass, which may be a good material in biogas production. Studies showed that the examined substrates, both silkworm breeding waste and caterpillar excreta, generate a biogas yield comparable to other substrates of agricultural origin, such as cattle, pig and chicken manures.

VERMIWASH:

Vermi-wash is obtained from vermicomposting beds and is used as an organic fertilizer for crop plants. Vermiwash is a collection of excretory products and mucus secretions of earthworms along with micronutrients from the soil organic molecules. These are transported to the leaf, shoots and other parts of plants in the natural ecosystem. Vermiwash, if collected accurately, is a clear and transparent, pale yellow coloured fluid. Vermiwash is a rich source of vitamins, hormones, macronutrients, and micronutrients when applied to plants to help in effective growth. The Vermiwash contains necessary plant nutrients, plant growth-promoting hormones (auxin and gibberellins), enzymes (cocktail of protease, amylase urease and phosphatase that acts as antimicrobic), symbiotic microbes (nitrogen fixing bacteria such as Azotobacter sp., Agrobacterium sp., and Rhizobium and some Phosphate Solubilising Bacteria (PSB)) in addition to the macronutrients and micronutrients. It can be used as a foliar spray as well as soil application whereby it acts as a pesticide and natural fertilizer for the crop plants in sustainable agriculture.

USE OF VERMI-WASH:

- Vermi-wash is a liquid organic fertilizer prepared from biodegradable organic wastes used both as replacement and supplement of solids and for their novel capacity to provide nutrient effectively and quickly.
- Vermiwash is an eco-friendly natural fertilizer prepared from biodegradable organic wastes and is free from chemical inputs.
- Being an excellent nutrient supplement, it enhances soils physico-chemical properties and maintains soil fertility in long run. It improves soil aeration, soil tilth and texture thereby reducing the compaction. It also enhances water holding capacity of soil and improves soil nutrient status of both macro and micro nutrients. It can also be added in the compost pit to hasten the degradation process.
- Vermi-wash is known to play a major role in the plant growth and development; contribute to root initiation, root growth, plant development, promotion growth rate and improvement in crop production and improved nutrient uptake by crop and inhance nutrient content which are readily available for the plants, resulting in good crop yield.
- Vermiwash helps to develop resistance against various disease & pests in plants. It helps in initiating good flowering and produce good yield in some vegetable crops.
- Vermi-wash has tremendous biopesticide properties. It is highly toxic against insect-pest survivaland it increases disease resistance power of the crop. It isreported that mycelial growth of pathogenic fungi was inhibited at 20-30% dilution. It acts as biopesticide when it is sprayed along with 10% cow urine or neem/garlic extracts. Now a days it is also being Popularised as liquid manure. It does not have any adverse effect on soil., plantand environment.

- Vermiwash helps to develop resistance against various disease & pests in plants.
- Application of organic manure to silkworm hostplant crops not only increases the growth but also nutritional quality of mulberry leaves, this in turn influences the silkworm growth and its economic traits.
- The mulberry garden sprayed with vermiwash showed better performance in mulberry growth parameter and reduced pest incidence in the mulberry garden.
- Application of vermiwash significantly stimulated plant growth and biochemical constituent of mulberry also the silkworm growth, cocoon and silk traits.

CONCLUSION

Now a days there is much focus on greener ways for sustainable agriculture. Technologies like vermin wash are being utilized for sustainable agriculture. In sericulture the waste produced remains unutilized. By adopting technologies like vermi-wash, the farmer can utilize the seriwaste waste for production of bio-digestor and vermi-wash for management of sericulture crop.