VERMICOMPOSTING BED TYPES FOR RECYCLING OF SERICULTURAL WASTE

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ABSTRACT:- Sericulture can be made sustainable and economical by recycling all the organic wastes of sericultural origin as compost and vermicompost. Vermicomposting is a bio- oxidation process of organic wastes involving the joint action of earthworms and micro organisms. In this process, earth worms act as versatile bioreactors converting organic materials into fine granules called vermicast. Thus, the application of plant nutrients through recycling of sericulture farm wastes as compost can facilitate quality leaf production for better and more sustainable silkworm production. Generally in sericulture farms, the left over leaves from rearing bed and field and other waste including silkworm litter are not properly utilized in preparing compost of high nutritive value. Hence, it is sentinel to convert the sericulture farm waste in to valuable compost by adopting suitable technology. This present paper focus on vermicomposting bed types for recycling sericultural waste.

Key words: Compost, Host plant, Recycling, Seri-waste, Vermicomposting

1. INTRODUCTION

The climatic conditions of India are very favourable for rearing all four types of silkworm (i.e Mulberry, Eri, Tasar and Muga), which produces high quality silk (Rathore *et al*. 2010). Hence, there is good scope for development of sericulture. To achieve high leaf yield of better quality under varied climatic conditions, it is essential to adopt suitable cultivation practices for host plants like suitable varieties, manures and fertilizers, method of application, type of pruning, method of leaf harvest, leaf transportation, plant protection measures and rational utilization of waste material.

The utilization of the by- products is as important need to every agro waste industry (Sinha *et al.* 2005). The extensive use of the by products play an important role in the silk industry. A part from utilization of silk, advancement has been made in purposeful use of sericultural waste. This enables the farmer to enhance his earning. Actual utilization however depends on the conditions in the industrial sector. Sericulture has been much more important than any other agriculture sideline activity on account of the very high potential for agriculture use of recycled sericulture farm wastes. Since in host plants, leaf is harvested repeatedly from the plant leading to continuous loss of nutrients in the soil. Weeds growing in fields also absorb substantial quantity of the nutrients. Hence loss of nutrients thus, has to be compensated by their external application for quality leaf yield.

The quantity of manure and chemical fertilizers recommended for various host plant cultivation is quite high compared to other agricultural crops. It is also increasingly becoming very difficult, especially for small and marginal farmers, to comply with the recommended dose of manure in economic plantation, due to the continuous increase in cost of farm yard manure and chemical fertilizers as well as the non availability of these inputs at required time. Under such circumstances farm wastes can greatly help farmers and can substantially decrease the dependency and expenditure on farm yard manure and chemical fertilizers (Gujalakshmi and Abbasi, 2008).

A sericulture farm of one hectare size can generate approximately 8-10 MT per year of wastes including silkworm litter, left over leaves, soft twigs and farm weeds, which have tremendous amount of nitrogen, phosphorus and potash as well as micronutrients like iron, zinc, copper etc. Most of the sericultural farm waste applied directly to the field for crop nutrition without proper care.

Application of any organic wastes directly to field crops is not advisable as the heat liberated during decomposition may affect the roots adversely and organic wastes do not meet actual nutrient demand of crops immediately. Further direct application of sericultural farm wastes in garden may lead to unhygienic conditions and harbour many infectious diseases. It is reported by earlier workers that the addition of sericulture waste increases micronutrient content of the compost substantiality than the farm yard manure (Sinha *et al.* 2005) (Fig.1).

Vermicompost is the excreta of earthworms, which is rich in humus and nutrients (Rathore *et al*. 2007). We can rear earthworms artificially in a brick tank or in basins. By feeding these earthworms with biomass and watching properly the food (bio-mass) of earthworms, we can produce the required quantities of vermicompost. In vermicomposting process exotic earthworms like *Eisenia foetida* are frequently used because of their high fecundity and decomposition rates. The nutrient status of vermicompost is Nitrogen-1.5 – 2.5 % Calcium-0.5 – 1.0 %, Phosphorus-0.9 – 1.7 % Magnessium-0.2 – 0.3 %, Potash-1.5 – 2.4 % Sulphur-0.4 - 0.5 % and other micronutrients with vitamins, enzymes and plant growth regulators. Apart from supporting livelihoods and providing employment, sericulture waste (waste and silkworm excreta) improves soil health through nutrient recycling and reduces the use of chemical fertilisers (Sannigrahi, 2009). Nutrient recycling along with changes in agronomic practices and water saving measures proved to be effective in controlling soil degradation and reducing the use of precious water.

2. ADVANTAGES OF APPLYING VERMICOMPOST IN FIELD

1. Vermicompost is rich in almost all essential plant nutrients.

2. Provides excellent effect on overall plant growth encourages the growth of new shoots / leaves and improves the quality and shelf life of the produce.

3. Vermicompost is free flowing, easy to apply, handle and store and does not have bad odour.

4. It improves soil structure, texture, aeration, and waterholding capacity and prevents soil erosion.

5. Vermicompost is rich in beneficial micro flora such as a fixers, P- solubilizers, cellulose decomposing micro-flora etc in addition to improve soil environment.

6. Vermicompost contains earthworm cocoons and increases the population and activity of earthworm in the soil.

7. It neutralizes the soil protection.

8. It prevents nutrient losses and increases the use efficiency of chemical fertilizers.

9. Vermicompost is free from pathogens, toxic elements, weed seeds etc.

10. Vermicompost minimizes the incidence of pest and diseases.

11. It enhances the decomposition of organic matter in soil.

12. It contains valuable vitamins, enzymes and hormones like auxins, gibberellins etc.

3. METHODS OF PREPARATION OF VERMICOMPOST

1. The vermicompost can be prepared in concrete tank. The size of the tank should be 10 ft. length or more depending upon the availability of land and raw materials, breadth 3- 5ft and height 3 ft. Suitable plastic tube / basin structure may also be needed. The floor of the tank should be connected with stones and pieces of bricks.

2. The available bio-wastes (leaves, twigs, and silkworm litter) are to be collected and are to be heaped under sun about 7-10 days and be chopped if necessary.

3. Sprinkling of cow dung slurry to the heap may be done.

4. A thin layer of half decomposed cow dung (1-2 inches) is to be placed at the bottom.

5. Place the chopped weed biomass and partially decomposed cow dung layer wise(10-20 cm) in the tank / pot upto the depth of 2 ½ ft. The seriwaste and cow dung ratio should be 60: 40 on dry wt. basis.

6. Release about 2-3 kg earthworms per ton of biomass or 100 nos. earthworms per one sq. ft. area. Efficient species: *Eisenia foetida*

7. Place net over the tank to protect earthworm from birds.

8. Sprinkling of water should be done to maintain 70-80 % moisture content.

9. Provision of a shed over the compost is essential to prevent entry of rainwater and direct sunshine.

10. Sprinkling of water should be stopped when 90 % bio-wastes are decomposed. Maturity could be judged visually by observing the formation of granular structure of the compost at the surface of the tank.

11. Harvest the vermicompost by scrapping layer wise from the top of the tank and heap under shed. This will help in separation of earthworms from the compost. Sieving may also be done to separate the earthworms and cocoons.

4. VARIOUS BEDS TYPES:

4.1 Cement ring based unit

Vermicompost unit can also be made above the ground by using cement rings, for making cement ring type of tank, the size of cement ring should be 90 cm x 90cm in diameter and length (Fig.2a). The bottom of cement is covered either with tiles or polythene sheet. The cement rings are filled with seriwaste and cow dung layer by layer upto three fourth of ring. The ring is covered with wire mesh or with gunny cloth to prevent birds from picking the earth worms.

4.2 Below the ground unit

Vermicomposting tanks can also be constructed below the ground of dimension of 2ft. below the ground and approximately 3 ft. width (Fig.2b). The construction material remains same as described for above the ground unit.

4.3 Above the ground unit

Tanks can be constructed above the ground by using different materials such as, normal bricks, hollow bricks or locally available rocks. The tank dimensions are of 12 ft length (4.0 m), 3ft width (0.9m) and 3ft height (Fig.2c). At the base of tank an outlet is provided at one corner which facilitates the collection excess of water. For large scale production a series of four tanks are built containing the partition wall with small holes for easy migration of earth worms from tank to another tank. The tank is filled with sericultural waste with cow dung layer by layer one after another for pre digestion. The earthworms are introduced into pre-digested material. The second tank is utilized for predigestion process. To avoid direct sunlight a thatched shed is constructed on a slight elevated ground Stone bunds are constructed all around the shed to prevent predators.

5. CONCLUSION

Today there is much focus on greener ways for sustainable agriculture. Technologies like vermicomposting are being utilized for sustainable agriculture. In sericulture the waste produced remains unutilized. By adopting technologies like vermicomposting, the farmer can utilize the seriwaste waste for production of vermicompost with high nutrient value, which will in turn reduce the cost of input application.

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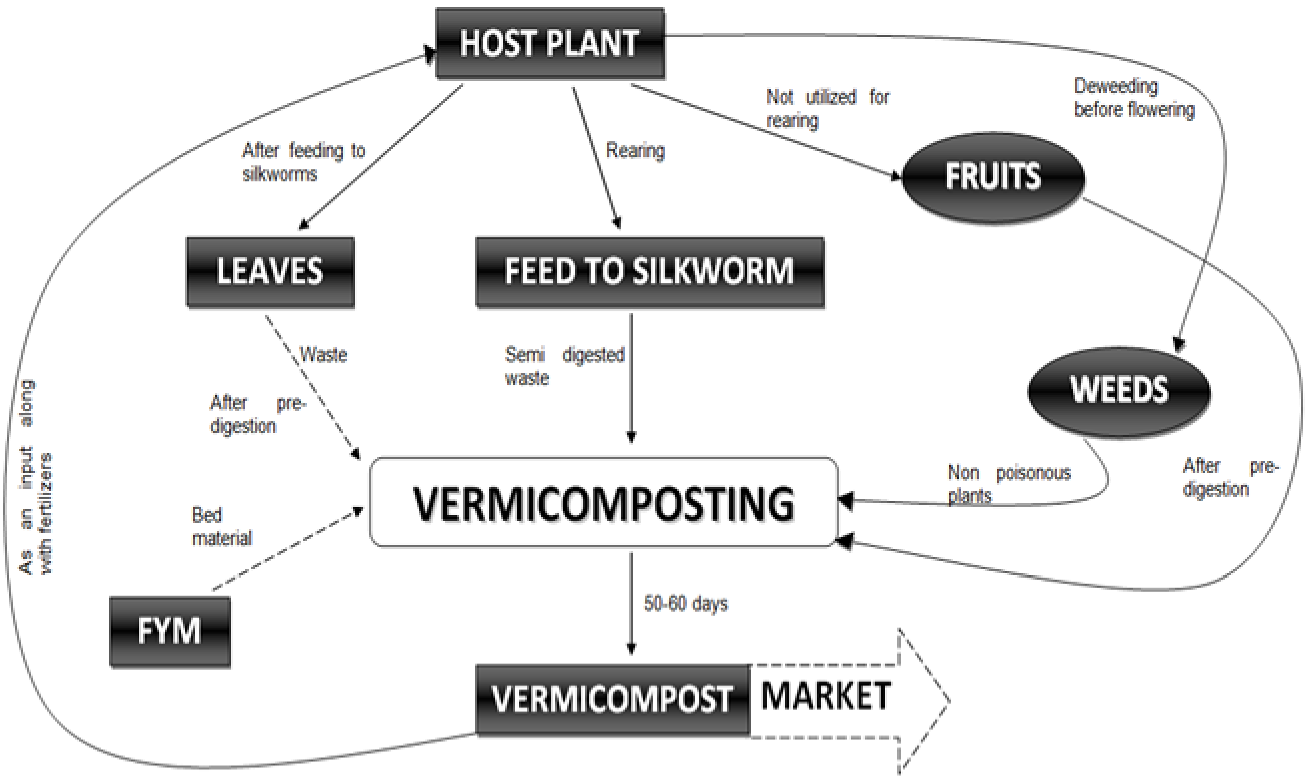

Fig1: A Flow chart dipicting various components of seriwaste utilized for vermicomposting

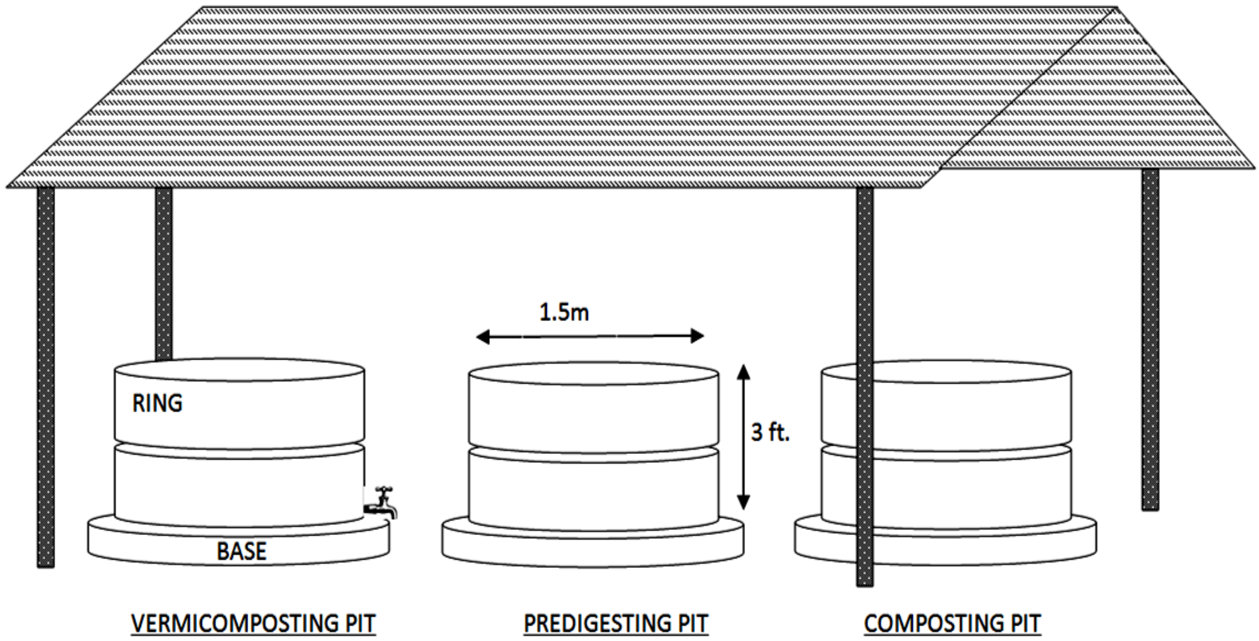

Fig. 2a: A cement ring based unit

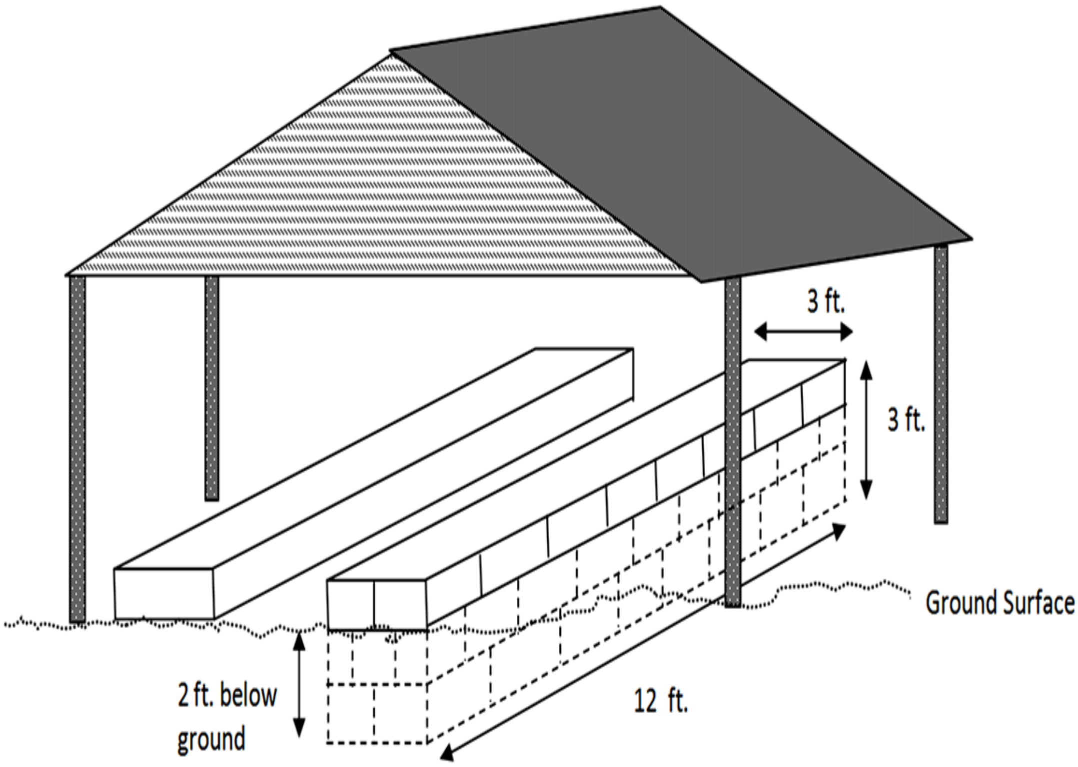

Fig. 2b: A below the ground unit

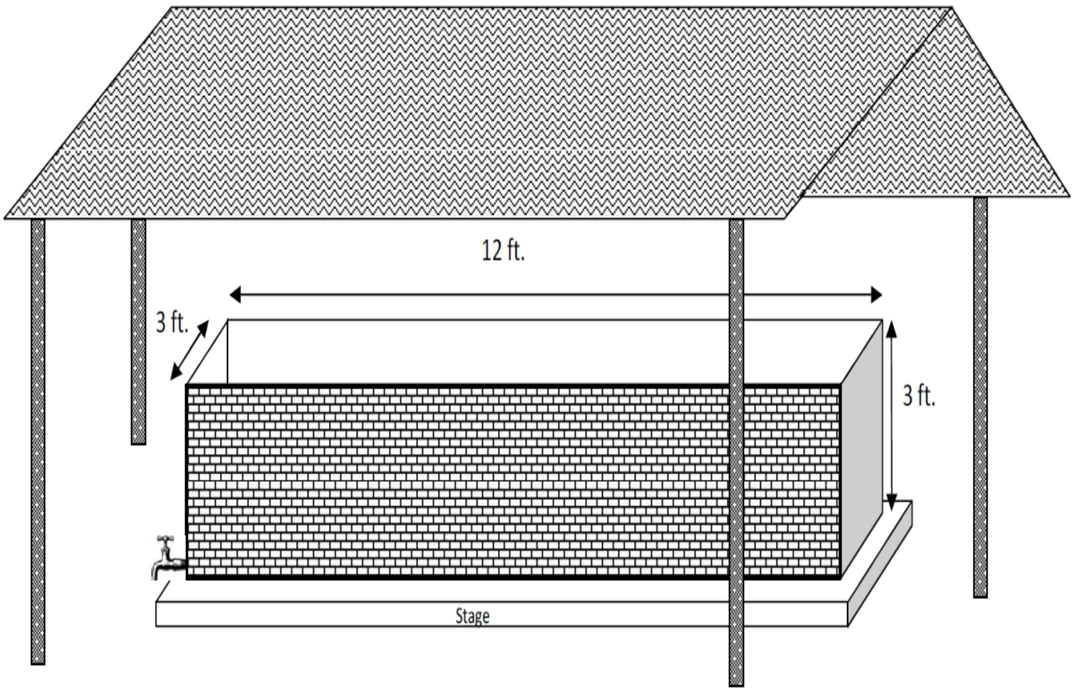

Fig. 2c: An above the ground unit