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ECO-FRIENDLY APPROACH FOR SERICULTURE WASTE MANAGEMENT AND NUTRIENT ENHANCEMENT USING VERMICOMPOSTING TECHNOLOGY TO IMPROVE SOCIO-ECONOMIC STATUS OF KARNATAKA: A REVIEW

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Abstract– Recycling of organic waste is an imperative need in agro waste sector. Organic wastes including sericulture waste can provide sustainability as well as economic advantages. Vermicomposting is a bio-oxidation process, which is also a mesophilic process in which certain earthworm kind are used to convert waste into value resources called organic manure. It's faster than composting due to the formation of earthworm casting (worm manure) as the material passes through the earthworm gut resulting in a significant transformation. Use of organic manure prepared from sericulture waste can help for more sustainable silkworm production. Mulberry (*Morus alba* L.) perennial in habitat is raised as a crop for the foliage to feed silkworm for the production for the higher demands of raw silk, organic acid and inorganic manures. One hectare of mulberry cultivation has the potential of generating more than 50 MT organic residues per hectare per year. Organic residues in mulberry farm where silkworm rearing residue including avenue the foliage and debris having a good manure value of N, P and potash as well as several micronutrients like Cu, Zn and Fe. Hence from this study, an attempt was made to evaluate the appropriate recycling of sericulture waste using the vermicomposting technology for eco-friendly farming.

INTRODUCTION

Sericulture is a cost effective and quick industry which is mainly done in India and China. Sericulture is also known as Silk farming which is cultivation of silkworms to produce silk. There are several commercial species of silkworms, but *Bombyx mori* is the most commonly used silkworm species. The production of silk from silkworms involves a simple process (Balakrishnappa *et al.*, 2010). The silkworms are fed with mulberry leaves. And they form a silken cocoon. Silk is a continuous filament consisting of fibroin protein. It is secreted from the two salivary glands in the head of the silkworm. The filaments of silk are cemented by a gum called 'sericin'. This gum can be removed by placing the cocoons in hot water. Then the filaments are separated and filaments are combined to form a thread. After drying, raw silk is obtained. About 2500 silkworms can produce a pound of raw silk. From each cocoon, about 600-900 m of usable silk can be obtained. There are different types of silk. They are Tasar silk, Eri silk, Muga silk and Mulberry silk. But in our project, we are focused on mulberry silk. Although silk farming is a profitable industry, waste products of sericulture can cause environmental issues. Disposal of cocoons is a major problem. Though the disposal of cocoons is a minor activity, silk farmers face various difficulties in disposal of cocoons. Silkworm litter is normally found on floors and cleaning is a difficult job. As a result, silkworm litter gets accumulated and it enhances the humidity and temperature and thus makes the atmosphere congenial for pathogens. It leads to high mortality and poor silkworm cocoon crop. Overcrowding of worms is another problem that silkworm farmers face. As farmers keep more silkworms per unit area for more yield, but

overcrowded silkworms die by starvation, then increase of humidity and temperature occur. Improper disposal of sericulture waste is another issue that is faced in silk farming. Farmers normally dispose of all sericulture waste including diseased, dead, and discarded silkworms in an open place. That can lead to problems like spreading of pathogens and spreading of diseases. Improper disinfection also causes various problems. Normally silk farmers do not properly disinfect the rearing house in proper timings. Therefore, there is a gap between disinfection and silkworms rears. Then the contamination of the rearing house and materials occur. Sometimes farmers keep their agricultural waste and household items in rearing places. It increases the chances of contagious diseases resulting in poor cocoon crops. Inappropriate ventilation is another problem that can arise in the sericulture industry. Most of the rears have improper ventilation and also, they keep the doors and windows closed during rearing. It results in accumulation of harmful gases released by silkworms. This increases the mortality of silkworms and production of poor-quality cocoons. Another main problem that arises in the sericulture industry is the poor quality of mulberry leaves used by the farmers because of poor methods of harvesting, transporting and storing of leaves. The most challenging problem in sericulture is disposal of sericulture waste (Shanmugam *et al.*, 2014). In the sericulture industry huge amounts of waste is produced in a silkworm rearing unit. Increasing population, urbanization and industrialization have led to an everlasting generation of wastes there by polluting the environment. Disposal and environmental friendly management of these wastes are becoming a serious global problem. Sericulture waste contains organic matter like larval excreta, leaf litter, dead larvae, moths and cocoons. But they are not utilized in producing compost of high nutrient value. Earthworms ingested organic matter and fragmented them into one particle by passing them through its gizzard and later produce sanitized; deodorized and textured humus in the form of castings (Uma Maheswari *et al.*, 2015). Sericulture waste from mulberry culture can also be used to produce organic manure. As sericulture waste produce compost with rich nutrient value, it should convert to valuable compost by using suitable technology. Then we can overcome the problems caused by sericulture waste and also, we can produce good nutritive compost which is highly beneficial. Both vermicompost and its body liquid (vermiwash) are proven to be growth promoters and protectors for crop plants. In this project we have focused on recycling sericulture waste by vermicomposting method.

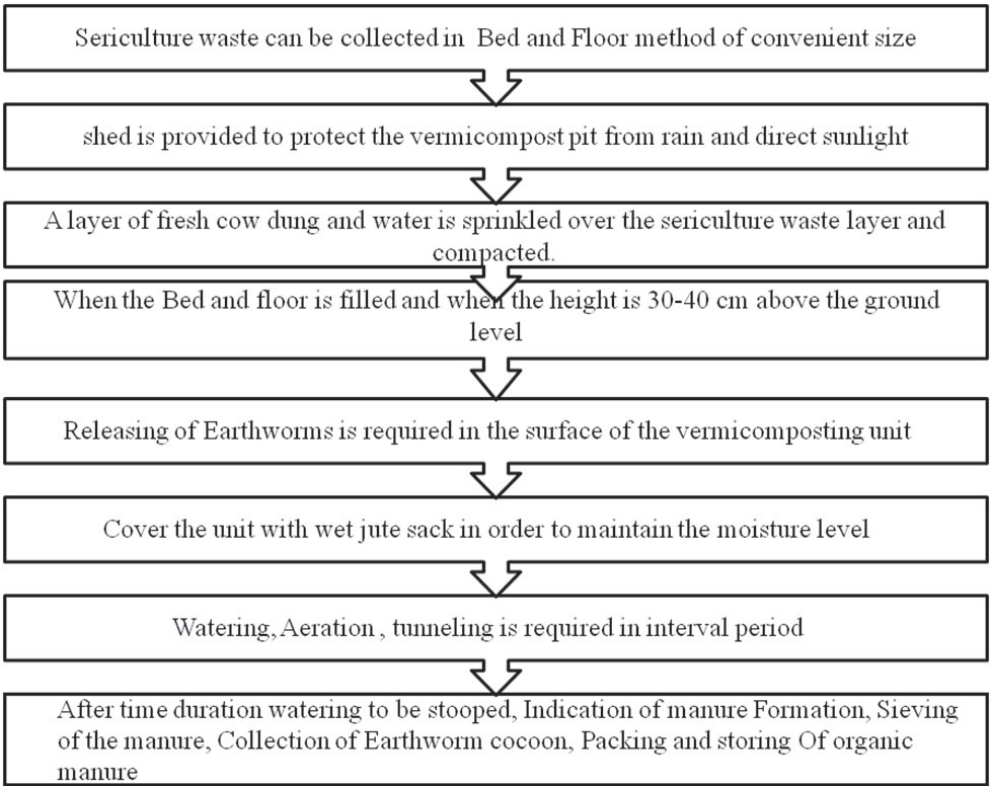
Objective of the study

The major objective of this cram is to recycle sericulture waste using vermicomposting technology. Vermicompost is the product formed by decomposition of waste by using different species of worms like red wigglers, white worms and the earthworms. The production of compost by this method is known as vermicomposting technology. As the sericulture industry produces more waste, we can use vermicomposting technology to recycle those wastes. Sericulture waste acts as a good source of organic nutrients for crops. It contains more plant nutrients like macro and micro nutrients which help in increasing the yield. The end product of breakdown of organic matter by earthworm is known as vermicasts. It is also called worm castings, worm humus, and worm manure or worm faeces. This vermicasts contains a smaller number of contaminants and higher levels of nutrients than organic material before vermicomposting. Vermicompost is an excellent nutrient rich organic fertilizer and soil conditioner. And also vermicomposting can be used in the treatment of sewage. Vermicomposting from sericulture waste van facilitates the quality leaf production of mulberry leaves and more sustainable silkworm production. Sericulture litter from sericulture farms are not properly utilized in producing compost of high nutritive value. Therefore, it has to be converted into valuable nutrient rich compost using suitable techniques. Vermicomposting is a good technology to convert Seri waste to nutrient rich compost. As sericulture waste creates different environmental problems, we can find solutions to those problems by recycling sericulture waste to useful nutrient rich compost. A sericulture farm of 1 hectare can produce 50 MT of waste per year which is very rich in N, P and potash and micronutrients like Fe, Zn, and Cu etc. But application of this sericulture waste directly to crops is not suitable as it affects the roots of plants because it generates more heat. Therefore, vermicomposting is an eco-friendly technology which can convert Seri waste to nutrient rich compost. And also, the composting process of vermicomposting is quick. Vermicomposting process is completed in 50-60

days while anaerobic composting takes about 120-150 days. Sericulture industry creates various environmental issues like improper disposal of cocoon waste, increasing of temperature and humidity, spreading of pathogens and diseases, overcrowding of worms, contamination of rearing house, poor cocoon yields, improper ventilation etc. These problems are created because of sericulture waste. Although silk production is profitable, it's waste creates so many problems. Therefore, we have to prevent environmental problems created by sericulture waste. As a solution for that we can introduce vermicomposting technology to recycle sericulture waste. It's not only preventing environmental problems, but also it is a very profitable industry to produce nutrient rich vermicompost. And also, it has more nutrient value than normal compost. As sericulture waste creates different environmental problems, we can find solutions to those problems by recycling sericulture waste to useful nutrient rich compost. A sericulture farm of 1 hectare can produce 50 MT of waste per year which is very rich in N, P and potash and micronutrients like Fe, Zn, and Cu etc. But application of this sericulture waste directly to crops is not suitable as it affects the roots of plants because it generates more heat. Therefore, vermicomposting is an eco-friendly technology which can convert seri waste to nutrient rich compost. And also, the composting process of vermicomposting is quick. Vermicomposting process is completed in 50-60 days while anaerobic composting takes about 120-150 days. Sericulture industry creates various environmental issues like improper disposal of cocoon waste, increasing of temperature and humidity, spreading of pathogens and diseases, overcrowding of worms, contamination of rearing house, poor cocoon yields, improper ventilation etc. These problems are created because of sericulture waste. Although silk production is profitable, its waste creates so many problems. Therefore, we have to prevent environmental problems created by sericulture waste. As a solution for that we can introduce vermicomposting technology to recycle sericulture waste. It's not only preventing environmental problems, but also it is a very profitable industry to produce nutrient rich and also, it has more nutrient value than normal compost.

Methodology of the project

Vermicompost is the product formed by decomposition of waste by using different species of earthworm. Sericulture waste acts as a good source



of organic nutrients for crops. It contains more plant nutrients like macro and micro nutrients which help in increasing the yield. A sericulture farm of 1 hectare can produce 50 MT of waste per year which is very rich in N, P and potash and micronutrients like Fe, Zn, and Cu etc. But application of this sericulture waste directly to crops is not suitable as it affects the roots of plants because it generates more heat. Therefore, vermicomposting is an eco-friendly technology which can convert Seri waste to nutrient rich compost. And also, the composting process of vermicomposting is quick. Vermicomposting process is completed in 50-60 days while anaerobic composting takes about 120-150 days. Karnataka mainly depends on rainfall and underground water sources. Due to lack of water sources – for crop production. Sudden depletion of water is the major constraint for crop production. The solution we can give from our research is MORICULTURE. Drip irrigation (Sub surface) Mulching is necessary for mulberry cultivation Intercropping cultivation is advisable for improving the economic status of farmer.

Social Benefits

Vermicomposting unit can be just as money-making for both the producer as it is to the customer, in addition to promoting social responsibility. Many people in the state are malnourished due to the inaccessibility to nutritious food and suffering from many poisoning effect due to the usage of suffer from acute poisoning due to the use of chemical fertilizers, many of whom die as a result. Suitable mulberry varieties plantation in Karnataka helps to mitigate soil erosion and Degradation, water saving devices and practices reduced use of precious water by 30 to 80% and saved on the costs of irrigation and labor. Vermicomposting contributes too many environmental benefits, including waste recycling. Cultivation of crops using organic manure provides more nutrient content food and shows the way how life will be healthy and happy.

Economic Benefits

However in Karnataka the number of families adopting sericulture had increased slowly of mulberry plantations, which leads to the increase their economic level and provide Entrepreneurs through self help women group, the development of sericulture production may be considered as an alternative way to solve the unemployment.

CONCLUSION

Recycling of sericulture waste using vermicomposting technology is a greener way for a sustainable agriculture which improves the soil nutrient value, provides a sustainable way to recycle sericulture waste as well as create job opportunities for the people in rural areas while improving the economy of the country. Therefore, we can conclude this method as a promising solution for an effective way of waste management

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