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INTRODUCTION

Agriculture is the science, art of producing crops and livestock. India has a large number of successful sustainable agricultural practices that are consistent with ecological principles. Intensive use of chemical fertilizers has its side effect on polluting underground water, destroying microorganism and soil fertility in the ecosystem (Darzi *et al.*, 2012). The usage of inorganic fertilizer, pesticide and insecticide in the lands decline the soil quality and cause harmful effect to the environment (Perunkotturselvi and Koilraj, 2015). Nowadays, the circulation of chemical fertilizer has gradually increased which affects the soil and human health. So, organic fertilizers got many recommendations to enhance plant growth and soil health without affecting the environment. Organic agriculture is one of the best methods that supports the environment and gives a productive yield.

Organic farming is the degradation of organic matter used in order to bring sustainable environment in the ecosystem. Organic manures are excellent source of plant available nutrients and their addition to soil could maintain high microbial population (Sundararasu, 2016). Among the various sources of organic matter, vermicompost have been recognized as having considerable potential as soil amendments. Several methods have been developed to convert agricultural wastes into organic manure in order to replace inorganic fertilizers. Recently, interest has been shown in the development of eco-friendly novel processes that are based upon the utilization of biological systems (Hemalatha, 2013).

Agricultural development and cultivation in developing countries are primarily based on subsistence crops and edible wild plant species and only secondarily on the cultivation or utilization of a wide diversity of food crops whose total number of species is large. Agriculture depends on several resources namely soil, water, nutrients and energy. Application of organic and inorganic fertilizers has been known to meet the immediate needs of soil nutrient deficit, improve the soil physical properties and enhance yield in tropical soils that have been exposed to loss of soil nutrients as a result of erosion, leaching and crop removal and continuous cropping. The use of organic elements has long been considered as an effective means of improving the structure and fertility of soil.

Vermicomposting technology has solved many problems. Earth worms have been known as farmer's friends for longtime. Vermicomposting is converting all biodegradable waste into plant nutrient rich organic manure with the help of composting. (Kanchilakshmi *et al*., 2015). Application of vermicompost produced by biodegradable waste could be one of the most economical and attractive methods to solve the problems of waste disposal and thereby increase the organic matter content of soil (Narkhede *et al.,* 2011). Vermicompost represents a very suitable medium for plant growth showing improved growth for many plant species that can also be used as a growth substrate in different stages of micropropagation. Million tons of different agricultural wastes are produced annually across the country, but a major fraction is burned or left unattended, which leads to environmental pollution (Torkashvand, 2010).

Composting is the process of biodegradation of organic matter by microorganisms. It's containing high amount of macro and micronutrients for plant growth. The organic fraction from municipal solid waste, farm, forest, poultry, dairy and market wastes are containing plenty of NPK and other micronutrients which is a good source of soil nutrients (Getnet and Raja, 2013). Compost is a mixture of decayed plants debris or organic matter, food etc. which is a rich source of plant nutrient. It can maintain a healthy soil environment for plant growth and development. This can reduce the use of chemical fertilizers in agriculture, which in directly provides a friendly environment (Rahman *et al*., 2012).

Agro industrial waste of sugarcane trash and sugarcane bagasse have rich in cellulose and hemicelluloses contents. Besides the loss of organic matter and plant nutrients burning of crop residues causes atmospheric pollution by emitting toxic gases methane, carbon dioxide that poses threat to the ecosystem. In situ composting of cane trash can be a good alternate to mitigate this problem (Viji and Neelanarayanan, 2016). On an average a hectare of sugarcane generates about 10 tons of trash. Trash contains 28.6% organic carbon, 0.35 to 0.42% nitrogen, 0.04 to 0.15% phosphorous, 0.50 to 0.42% potassium. The sugarcane trash incorporation in the soil influences physical, chemical and biological properties of the soil. (Shree Harsha Kumar *et al*., 2018). Sugarcane trash incorporation reduces the bulk density of the soil and there is an increase in infiltration rate and decrease in penetration resistance. Sugarcane trash can be easily composted by using the fungi like *Trichurus, Aspergillus, Penicillium and Trichoderma*. (Plate 1)

PLATE 1

SUGARCANE FIELD AND SUGARCANE TRASH WASTE

Bagasse is a lignocellulosic waste from sugar mills after agricultural processing. Bagasse consists largely of cellulose, pentose and lignin. It is made up of 45-55% cellulose, 20-25% hemicelluloses and 18-24% lignin (Wan Surya *et al*., 2015). Some reports have described the conversion of bagasse into value-added compost that has the potential to improve productivity of crops and reduce the problem of environmental pollution. The plants grown on sugarcane bagasse yielded 22% increase in root length, 20% increase in plant height and 63% increase in the number of roots (Mohan *et al*., 2004). Bagasse can be used as raw material organic fertilizer and recycled in agriculture as organic fertilizer product. Bagasse also has high nutrient content that is beneficial for plant growth. Bagasse products are biodegradable and compostable. (Plate 2)

PLATE 2

SUGARCANE BAGASSE AND SUGARCANE BAGASSE WASTE

Hence in the present study agro industrial waste sugarcane trash and sugarcane bagasse are degraded with the help of *Pleurotus florida*, *Trichoderma asperelloides*, microbial consortium and earthworm (*Eudrilus eugeniae*) by pit composting method during December 2019 at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India. It is easiest and low-cost production method. The advantages of pit composting are they decompose very faster and good quality manure will be obtained.

The present investigation was conducted to produce bio compost from the waste sugarcane trash and sugarcane bagasse as well as to characterize and analyze their effects on the following four test crops

1. Onion (*Allium cepa* L.)
2. Black nightshade (*Solanum nigrum* L.)
3. Tomato (*Solanum lycopersicum* L.)
4. Brinjal (*Solanum melongena* L.)

Onion (*Allium cepa* L.) is a biennial or perennial crop belongs to family Lilliaceae. It is one of most important crops. In India, the major onion cultivating states are Maharashtra, Uttar Pradesh, etc. *Allium cepa* L. is a rich source of minerals like phosphorus, calcium and carbohydrates. It contains protein and vitamin C. *Allium cepa* L. has got good medicinal value (Kalirawna *et al*., 2022). Onion helps to reduce the risk of obesity, heart disease and cancer. Onion is liked for its flavour and pungency which is due to the presence of a volatile oil 'allyl propyl disulphide'- organic compound rich in Sulphur. They are rich in vitamins, minerals and antioxidants. Onion (*Allium cepa* L.), the "Queen of Kitchen" is one of the most important commercial crops not only in India but also in the world. (Plate 3)

Black nightshade (*Solanum nigrum* L.) is perennial crop vegetable belongs to the family solanaceae. It is one of the most important green leafy. They are grown in both high and lowland areas in west and east Africa. The *solanum nigrum* L. plant height is 40 to 130 cm and leaves are 4 to 6 cm long. *Solanum nigrum* L. leaves are used in ulcer, asthma, cough and skin diseases. Black nightshade is an important ingredient in traditional Indian medicines. The juice of the leaves is used on ringworm, cooling hot inflammations, testicular swelling, gout and ear pain. (Plate 4)

Solanum lycopersicum L. is an important vegetable crop that belongs to the family solanaceae. Tomato is considered one of the most important vegetables in the world because of its great demand for fresh consumption and as an industrial product. The species originated in western South America. Root decoction is ingested for relief from tooth pain. Tomatoes are rich in lycopene, a substance with beneficial effects on the heart and prostrate. It is also used for rheumatism and headaches. Tomato is one of the vegetable crops grown throughout the world. Tomato juice can be used for healing sunburn because of its unique vitamin c. (Plate 5)

Brinjal popularly known as eggplant belongs to family solanaceae, one of most common vegetable crops grown in India. Brinjal is staple vegetable in almost all tropical countries in the world and utilized by both poor and rich. Its nutritive value varies among varieties. *Solanum melongena* fruits are known for being low in calories and having a mineral composition and important for human health. It is rich source of potassium, magnesium, and calcium. The brinjal fruit contains moisture 92.7g, protein 1.4g, phosphorous 47mg, iron 0.9mg, vitamin C 10mg, riboflavin 0.11mg, thiamine 0.04mg. White brinjal is also used for Diabetics patients (Palia *et al*., 2021). (Plate 6).

PLATE 3

HABIT: ONION (*ALLIUM CEPA* L.)

PLATE 4

HABIT: BLACK NIGHTSHADE (*SOLANUM NIGRUM* L.)

The fertility of a soil is its ability to provide nutrients in adequate amounts and in proper balance for the growth of the plants. For optimum production, a soil should enable deep rooting, proper aeration, good water holding capacity and supply adequate plant nutrients. Nitrogen (N), phosphorus (P) and potassium (K) are the three most important soil nutrients required for plant growth.

Soil enzyme are derived primarily from soil fungi, bacteria, plant roots, microbial cells, plant and animal residues which, plays a significant role in mediating biochemical transformation involving organic residue decomposition and nutrient cycling in soil. This confirms the positive role of organic manure incorporation in increasing crop yield in sequence which commensurate with resultant increase in available soil macro and micro nutrients and crop productivity.

Antibacterial and antioxidant profile has been recognized to represent an important parameter to predict the impact of food on human health and it also affects the shelf life of the products. Many investigators obtained best results by using organic compost for several medicinal plants and aromatic plants on *Mentha* species (Khalil and El-Sherbeny, 2003), *Hyasyamus muticus* (Naguib and Aziz, 2004), *Sidritis montana* (El-Sherbeny *et al*., 2005) *Andrographis paniculate* (Vijaya *et al.*, 2008; Bharat and Divya, 2015) etc.,

Organic manures contain growth like enzymes and hormones, along with plant nutrients improves of soil fertility and productivity. Sustainability in agriculture refers to the capacity to remain productive while maintaining the soil fertility and increasing biodiversity.

The current investigations describe the use of biocomposted sugarcane trash and sugarcane bagasse. Hence in the present study analysis of microbial population, physico-chemical parameters, FTIR studies of raw and composted sugarcane trash and sugarcane bagasse, biometric parameters, biochemical components, pre and post-harvest soil status, soil microbial population, antioxidant and antibacterial of four plants onion (*Allium cepa* L.), black nightshade (*Solanum nigrum* L.), tomato (*Solanum lycopersicum* L.) and brinjal (*Solanum melongena* L.) were carried out. The success of the study will provide not only an alternate solution for the disposal of sugarcane trash and sugarcane bagasse but also minimizes the application of chemical fertilizers to crops and encourage organic farming and sustainable crop production.

With all this is mind the following objectives were successfully examined.

PLATE 5

HABIT: TOMATO (*SOLANUM LYCOPERSICUM* L.)

PLATE 6

HABIT: BRINJAL (*SOLANUM MELONGENA* L.)

OBJECTIVES

- To prepare compost from sugarcane trash and sugarcane bagasse waste using *Pleurotus florida, Trichoderma asperelloides, Eudrilus eugeniae* and Microbial consortium.
- To count and evaluate the microbial population present in compost during 30, 60 and 90th days.
- To evaluate physico-chemical parameters of raw and composted sugarcane trash and sugarcane bagasse waste.
- To investigate the functional groups of raw and composted sugarcane trash and sugarcane bagasse waste using Fourier transform infrared spectroscopy (FT-IR).
- To evaluate the role of different compost treatments on the growth and yield of *Allium cepa* L., *Solanum nigrum* L., *Solanum lycopersicum* L. and *Solanum melongena* L.
- To study the protein and carbohydrates content in leaves and seeds of selected plants.
- To determine chlorophyll 'a', chlorophyll 'b' and total chlorophyll content in leaves of selected plants.
- To analyze pre and post-harvesting soil.
- To analyze the pre and post soil microbial population
- To study the antioxidant and antibacterial activity of the selected plants.