ABSTRACT

Organic manures are excellent source of plant available nutrients and their addition to soil could maintain high microbial population. Several methods have been developed to convert agricultural wastes into organic manure to replace inorganic fertilizers. Sugarcane bagasse dumped on road sides pollute air and water which has an impact on environment. Agro industrial waste of sugarcane trash and sugarcane bagasse are rich in cellulose and hemicellulose contents. Insitu composting of cane trash can be a good alternate to mitigate these problem. The bio composted sugarcane trash incorporation in the soil influences physical, chemical and biological properties of the soil. Bagasse is a lignocellulosic waste from sugar mills and agricultural processing. The aim of the present study is to recycle Sugarcane trash and Sugarcane bagasse waste into compost as manure and analyse its microbial population, physico-chemical and FT-IR in raw and compost sample. The compost was incorporated into different treatments and evaluated its effect on vegetative growth, biochemical, yield, soil status, soil microbial population, antioxidant and antibacterial activity of Onion (*Allium cepa* L.), Black Nightshade (*Solanum nigrum* L.), Tomato (*Solanum lycopersicum* L.) and Brinjal (*Solanum melongena* L.). The study was carried out in four different phases.

In phase I, composting was carried out in pit using *Pleurotus florida, Trichoderma asperelloides*, Microbial consortium and *Eudrilus eugeniea*. Microbial population composting revealed that treatment C_5 noted highest bacterial, fungal and actinobacteria count on 30^{th} day with remarkable increase on 60^{th} day and the microbial population was gradually declined on 90^{th} day respectively. A significant decrease in lignin, cellulose, EC, organic carbon and C:N ratio was noted in C_5 treatment when compared to the raw sample. The increasing trend was noted in C_5 and C_2 treatment for pH, N, P, K, Ca and Mg respectively. The FT-IR spectroscopic analysis showed that raw sugarcane trash and sugarcane bagasse waste sample has a deep peak when compared to the composted sample having a smaller or disappearing peak which may be due to the composting process.

The findings of phase II revealed that the biometric character of Onion (*Allium cepa* L.) is increased in T_3 treatment when compared to the control on 30, 60 and 90 DAS. Black Nightshade (*Solanum nigrum* L.) is increased in T_4 treatment when compared to the control

on 30, 60 and 90 DAS. Tomato (*Solanum lycopersicum* L.) is maximum in T_3 treatment over the control on 30, 60 and 90 DAS. Brinjal (*Solanum melongena* L.) is highest in T_5 treatment when compared to the control on 30, 60 and 90 DAS. Maximum number of bulbs, diameter of bulb (cm), bulb length (cm), single bulb weight (g) and bulb yield per plot (kg) content was more in T_3 treatment when compared to the control on 90 DAS in onion (*Allium cepa* L.). A significant increase in number of fruits, diameter of fruits (cm), single fruit weight (g), fruit yield per plant (kg) and fruit yield per plot (kg) in T_4 treatment when compared to control on 90 DAS in black nightshade (*Solanum nigrum* L.). Maximum number of fruits, diameter of fruits (cm), single fruit weight (g), fruit yield per plant (kg) and fruit yield per plot (kg) in T_3 treatment when compared to the other treatment and control on 90 DAS in tomato (*Solanum lycopersicum* L.). The number of fruits, fruit length (cm), single fruit weight (g), fruit yield per plant (kg) and fruit yield per plot (kg) was increased in T_5 treatment on 90 DAS in brinjal (*Solanum melongena* L.).

The phase III results revealed that Maximum protein, carbohydrates and chlorophyll a, b and total chlorophyll content in leaves was noted in T_3 treatment when compared to the control and other treatment on 30, 60 and 90 DAS in onion (*Allium cepa* L.) and tomato (*Solanum lycopersicum* L.). The increase in protein, carbohydrates and chlorophyll a, b and total chlorophyll content in leaves was observed in T_4 treatment on 30, 60 and 90 DAS in black nightshade (*Solanum nigrum* L.). A significant increase in protein, carbohydrates and chlorophyll a, b and total chlorophyll content in leaves were recorded in T_5 treatment when compared to the control and other treatment on 30, 60 and 90 DAS in brinjal (*Solanum melongena* L.).

Phase IV results showed maximum initial soil pH, electrical conductivity, available nitrogen, available phosphorus and available potassium in T_5 treatment over the control. The post-harvest soil crops grown in Onion (*Allium cepa* L.) is increased in T_3 treatment. Black Nightshade (*Solanum nigrum* L.) is increased in T_4 treatment. Tomato (*Solanum lycopersicum* L.) is maximum in T_3 treatment. Brinjal (*Solanum melongena* L.) is highest in T_5 treatment. Initial soil microbial population of bacteria, fungi and actinobacteria were observed in T_3 treatment when compared to the control. Post-harvest soil microbial population of bacteria, fungi and actinobacteria were maximum T_3 in onion, T_4 in black nightshade, T_3 in tomato and T_5 in brinjal. Antioxidant and antibacterial

activity of *Allium cepa* L. in T_3 treatment, *Solanum nigrum* L. in T_4 treatment, *Solanum lycopersicum* L. in T_3 treatment and *Solanum melongena* L. in T_5 treatment showed highest zone of inhibition in best treatments when compared to the control. From the present study it is concluded that the combined application of compost produced from Sugarcane trash and sugarcane bagasse in an eco-friendly way enhanced the growth of the crops investigated.