Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 24, No. (2) : 2022 : 384-387

ISSN-0972-3005

DOI No.: http://doi.org/10.53550/AJMBES.2022.v24i02.029

BIO-COMPOSTING OF SERI-FARM RESIDUES BY *TRICHODERMA VIRIDE*

J. RAVIKUMAR[1], P. SAMUTHIRAVELU[2], M. TILAK[3*], L. HEMANT KUMAR[4] AND BHUVANESHWARI T.[5]

[1]Silkworm Seed Production Centre, NSSO, Chintamani, Karnataka, India
[2]Research Extension Centre, Udumalpet, Tamil Nadu, India
[3]Department of Microbiology, Forest College and Research Institute, TNAU, Mettupalayam, T.N., India
[4]Research Extension Centre, Central Silk Board, Krishnagiri, T.N., India
[5]Forest College and Research Institute, TNAU, Mettupalayam, T.N., India

(Received 4 February, 2022; Accepted 27 March, 2022)

Keywords: *Trichoderma viride, Bio-composting, Sericultural residues.*

Abstract – With a view to minimize the consumption of chemical fertilizers, farming community should be able to produce and apply organic manures as part of Integrated Plant Nutrition System for reducing cost of production of their produce. Adequate quantity of farmyard manure could not be produced due to dwindling population of cattle wealth in recent years. Hence, bio-composting is the best option to utilize on-farm wastes effectively for nutrient recycling and soil health improvement. Hence, a study on composting of sericultural residues by using *Trichoderma viride* was undertaken at 6 farm holdings in Avathanapatti and 7 farm holdings at Kasiripalli / Gollapalli in Krishnagiri district of Tamil Nadu. The objectives were to study mulberry growth parameters by using the compost prepared by mediation of *T. viride* and its impact on silkworm rearing. A quantity of 1 kg of inoculum was mixed with one ton of moistened Seri residue. The decomposition was completed in 90 days after inoculation. Thus prepared compost was applied to mulberry and observations were made on growth parameters such as plant height, biomass, leaf yield, shoot weight and leaf shoot ratio and silkworm rearing. The results of the present study revealed that application of compost prepared by using T. viride resulted in improvement of biomass and leaf yield besides plant height in the compost treated plots of both the villages when compared to control. The impact on silkworm rearing was found better with all the rearing parameters like single larval weight, single shell weight, and single cocoon weight and shell ratio percentage better besides improvement in cocoon yield.

INTRODUCTION

Organic matter plays an imperative role in improving the soil fertility and crop productivity. It is an integral component of soil which comprises of plant and animal residues that are made up of complex carbohydrates, starch, cellulose, hemicellulose, lignin, protein, fats, organic acids, oils resins etc. The importance of organic matter in crop production is well known. Undeniably, the amount of organic matter present in soil determines its suitability for crop cultivation. Of late, availability of cow dung has become scant for composting. Intensive cultivation causes depletion of organic matter as well as other nutrient content of the soil. Hence, to harvest better crop yields from the soil, it becomes necessary to apply organic manures and inorganic fertilizers to soils. Well- decomposed organic manures have a greater potential to improve the physical condition in terms of water holding capacity, soil porosity, infiltration rate and humus content and also the microbial status of the soil. The most apparent approach is to improve the known microbiological processes of organic waste degradation into well- humified product, which is very much needed as an important input for carbon deficient agricultural land of India. Gautam *et al.* (2012) found that *Trichoderma viride* has potential to decompose cellulose rich municipal organic waste due to its higher cellulase activity. According to Sanjeev Kumar (2013), these root micro-organism associations cause substantial changes to the plant

proteome and metabolism. Plants are protected from numerous classes of plant pathogen by responses that are similar to systemic acquired resistance and rhizobacteria-induced systemic resistance. Root colonization by *Trichoderma* spp. also frequently enhances root growth and development, crop productivity, resistance to abiotic stresses and the uptake and use of nutrients. As most of the crops are infected by the soil borne plant pathogens that primarily attack the vulnerable seeds or seedlings, the *Trichoderma* can be applied directly to target area, i.e., to seeds or seedlings and a single application using an existing delivery system (seed treatment, biopriming, furrow treatment) can significantly reduce crop losses**.** Hence, a study was undertaken to explore the use of *T. viride* mediated Seri compost by observing its impact on mulberry growth parameters and on silkworm rearing.

MATERIALS AND METHODS

The study was taken up at 6 farm holdings at Avathanapatti and 7 farm holdings at Kasiripalli / Gollapalli in farmers' participatory mode. A quantity of 1kg of *T. viride* inoculum was mixed with one ton of seri residue with 60% moisture. The entire heap was plastered with red soil and made holes for exchange of heat at thermophilic stage of decomposition. The water was sprinkled over the heap once in 5 days in order to facilitate the multiplication of this antagonistic and bio decomposing agent.

Thus prepared bio compost was applied in mulberry garden @ 8 t/ ac/ year and observations were made on mulberry growth parameters namely, number of shoots/ plant, plant height, biomass, leaf yield, shoot weight and leaf shoot ratio. Further, the effect of this compost on silkworm rearing parameters such as single larval weight (g), single cocoon weight (g), single shell weight (g), shell ratio (%) and cocoon yield / 100 Dfls and cocoon yield. Thus collected data were subjected to't' test.

RESULTS AND DISCUSSION

Gautham *et al*. (2010) found that the optimum temperature and pH of the medium for the cellulase production by *T. viride* was 45 ° C and 6.5. Cellulase production from *T. viride* can be an advantage as the enzyme production rate is normally higher as compared to other fungi.

According to Gautham *et al*. (2011), the optimum ranges of pH and temperature were 7 - 8 and 30 - 70°C, respectively. The suitable incubation period was 3 to 4 days. This selected fungus was tested for its potential to bio convert municipal solid waste. However, it can tolerate a soil reaction between pH 4 to 10, but the most favorable pH for the majority is just on the alkaline side of neutrality.

Effect of *T. viride* mediated Seri compost on mulberry growth

The results of the present study revealed that the application of compost prepared by using *T. viride* significantly increased biomass, leaf yield and shoot weight besides other plant parameters like number of shoots/ plant and plant height in all the study villages. However, the leaf shoot ratio was found non-significant in the villages compared to control (Table 1 and 2). The improvement might be due to increase in availability of more nutrients, humic and fulvic acids in the compost. This study was in

Table 1. Impact on mulberry plant parameters at Avathanapatti

Particulars	Number of shoots/ plant	Plant height (cms)	Biomass (t/ha/cp)	Leaf yield (t/ha/cp)	Shoot weight (t/ha/cp)	Leaf shoot ratio
Treatment	7.9	138.54	13.82	7.83	5.99	1.04
Control	5.9	128.60	6.70	7.00	7.30	1.00
t-value	2.8	3.12	2.76	2.92	2.72	0.07
Significance	*	*	*	*	*	NS

Table 2. Impact on mulberry plant parameters at Kasiripalli / Gollapalli

Particulars	Number of shoots/ plant	Plant height (cms)	Biomass (t/ha/cp)	Leaf yield (t/ha/cp)	Shoot weight (t/ha/cp)	Leaf shoot ratio
Treatment	7.93	136.53	12.81	6.66	6.14	1.10
Control	6.30	128.00	11.25	5.58	5.66	0.98
t-value	2.90	3.11	2.79	2.69	2.65	0.93
Significance	*	*	*	*	*	NS

Table 3. Impact on silkworm rearing at Avathanapatti

Particulars	Single larval weight (g)	Single shell weight (g)	Single cocoon weight (g)	Shell ratio%	Yield/ 100 Dfls
Treatment	3.92	0.33	1.45	22.75	78.66
Control	3.18	0.32	1.42	22.53	72.00
t-value	2.63	1.89	2.44	2.31	2.53
Significance	*	NS	*	*	*

Table 4. Impact on silkworm rearing at Kasiri gollapalli

Particulars	Single larval weight (g)	Single shell weight (g)	Single cocoon weight (g)	Shell ratio%	Yield/ 100 Dfls
Treatment	3.97	0.38	1.71	22.22	61.69
Control	3.20	0.30	1.40	19.30	52.70
t-value	2.71	1.87	2.35	2.52	3.10
Significance	*	NS	*	*	*

agreement with the findings of Wagh and Gangurde (2015) who found more nutrients along with fulvic; humic acid in compost prepared out of bamboo and teak leaf litter treated with decomposing culture *Trichoderma spp.* @1kg/ton than control. Hemanth kumar *et al*. (2005) reported that the application of *T. viride* mediated Agave wastes improved the mulberry growth parameters. The study is further corroborated with the findings of Ravikumar *et al*. (2005) who reported that the application of green foliage compost prepared by using consortium of *T. viride*, *Lactobacillus* sp. and *Pleurotus* sp. along with 150 g of urea and single super phosphate improved the mulberry growth and its nutrient content

Effect of *T. viride* mediated Seri compost on silkworm rearing

The present study revealed that the application of *T. viride* mediated Seri compost improved the silkworm rearing parameters in all the study villages and the mean values of treatment and control was significantly different except single shell weight (Table 3 and 4). *Trichoderma spp.* are the most effective strain for solid waste decomposition. *Trichoderma viride* is capable of producing various polysaccharide degrading enzymes, which may help to degrade long-chain carbon compounds, particularly materials normally incorporated for composting of cellulosic materials (Tchobanoglous, 1977). Natarajan (1992) found that with microbial composting, the lignin, cellulose, organic carbon and C: N ratio was reduced in coir pith.

Further, this compost is comparable to well-decomposed vermicompost. It could be used for nutrient recycling; antagonistic fungus against certain soil-borne pathogens, viz., *Fusarium* spp., *Rhizoctonia* spp. etc. (Anonymous, 2012). According to Coventry *et al*. (2006), *T. viride* reduced the proliferation of sclerotium-forming fungus *Sclerotium cepivorum* causing *Allium* white rot and increased bulb yield.

CONCLUSION

The bio-compost of sericultural wastes by using *T. viride* was found superior over conventional farm yard manure in this study which can be utilized not only to improve soil health and mulberry leaf / silkworm cocoon productivity but also for antagonistic activity against soil borne pathogens.

REFERENCES

Anonymous, 2012. http://agritech.tnau.ac.in/org_farm/org-_farm composting.html

Coventry, E., Noble, R., Mead, A., Marin, F. R., Perez, J. A. and Whipps, J. M. 2006. *Allium* White rot suppression with composts and *Trichoderma viride* in relation to sclerotia viability. *Biol Control*. **9** : 1009-1020.

Gautam, S.P., Bundela, P.S., Pandey, A.K., Jamaluddin, Awasthi, M.K. and Sarsaiya, S. 2010. Optimization of the medium for the production of cellulase by the *Trichoderma viride* using submerged fermentation, *International Journal of Environmental Sciences*. 1(4): 656.

Gautam, S.P., Bundela, P.S., Pandey, A.K., Jamaluddin, Awasthi, M.K. and Sarsaiya, S. 2011. Isolation, Identification and Cultural Optimization of indigenous fungal isolates as a potential

bioconversion agent of municipal solid waste. *Annals of Environmental Science*. 5 : 23-34.

Gautam, S.P., Bundela, P.S., Pandey, A.K., Jamaluddin, Awasthi, M.K. and Sarsaiya S. 2012. Diversity of Cellulolytic Microbes and the Biodegradation of Municipal Solid Waste by a potential Strain. *International Journal of Microbiology*. 1-12

Hemanth Kumar, L., Suresh, A., Samuthiravelu, P., Ravikumar, J., Jayaraj, S. and Qadri, S.M.H. 2005. Studies on the composting of Agave wastes for mulberry productivity. In: *National seminar on composting and vermicomposting held at CSR&TI, Mysore* on 26/27.10.2005: 159.

Natarajan, S., Rajan S.S.S. and Kandasamy, P. 1992. Use of coir pith waste as an amendment and manure for crops. In: *Workshop on the use of waste and byproducts as fertilizers and soil amendments for pastures and crops at Massey University, New Zealand* on 19-20 Feb.

Ravikumar, J., Hemanth Kumar, L., Samuthiravelu, P., Jayaraj, S., Qadri, S.M.H. and Vijayakumar, R. 2005. Studies on biocomposting of green foliage, In: *National seminar on composting and vermicomposting held at CSR&TI, Mysore* on 26/27.10.2005: 160.

Sanjeev Kumar, 2013. *Trichoderma*: A biological weapon for managing plant diseases and promoting sustainability. *International Journal of Agricultural Sciences and Veterinary Medicine*. 1(3) : 107-121.

Tchobanoglous G. 1977. *Solid Waste Engineering Principles and Management Issues*. McGraw Hill. New York.

Wagh, S.P. and Gangurde, S.V. 2015. Effect of cow dung slurry and *Trichoderma* Spp. on quality and decomposition of teak and bamboo leaf Compost. *Research Journal of Agriculture and Forestry Sciences.* 3(2): 1-4.