International Journal of Advanced Research in Biological Sciences
ISSN : 2348-8069
www.ijarbs.com

Review Article

Vermicompost tea and its role in control of pest: A Review

Jayanta Mistry[1] and Sarada Mukherjee[2]

[1]Gotha A. R. High School, Suti-I, Murshidabad, West Bengal, India, Pin- 742223
[2] Ayesgbag Vidyapith, Lalbagh, Murshidabad, West Bengal, India, Pin- 742164

*Corresponding author: *mistryjayanta@yahoo.com*

Abstract

This review investigated the effects of vermicompost tea on plant pest control. Vermicompost teas were prepared using various extraction methods (non - aerated, aerated, with additives) with various ratios of compost and water for several days to week. In aerated vermicompost teas, water and nutrient additives greatly increase microbial populations. The aerated, vermicompost 'teas' suppressed the plant diseases. Vermicompost 'teas' also suppressed population of plant roots nematode parasite, spider, mite and aphids significantly.

Keywords: Additives, aerated, non – aerated, tea, vermicompost.

Introduction

Vermicompost are stabilized organic soils bi-product that are produced by a non-thermophilic process, in which organic matter is broken down through interactions between earthworms and microorganisms, under aerobic conditions. Vermicompost have much greater microbial biodiversity and activity than conventional thermophilic composts (Edwards *et al*., 1998; Edwards 2004). Although microbes are responsible for the biochemical degradation of organic matter, earthworms are the important derivers of the process, conditioning the substrate and altering the biological activity (Aira *et al*., 2002). During vermicomposting the nutrients are released and converted into soluble and available forms to plants (Ndegwa and Thompson, 2001).

Now a days, crop growers have been producing aqueous extracts of vermicomposts (VC), commonly termed as vermicompost 'teas' can increase crop resistance to pest, crop growth and are much easier to apply to crops and soils. Compost tea practitioners are largely responsible for developing the wide array of compost tea production practices and uses of compost tea in plant pest, disease, and fertility management programs (Brinton, 1995; Brinton *et al*, 1996; Diver, 1998 and 2001; Ingham, 2003; Quarles, 2001; Scheuerell and Mahaffee, 2002; Touart, 2000). A primary reason for producing compost tea is to transfer microbial biomass, fine particulate organic matter, and soluble chemical components of compost into an aqueous phase that can be applied to plant surfaces and soils in ways not possible or economically feasible with solid compost.

Materials and Methods

Vermicompost tea is produced by mixing vermicompost with water and culturing for a defined period, either actively aerating (aerated compost tea, ACT) or not (non-aerated compost tea, NCT) and with or without additives that are helps to increase microbial population densities during production (NOSB, 2004; Scheuerell and Mahaffee, 2002). An important distinction between NCT and ACT is that

ACT uses vermicompost, water, and nutrient additives to greatly increase microbial populations over a 12-36 hour period, while NCT uses greater quantities of vermicompost, typically doesn't add separate nutrient additives, and is produced over several days to several weeks. In addition to the source of compost and the use of active aeration, a number of vermicompost tea production parameters will affect the final biological and chemical properties of vermicompost tea.

The predominant compost tea production method practiced in the United States is commonly termed actively aerated compost tea, which is the product of the following general process. Usually vermicompost is filled into a porous container which is then suspended in water containing a large container, typically 1 part compost to 10-50 parts water. Constant mechanical energy input is used to provide aeration either by air pump directly into the water or by re-circulation of the water, typically for 12-24 hours. Compost tea additive, such as molasses, yeast extract, algal powders, when included, substantially increase microbial biomass in the aqueous phase from microorganisms extracted from the compost. In The United States aerated compost teas are made using one of many commercially produced "brewers", however, many home-made brewers are also in use. (Diver, 2001; Ingham, 2003; Scheuerell and Mahaffee, 2002).
A second form of compost tea is termed either non-aerated compost tea or passively aerated compost tea, and is the product of the following general process. Typically 1 part compost is mixed with 3-10 parts water in an open container, where it remains with or without daily stirring, for at least several days, often for 1 to 3 weeks. Compost tea additives are infrequently added to non aerated compost tea. For the purposes of distinguishing compost tea production practices that have the potential to support growth of bacterial pathogens, any mixture of compost and water that is held for longer than one hour before initiating application to be a form of compost tea. Any mixture of compost and water that is held for less than one hour before initiating application is considered a compost extract (Scheuerell and Mahaffee, 2002; Weltzien, 1991). Before use, compost teas are typically filtered to a degree necessary to avoid plugging the sprayer or irrigation system used for application. Spray adjuvant are sometimes added immediately prior to application.

Discussion

Compost tea has evolved from historical horticultural practices such as steeping manure or plants in water, with the liquid applied to crop plants for nutritional and plant health reasons. In recent decades, the majority of published studies examining compost tea have focused on foliar plant disease suppression using liquid material produced by steeping vermicompost in water for several days to weeks.

Vermicompost have also been shown to suppress attacks by soil and foliar transmitted plant diseases, such as *Pythium, Rhizoctonia, Plectosporium* and *Verticillium*, significantly in both the field and greenhouse. Vermicomposts can also suppress arthropod pests such as caterpillars: including cabbage white caterpillars, tomato hornworms, and cucumber beetles, as well as sucking arthropods: such as scale insects, mealy bugs, aphids and spider mites (Arancon *et al*, 2005). The suppression of aphids is particularly important, since they are major transmitters of plant viruses. The vermicompost applications to soils appear to make the plants that are grown in them less attractive to the pests but also by suppressing their reproduction.

Work at The Ohio State University has shown that vermicompost 'teas' increased the germination, growth, flowering, and yields of tomatoes, cucumbers, and other crops in similar ways to solid vermicomposts. The aerated, vermicompost 'teas' suppressed the plant diseases *Fusarium, Verticillium, Plectosporium,* and *Rhizoctonia* to the same extent as the solid vermicomposts. (Edwards *et al*, 2006). Vermicompost 'teas' also suppressed populations of spider mites (*Tetranychus urticae*) and aphids (*Myzus persicae)* significantly. Additionally, they had dramatic effects on the suppression of attacks by plant parasitic nematodes such as *Meloidogyne* on tomatoes both in terms of reducing the numbers of root cysts significantly and increasing root and shoot growth (Arancon *et al*, 2003). These plant responses may be due to the production of plant growth regulators such as as indole acetic acid (IAA), kinetin, or gibberellins associated with humic and fulvic acids also acting as plant growth regulators.

Conclusion

Vermicomposts and vermicompost 'teas' that can be produced from organic wastes, such as food and wastes, have enormous economic potential for increasing crop yields and suppressing attacks by pests and diseases. Compost tea production practices that use compost tea additives to increase microbial populations; thereby potentially posing a risk of contaminating crop plants with human pathogens due to introduction of pathogenic bacteria. So vermicompost tea does not satisfy Soil fertility and crop nutrient management practice standard. The producer must manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances (NOSB Compost Task Force Recommendation, 2004).

References

Aira, M., F. Monoroy, J. Dominguez, and S. Mato., 2002. How earthworm density affects microbial biomass and activity in pig manure. *Eur. J. Soil Biol*., **38**: 7-10.

Arancon, N.Q., Yardin, E., Edwards, C.A., Lee, S., 2003. The trophic diversity of nematode communities in soils treated with vermicomposts. *Pedobiologia.* 47, 731-735.

Arancon, N.Q., Galvis, P., Edwards, C.A., 2005. Suppression of insect pest populations and plant damage by vermicomposts. *Bioresource Technology*. 96, 1137-1142.

Brinton, W.F., 1995. The control of plant pathogenic fungi by use of compost teas. *Biodynamics* Jan/Feb:12-5.

Brinton, W.F., A. Trankner, M. Droffner, 1996. Investigations into liquid compost extracts. *Biocycle* 37(11):68-70.

Diver, S., 1998. Compost Teas for Plant Disease Control. ATTRA, Fayetteville, AR. http://attra.ncat.org/attra-pub/comptea.html

Diver, S., 2001. Notes on Compost Teas: A 2001 Supplement to the ATTRA publication Compost Teas for Plant Disease Control. ATTRA, Fayetteville, AR. http://attra.ncat.org/attra-pub/compost-tea-notes.html

Edwards, C. A., Fletcher, K. E., 1988. Interaction between earthworms and microorganisms in organic matter breakdown. *Agriculture, Ecosystems and Environment.,* **20** (3), 235–249.

Edwards, C. A., Arancon, N. Q., 2004. Interactions among organic matter, earthworms and microorganisms in promoting plant growth. Functions and Management of Organic Matter. In: Magdoff, F., Weil, R. (Eds.), *Agro ecosystems*, vol. 11. CRC Press, Boca Raton, FL, pp. 327–376.

Edwards, C.A., Arancon, N.Q., Greytak, S., 2006 Effects of Vermciompost Teas on Plant Growth and Diseases. *Biocycle.* May 2006, 28-31.

Ingham, E. R., 2003. The Compost Tea Brewing Manual, 3rd Edition. Soil Food Web, Inc., Corvallis.

Ndegwa, P. M. and S. A. Thompson, 2001. Integrating composting and vermicomposting the treatment and bioconversion of Biosolids, Biores. *Technol*., 76: 107-112.

NOSB, 2004. Compost Tea Task Force Final Report. National Organic Standards Board, 2004. www.ams.usda.gov/nosb/meetings/CompostTeaTaskForceFinalReport.pdf

Quarles, W., 2001. Compost tea for organic farming and gardening. The IPM Practitioner 23(9):1-8.

Scheuerell, S. and W. Mahaffee., 2002. Compost tea: Principles and prospects for plant disease control. Compost Science and Utilization 10(4):313-338.

Touart, A. P., 2000. Time for compost tea in the Northwest. *Biocycle* 40(10):74-7.

Weltzien, H. C., 1991. Biocontrol of foliar fungal disease with compost extracts, p.430-450.