Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 04, Issue: 04 (JULY-AUG, 2024)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Vermicompost: A Sanctuary for Beneficial Microorganisms in Sustainable Farming

(Shweta Sharma[1], RK Gupta[1], Rahul Kumar[1] and *Dilbag Singh[2])
[1]Department of Zoology, CCS Haryana Agricultural University, Hisar, Haryana-125004
[2]Galgotias University, Greater Noida, Uttar Pradesh, 203201
*Corresponding Author's email: sdilbag460@gmail.com

Earthworms' secretions and their cast restore and improve soil. Vermicast of earthworms have a higher base-exchange capacity and are generally richer in total organic matter, total exchangeable bases, phosphorous, exchangeable potassium and manganese and total exchangeable calcium. They enhance nitrification because they increase bacterial population and soil aeration. The excreta of earthworms known as castings are a rich source of organic matter. When the worm excretes this in the form of casts which are deposited on the surface or deeper in the soil, minerals and plant nutrients are made available in an accessible form (Thippareddy and Agrawal, 2014).

Various components in vermicompost which help in growth of microorganisms

It was found that rice when rice plants were grown in earthworm castings their dry shoot weight gradually increased as well as nutrient uptake also increased as compared to that in fertilizers. *Eisenia fetida* is one of the most recommended species of earthworm for vermicomposting. There are many nutrient elements present in vermicompost and also this vermicompost contains many microbes like mycorrhizae, nitrogen fixing bacteria and many growth promoting substances which improve the crops (Barik*et al.*, 2006).

Perekh and Mehta (2015) reported the Nitrogen, Phosphorus and Potassium content in vermicompost which varied from 0.38-1.76%, 0.2-1.76% and 0.69-4.98%, respectively and these contents also depend on the type of the waste food used. This technique *i.e.*, vermicomposting improves the soil structure which leads to the increased soil fertility, good water holding capacity ultimately increasing the crop yield.

The gut of the earthworms activates the ingested N_2O-producing soil bacteria and hence the gut of these earthworm was extremely rich in total nitrogen, inorganic carbon and total carbon. Also, the nitrite and ammonium were enriched in the gut up to 10 and 100-fold, respectively as compared to soil. In earthworm's gut the anoxic environment caused the pH 6.9 and the water content *approx.* 50% (Horn *et al.*, 2003).

A study on vermicomposting of crop residues and cattle dung with *E. fetida* showed increase in Nitrogen and significant decrease in C:N ratio (Bansal and Kapoor, 2000). The microorganisms present in the gut of earthworm used the carbon as a source of energy and nitrogen was used by them for building the cell structure to bring about the decomposition of organic matter. The reduction was greater in vermicomposting as compared to ordinary composting due to the fact the earthworms had higher assimilating capacity. The nitrogen content increased probably due to the mineralization of organic matter and carbon loss (Kaushik and Garg, 2004). The final nitrogen content of compost depends on the initial nitrogen content present in waste and the extent of decomposition.

Vermicompost contains high levels of bio-available nutrients in plant-available form like nitrogen as nitrates, phosphorus as phosphates, soluble potassium, soluble magnesium and exchangeable calcium and phosphorus. Vermicomposts have large size particles which provide a large surface area which provides many micro-sites for microbial activities and also for the retention of nutrients (Edwards and Arancon, 2006). Vermicompost prepared from kitchen waste using *E. fetida* showed increase in nitrogen, phosphorus and potassium content while decrease in organic carbon, C:N and C:P ratio. In comparison to control, treated vermi bed with *E. fetida* showed 1.07, 10.94, 13.2 and 24.7% increase in carbon, total nitrogen, potassium and phosphorus, respectively (Suthar, 2009). Decomposition of leaf litter using *E. fetida* was studied along with nutrient status of vermicompost (Karmegam and Daniel, 2000). Nutrient status of vermicompost from vegetable waste and cow-dung by using three different species (*E. fetida*, *E.eugeniae and P. excavates*) showed a high increase in nitrogen, potassium and high decrease in organic carbon, C:N and C:P ratio (Chauhan *et al.*, 2010).

References

1. Bansal, S.& Kapoor, K. K. (2000). Vermicomposting of crop residues and cattle dung with *Eisenia foetida*. *Bioresource technology*, **73**(2): 95-98.
2. Barik, A. K., Das, A., Giri, A. K.& Chattopadhyay, G. N. (2006). Effect of integrated plant nutrient management on growth, yield and production economics of wet season rice (*Oryza sativa*). *Indian journal of agricultural science*, **76**(11): 657-660.
3. Chauhan, A., Kumar, S., Singh, A. P.& Gupta, M. (2010). Vermicomposting of vegetable wastes with cowdung using three earthworm species *Eisenia foetida, Eudrilus eugeniae* and *Perionyx excavatus*. *Nature and science*, **8**(1): 34-42.
4. Edwards CA & Arancon NQ (2006). The science of vermiculture: the use of earthworms in organic waste management, In: Guerrero RD III, Guerrero-del Castillo MRA (eds) Vermi technologies for developing countries. Proceedings of the international symposium–workshop on vermi technologies for developing countries, Philippine Fisheries Association Inc, Los Baños, Laguna, Philippines, 32-65.
5. Horn, M.A., Schramm, A. & Drake, H.L., (2003). The earthworm gut: an ideal habitat for ingested N2O-producing microorganisms. *Applied and Environmental Microbiology*, **69**(3): 1662-1669.
6. Karmegam, N. & Daniel, T. (2000). Effect of biodigested slurry and vermicompost on the growth and yield of cowpea, *Vigna unguiculata* (L.). *Environment and Ecology*, **18**(2): 367-370.
7. Kaushik, P. & Garg. V.K. (2004). Dynamics of biological and chemical parameters during vermicomposting of solid textile mill sludge mixed with cowdung and agricultural residues. *Bioresource Technology*,**94**: 203-209.
8. Perekh, S. A.& Mehta, M. J. (2015). Vermicomposting as sustainable option for organic waste management.*International Journal of Innovative and Emerging Research in Engineering*, **2**(1): 13-20.
9. Suthar, S. (2009). Vermicomposting of vegetable-market solid waste using *Eisenia fetida*: Impact of bulking material on earthworm growth and decomposition rate. *Ecological engineering*, **35**(5): 914-920.
10. Thippareddy K.S. & Agrawal P. (2014). Characterization And Biological Production Of Ethanol From Biomass. *Journal of Environmental Research and Develooment*, **9**(2): 334-341.