ABSTRACT

The cost of feed and fertiliser constitute about 70% of the total operating expenses in aquacultural operation. Thus, there is a need for finding out alternative cheap source of feed and fertiliser. Recycling of wastes minimises the operational expenses on feed and fertiliser, but all types of wastes can not be used directly in aquaculture and need pretreatment before use. Vermicomposting is one of the recent biological methods for treatment of organic solid waste. Therefore, the present work was carried out to study the vermicomposting process of paper mill solid waste and application of vermicompost as fertiliser in aquacultural tanks and earthworm as a source of protein in fish feed.

All vermicomposting experiments were carried out in plastic trays kept inside a vermary using the earthworm *Eisenia foetida* (Savigny). The aquaculture experiments were done in cemented tanks and aquaria and the fishes used were, tilapia and Indian major carp fry. The vermicomposting process parameters under consideration were waste mixture, C/N ratio, particle size, worm density, waste addition schedule and height of the vermicomposting system. The environmental parameters such as temperature, moisture and pH of the vermicomposting system were observed. The changes in the metal content on vermicomposting were also measured. The use of vermicompost as a fertiliser was compared with the commercially available other organic manures and chemical fertilisers. Fish feeds were prepared by replacing the fish meal by earthworm meal and tested for fish growth.

The present work shows that the vermicomposting period of paper mill solid waste can be reduced by addition of farmyard manure and 50 C/N ratio of waste mixture of paper mill solid waste and farmyard manure is ideal for maximum earthworm biomass production.. The ideal worm density for higher biomass production rate and faster vermicomposting process, is 160 worms/kg of waste. Fed batch system is better than the batch system in terms of the rate of biomass production and biodegradation. The height of the vermicomposting system can be kept maximum upto 1.5 m. Particle size of waste, worm density, frequency of addition of waste, height of the vermicomposting system and addition of urea for the reduction of C/N ratio did not appear to have any effect on the nutrient content of the vermicompost produced. There was no bioaccumulation of metals

in the earthworm body and metal leaching to the water media on application of vermicompost. Vermicompost from paper mill solid waste resulted in comparatively better fish growth than when using commercial organic manure. As a nitrogenous fertiliser, vermicompost mixed with chemical fertiliser in 1:1 combination gave better growth of fish than when used alone and it is also a good source of phosphorous fertiliser in comparison to the chemical fertilisers. The fish feed prepared after replacing 50% of the fish meal by earthworm meal yielded better results than the feed prepared from fish meal only, in terms of fish growth and resulted in lower FCR and higher PER and SGR%.

Key words : Aquaculture, Carp, Earthworm meal, *Eisenia foetida*, Fish feed, Organic fertiliser, Paper mill solid waste, Tilapia, Vermicomposting, Vermiculture.