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***Research Article***

# *CHARA ZEYLANICA* IN VERMITECHNOLOGY

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## ABSTRACT
Vermicomposting of aquatic weeds is a positive biotechnological approach to produce an eco -friendly nutrient rich manure. *Chara zeylanica* Willd. is a freshwater macro-alga of the class Charophyceae. The plant is available in plenty and the aquatic weed biomass if harvested for further utilization would save the aquatic body and the processed biomass could be manure. *Chara zeylanica* plant biomass was collected manually from Kootumangalam coastal ditch. *Chara zeylanica* biomass and cow dung in 1: 1 proportion and 2: 1 proportions were set separately. After one month duration earthworms were introduced for further processing. Nutrient analysis was done to evaluate the composition of macro and micronutrients. Phosphorous and potassium concentration were high as 278ppm and 356.7ppm respectively in 2:1 ratio of vermicompost. The zinc, copper and iron content were 11.46ppm, 22.34ppm and 64.91ppm. The calcium (134.5ppm) and magnesium (125.3ppm) contents were also high.

***Key Words:*** *Chara zeylanica, Biofertilizer, Vermicomposting*

## INTRODUCTION
Biotechnology is an interdisciplinary pursuit with multidisciplinary applications and it may be a growing science with future scope and development. One of the branches of modern biotechnology is vermitechnology which gives ecofriendly, pollution free biomanure/ biofertilizer in the form of vermicompost. The process involves the interaction of earthworms with organic source and converting into valuable resource for agricultural use (Lekshmi and Ebeneser, 2011). *Chara zeylanica* is a macroalga characteristic of mass production and this is taken advantage to utilize it in vermicompost preparation.

## MATERIALS AND METHODS
### *Vermicompost Preparation*
*Chara zeylanica* Figure 1(a) plant biomass was collected manually from Kootumangalam coastal ditch Figure 1(b) of Kakulam taluk, Kanyakumari District, Southern Tamil Nadu, India. The earthworm *Eisenia foetida* was collected from the Department of Zoology, Scott Christian College, Nagercoil. Concrete tanks of size 60x 30x 30cm were used for the vermicompost preparation. The bins were lined with gravel and sand and followed by *Chara zeylanica* biomass and cow dung in 1: 1 proportion and 2: 1 proportion separately. Control setup was maintained without *Chara zeylanica*. Regular stirring and moisturizing was done. After one month duration earthworms (100 numbers) were introduced for further processing. Water was sprinkled to maintain optimum moisture level and neutral pH. After 45 days watering was stopped and kept ready for harvesting the dark brown granules of vermicompost.
### *Nutrient Analysis of Vermicompost*
Nutrient analysis was done to evaluate the composition of macro and micronutrients. Nitrogen was measured by Kjeldahl digestion and distillation method, phosphorus was determined by colorimetric method. Using Flame photometer potassium, calcium, and magnesium were determined. Zinc, copper and iron were analyzed by Atomic Absorption Spectrophotometer. Electrical conductivity and pH were measured in electrical conductivity meter and pH meter respectively.

## RESULTS AND DISCUSSION
The pH of 1:1 ratio of vermicompost is 4.35 and in 2:1 ratio it was 4.67. The electrical conductivity reported was 13.56 ds/m and 15.7 ds/m. Nitrogen content was 3.18% (1:1) and 4.57% (2:1). Phosphorous

and potassium concentration were high as 156.7ppm and 213.45ppm, 278ppm and (356.7ppm respectively in 1:1 and 2:1 ratio of vermicompost preparations respectively. The zinc, copper and iron content were 8.44ppm, 13.4ppm and 54.56ppm (1:1 ratio) respectively. It was 11.46ppm, 22.34ppm and 64.91ppm in 2:1 ratio vermicompost. The calcium (113.4pm & 134.5ppm) and magnesium (99.3ppm and 125.3ppm) contents were also high. Under favourable conditions charophytes form dense meadows which are probably efficient nutrient traps. Biomass and nutrient content in such beds are comparable or even higher than in beds of vascular aquatic macrophytes. They have been reported to decompose slower than their vascular counterparts prolonging nutrient storage in plant biomass (Kufel and Kufel, 2002). Nitrogen, phosphorus and calcium concentrations in charophytes vary considerably even within the same species. Such variability reflects differences in nutrient abundance in natural habitats (Kufel and Ozimek, 1994; Krolikowska, 1997). *Chara zeylanica* produced maximum standing crop under the low light conditions of the station. The observation was in agreement with the report of Saito *et al.,* (1978) and Grimshaw *et al.,* (2005).

Aquatic macrophytes were observed to play substantial role in the local socio- economy as green manure/compost. In the present study the harvested aquatic weed (*Chara zeylanica*) biomass of the experimental station was utilized in vermicomposting in combination with garden soil and cow dung as additives to reduce moisture levels and maintain C: N ratio. Vermicomposting process was successfully completed. This observation is in agreement with the reports of Wile *et al.,* (1975 and 1978).

The macronutrient and micronutrient constituents of *Chara zeylanica* used vermicompost (1:1 and 2:1 ratio) are shown in Figure 1(c). Efforts have been made in different countries to find uses of algae as food, feed, medicine or fertilizers being rich in K, P and trace elements (Nicol, 1992). Macronutrients are essential elements and nitrogen is the basic component of nucleic acid, protein and other organic molecules. In the present observation nitrate concentration ranged from 8.96ppm in 1:1 ratio to the maximum of 15.6ppm in 2:1 ratio of vermicompost. Similar observations were also made from the vermicompost prepared from duck weed (Wong *et al.,* 1977), sewage sludge (Bury *et al.,* 2009) black gram pod (Kannan *et al.,* 2011). Vasanthy and Kumaraswamy (1999) and Padmavathiamma *et al.,* (2008) reported that it was mainly by the nitrogenous products of earthworms. Phosphate and potassium contents were more (213.45ppm phosphate and 356.7ppm potassium) in *Chara zeylanica* (2:1) used vermicompost than that in other aquatic weeds. The present observation corroborates with the findings of Kasthuri *et al.,* (2011); Estherrani (2007) and Kittumath *et al.,* (2007) from different organic waste used vermicompost. Uma and Malathi (2009) have reported 120.5ppm of nitrogen, 18.39ppm of phosphorus and 50.90ppm of potassium from the organic waste used vermicompost. Lohani (2005); Rakshit *et al.,* (2008) and Ansari (2009) have reported high NPK content from the aquatic weeds used vermicompost. The secondary macronutrients such as calcium and magnesium were high and recorded as134.5ppm and 125.3ppm respectively in 2:1 ratio of vermicompost.

The micronutrient constituents of vermicompost were also in appreciable levels. *Chara zeylanica* used vermicompost produced 8.44ppm of zinc in 1:1 ratio and 11.46ppm of zinc in 2:1 ratio. Similarly 13.4ppm of copper in 1:1 ratio vermicompost and 22.34ppm in 2:1 ratio vermicompost were recorded. Iron content was 54.56ppm in 1:1 ratio vermicompost and 64.91ppm in 2:1 ratio vermicompost. The present findings are in agreement with the report of Jeyabal and Kuppusamy (1997), Kostecka and Kaniczak (1999) and Suthar (2007) respectively from paddy straw, duckweed and groundnut shell used vermicompost. *Eisenia foetida's* good growth in aquatic weed beds indicates that these organic matters are palatable to them. Several researchers reported that the nutrient composition of vermicompost varied in their micronutrient levels depending upon the waste materials used during the feeding process of earthworms (Paola and Ceppi, 2008).

**(a)** 

**(b)** 

**(c)**

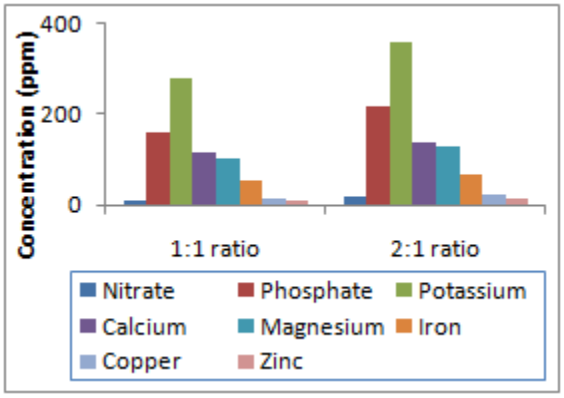


**Figure 1: *Chara zeylanica***

**(a)Plant specimen,**
**(b) Plant collected site,**
**(c) Macro and Micronutrients in the plant biomass: cowdung used vermicompost.**

***Conclusion***

Utilization of *Chara zeylanica* in vermitechnology is a pioneer work. From the present study it is concluded that vermicomposting of aquatic weeds is a positive biotechnological approach to produce an eco -friendly nutrient rich manure. The *Chara zeylanica* –Cowdung medium is favorable and palatable to the earthworm population of *Eisenia foetida* and their interactions produce good biofertilizer containing both macronutrients and micronutrients which could not only promote crop yield but also protect the plant from deficiency and disease symptoms.

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