Asian Journal of Biological and Life Sciences | Original Research

Effect of vermicompost as pond fertilizer on growth performance of *Cirrhinus mrigala* (Ham.)

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Submitted : 13.01.2016 Accepted : 01.04.2016 Published : 30.04.2016

Abstract

Fertilization of organic manure and provision of supplementary feed with additives such as mineral and vitamin premix has a positive influence on the growth of Indian major carps that contributed to high fish production. An experiment was conducted to study the effect of different doses of fertilizer i.e Vermicompost @15,000kg/ha/yr ,vermicompost @10,000 kg/ha/yr, vermicompost @5,000 kg/ha/yr and cowdung @ 10,000 kg/ha/yr on the growth of *Cirrhinus mrigala*. The response of treatments towards increase in fish weight and total length was significantly different. The fertilizers of ponds enhanced the gross fish yield / pond / 5 months from that of the observations of control experiment. Increase in body weight of mrigal was maximum in vermicompost @10,000 kg/ha/yr. While the poor increase in body weight was observed in control.

Key words : *Cirrhinusmrigala,* Vermicompost, Water parameters, Cowdung,

INTRODUCTION

Fish production sector is very important not only as a main source of animal protein to ensure food security[1] but also to improve employment and income for poverty elimination in developing countries. The production of fish pond depends on the production of vegetation which in turn is dependent on the nutrients present in the pond. It is not possible to increase the production of cultivated fish by giving them the greater quantities of natural food directly.

Organic manures and chemical fertilizers can be used to increase the planktonic biomass on which fish mainly feeds. It stimulates the growth of natural food by providing some essential deficient elements, which are utilised by phytoplankton and zooplankton. The advantages of fertilization in fish farming are to improve water quality and to increase the variety and quantity of phytoplankton and zooplankton which ultimately leads to fish yield, increment and high economic returns. Among the organic manures, vermicompost is one of the ready to use organic manure. The efficacy of vermicompost for fish production has not yet been extensively explored. Bansal[2]suggested that higher potential of utilizing vermicompost as compared to semi-digested cowdung. Hence, it can be used more effectively for manuring semi-intensive carp culture ponds without affecting the hydrobiological parameters. So, the experiment was designed to evaluate the growth performance of C*irrhinusmrigala* under different treatments of vermicompost and cowdung.

MATERIALS AND METHODS

For studying the growth performance of *Cirhinus mrigala* under 5 different treatments of vermicompost and cowdung with 5 replicates per treatment and control. Ponds of equal size were used to conduct the experiment. Each pond has an area of 360 sq. ft. and is located at fish farm hatchery of Dept. of Zoology CCS Haryana Agricultural University, Hisar, Haryana. The experiment was conducted from 18th June 2011 to 15th Nov., 2011. Before stocking, all the ponds were sun dried for 15 days. For the purpose of disinfection and the stabilization of pH, lime was applied @200kg/ha/yr. Essential precautionary measures were taken to screen the water inlets to avoid the entry of intruders or exit of fish out of ponds. After one week of taking these preliminary steps, each pond was watered and the level of water was maintained throughout the experiment. All the ponds were fertilized with organic manures vermicompost @ 15,000kg/ha/yr, vermicompost @ 10,000kg/ha/yr,vermicompost @ 5,000kg /ha/yr and cowdung@ 10,000kg/ha/yr. Initial dose was applied at 25% to stimulate the productivity of ponds. The fry after acclimatizing under laboratory conditions for10 days were randomly distributed @9 fishes per pond of each treatment given in [Table 1].

Supplementary feed (fish meal 10%, mineral mixture 1.5%, common salt 0.5%, wheat flour10%, soya flour 45%, mustard oil cake 17%, rice bran16%) was used for feeding the twice daily @2% BWd^{-1} for the whole exp.

The sampling was done after 15 days interval in terms of body weight and length gain and the feeding rate was adjusted accordingly. Water quality parameters such as dissolved oxygen, free CO, alkalinity, hardness, pH and the quantitative estimation of planktons was done at 15 days interval by using the Sedwick Rafter Cell. Data was analyzed using statgraphics statistical package for the following parameters. Differences among different treatments were calculated by using ANOVA ($P \leq 0.05$).

Live weight gain(g) = Final body weight - Initial body weight

Live length gain(cm) = Final body length - Initial body length

Growth Increment (GI)= (Final body weight - Initial body weight) / (culture period)

RESULTS

The study revealed that during the experimental period, water quality parameters such as pH, dissolved oxygen, alkalinity, hardness, phytoplanktons and zooplanktons differed

Table 1: Different treatments used during the experiment

Serial no.	Treatments (manure)
Treatment-1	Control
Treatment-2	Vermicompost @15000kg/ha/yr (VC_{15})
Treatment-3	Vermicompost @10000kg/ha/yr (VC_{10})
Treatment-4	Vermicompost @5000kg/ha/yr (VC_5)
Treatment-5	Cowdung @10000kg/ha/yr (CD_{10})

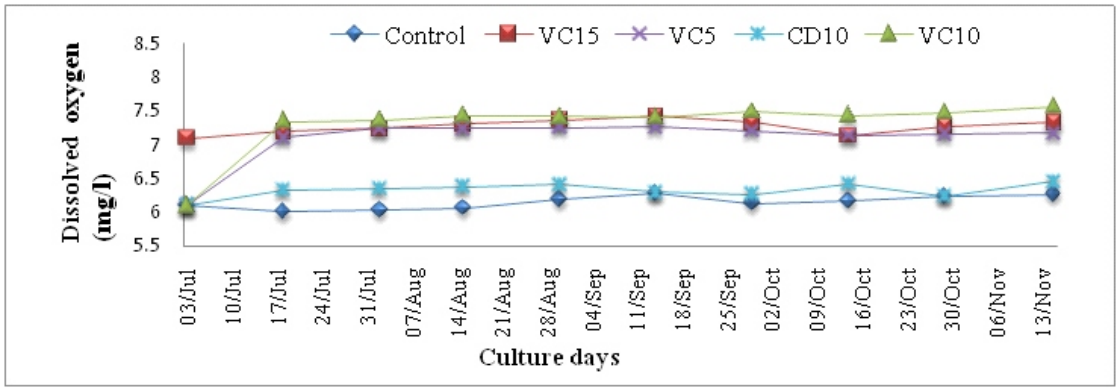

Fig 1 : Measurement of dissolved oxygen (mg/l) under different treatments

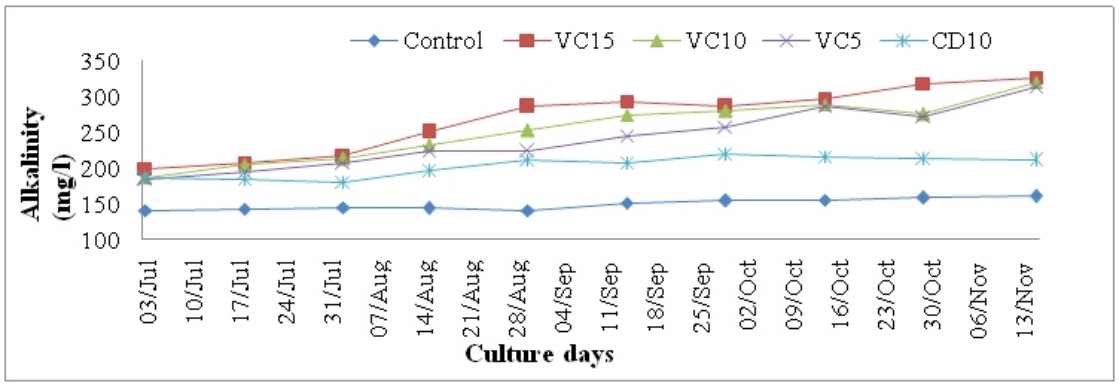

Fig 2 : Measurement of pH under different treatments

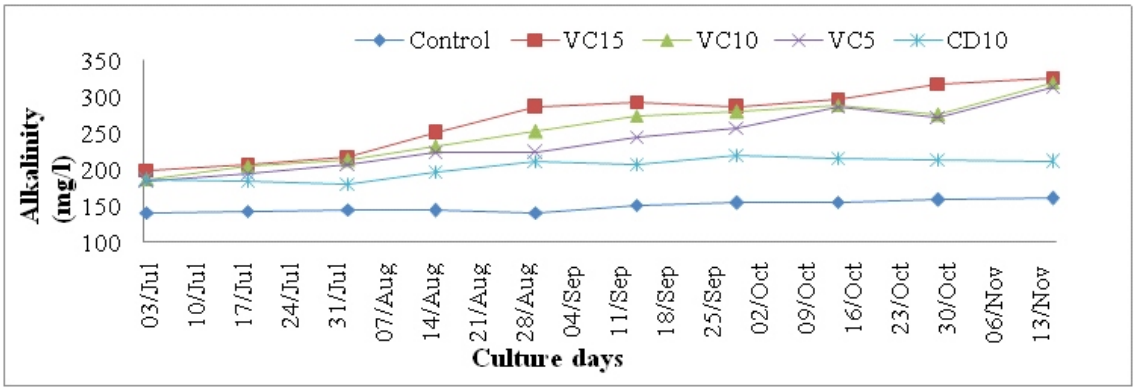

Fig 3 : Measurement of alkalinity (mg/l) under different treatments

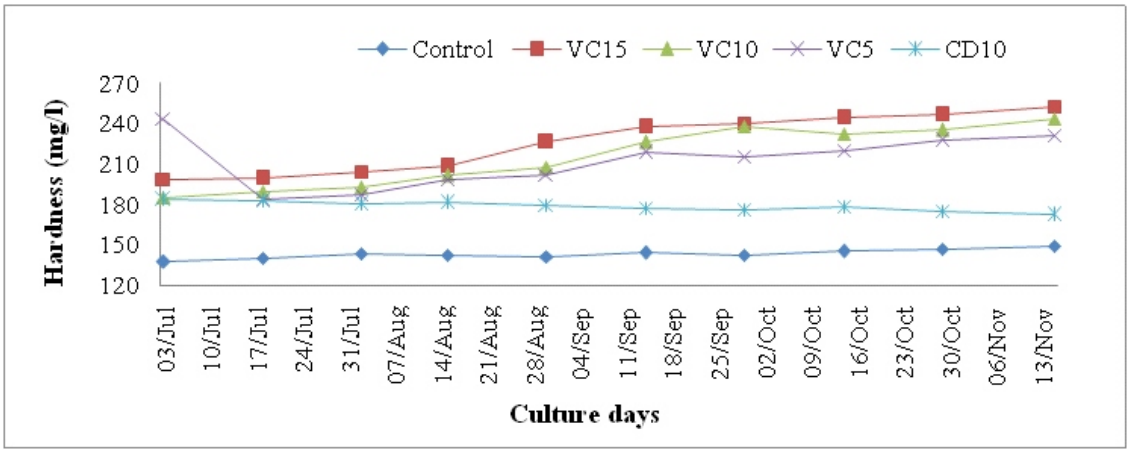

Fig 4 : Measurement of hardness (mg/l) under different treatments

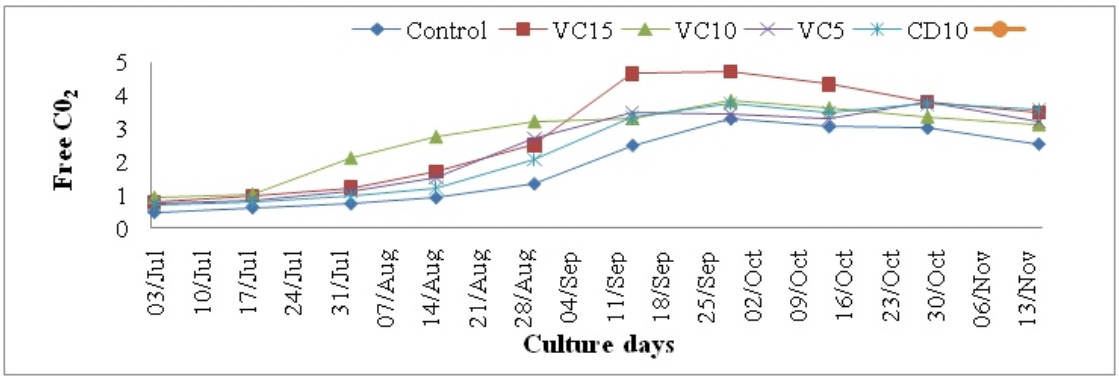

Fig 5 : Measurement of free CO2 (mg/l) under different treatments.

significantly. The maximum value of dissolved oxygen (7.314 ± 0.060 to 7.573 ± 0.047mg/l), phytoplankton (536.000 ± 5.099 to 5210.00 ± 4.45 no/l) and zooplankton (186.000 ± 2.449 to 1782.00 ± 5.83 no/l)was observed under the vermicompost @ 10000kg/ha/yr[Fig.1, Fig.6, Fig.7].While that of pH (7.258 ± 0.54 to 8.251± 0.041mg/l), alkalinity (199.320 ± 0.524 to 326 ± 0.743mg/l), hardness (198.600 ± 0.872 to 252.640 ± 0.172 mg/l) and free CO_2(0.812 ± 0.006 to 4.720 ± 0.037mg/l) were maximum vermicompost @15000kg/ha/yr [Fig. 2, Fig. 3, Fig. 4, Fig. 5]. The values of all these parameters were however, within the recommended range for carp culture.

Planktonic biomass includes the complete biotic components of each pond ecosystem. Planktonic biomass data is shown [Figures 5&6].An increasing trend was observed inthe pond treated with vermicompost @ of 10000 kg/ha/yrwhich was found to be highest (536± 5.09 to 5210± 4.45) as compared to VC_{15} kg/ha/yr,VC_5 kg/ha/yr, CD_{10}kg/ha/yr. While the mean values of number of phytoplankton in control (154.000 ± 2.449 to 670.000 ± 3.162)was found to be lowest among these five treatments. On the other hand similar trend was observed in the zooplankton were the high number of zooplankton was recorded in VC_{10}(186.000 ± 2.449 to 1782.00 ± 5.83) and in the pond of control experiment the mean value range remained in 78.000 ± 3.742 to 124.000 ± 5.099[Fig. 7].Among the various treatments, the maximum body weight and length gain was recorded in VC_{10}(136.3gm, 15.08cm), followed by VC_{15}(122.18gm, 13.32cm) VC_5(110.4gm, 11.32cm)andCD_{10} (102.32gm, 10.22cm).

DISCUSSION

The positive and significant relationship among the phytoplankton and zooplankton productivities under the fertilization that caused the increment in fish yield.[3,4,5,6] Statistical analysis of present study also revealed the difference in monthly variation of planktonic biomass, however, significant difference($P \leq 0.05$) was observed for the treatments.

During the investigation, there is steady increase in the body weight and length of fish in all ponds as proved by results of Hasan[7]who investigated the length-weight relationship of major carps by the application of organic manure at different levels. However growth was much higher in the treated ponds as compared to control. Minimum growth was observed in the control pond (50.64gm, 8.54cm). These results are in accordance with the findings ofBansal[2], who investigated the length and weight relationship of *Cyprinus carpio* by addition of organic manure at different levels. Similar results were obtained by Deolalikar[8] who found that use of vermicompost as manure resulted in an increase in fish growth and gross fish production.

CONCLUSION

In India, the use of livestock waste in various agriculture/pisciculture practice is in vogue and had given encouraging results. Present studies have concluded that vermicompost can be used as an excellent pond fertilizer to enhance the fish yields especially in carp culture. This novel

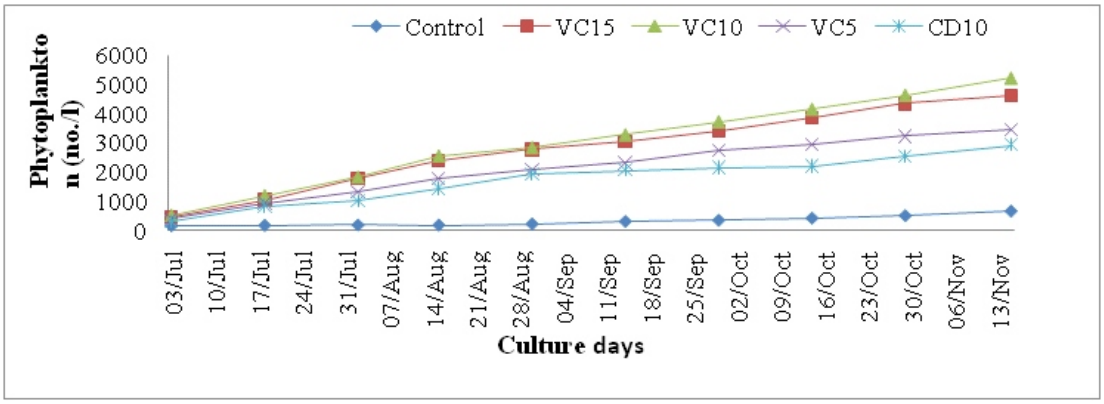

Fig 6 : Density of phytoplankton (no's/l) under different treatments

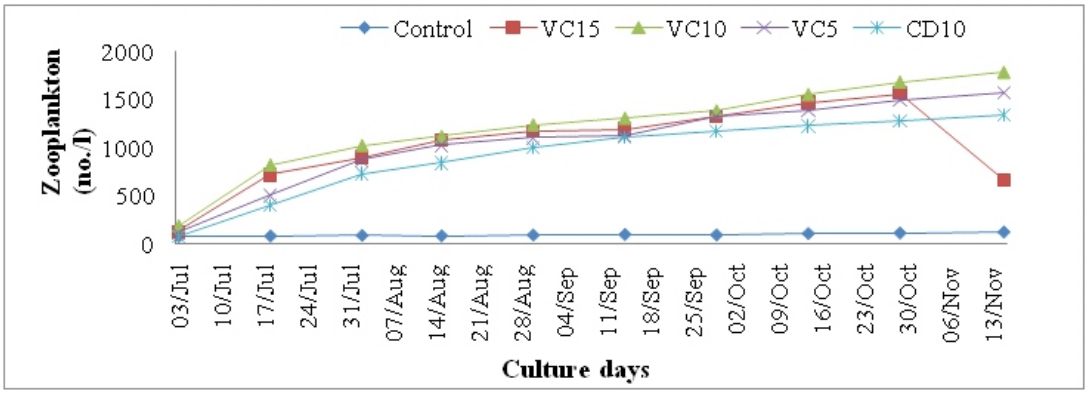

Fig 7 : Density of zooplankton (no's/l) under different treatments

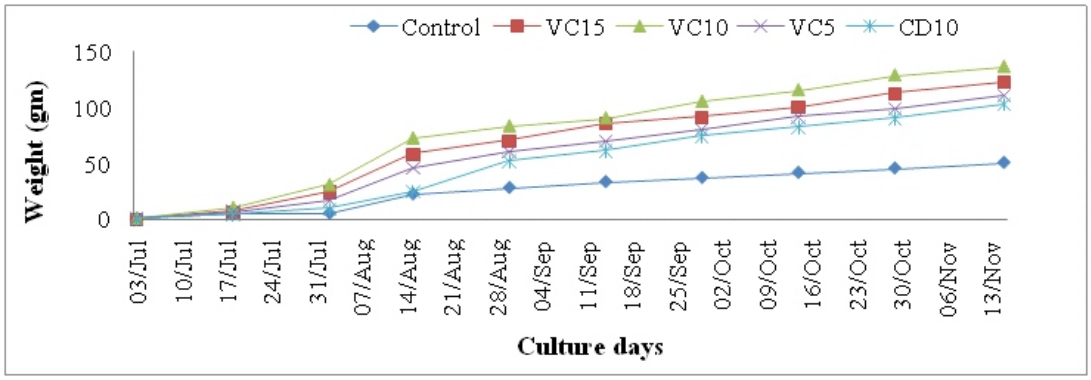

Fig 8 : Measurements of Body weight (gm) of Cirrhinusmrigala under different treatments.

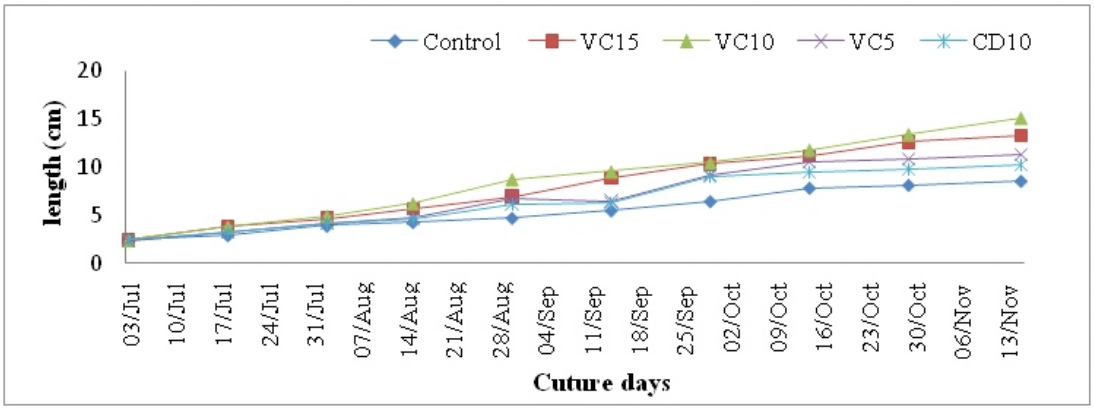

Fig 9 : Measurements of Body length(cm) of Cirrhinusmrigala under different treatments.

Table 2: Growth parameters in different treatments.

Parameters	VC_{15}	VC_{10}	VC_5	CD_{10}	Control
Average initial weight (g)	0.72 ± 0.03	0.82 ± 0.03	0.92 ± 0.03	0.67 ± 0.04	0.85 ± 0.045
Average final weight (g)	122.1 ± 0.03	136.3± 0.04	110.4 ± 0.05	102.32± 0.03	50.64 ± 0.05
Weight gain (g)	121.46	135.54	109.52	101.65	49.79
Growth increment (GI)	0.80	0.90	0.72	0.67	0.33

fertilizer has no side effects, hence, it must be encouraged.

ACKNOWLEDGEMENT

Authors are thankful to Prof. M.S Johal for going critically through the manuscript and suggestions.

REFERENCES

1. Sheikh BA, Sheikh SA.Aquaculture and integrated farming system. Pak. J. Agric. Eng. Vet.Sci. 2004:20:52-58.

2. Bansal N. Effect of vermicompost as pond fertilizer on growth performance of common carp (*Cyprinus carpio* Linn.). Journal of Environmental Science and sustainability. 2010:2 (1):23-30.

3. Mahboob S, Sheri AN. Influence of fertilizers and artificial feed on the seasonal variation in physico-chemical factors in fish ponds. Pakistan J. Zool. 2002:34(1):51-56.

4. Azad MAK, Rahman MR, Rahman Z, Kader MA, Haque MM, Alam MJ. Polyculture of carp, tilapia and pangas using low cost inputs.Pakistan J. Biology Sciences. 2004:7(11):1918-1926.

5. Hassan M, Javed M, Hayat S. Polyculture of major carps under broiler manure fertilization of ponds. Pakistan J. Live.Poul. 1996:2(2): 65-71.

6. Hassan M, Javed M, Mahmood G. Response of different levels of nitrogen from broiler droppings towards planktonic biota of major carps rearing ponds. Pakistan J. Biol. Sci. 2000:3(10):1712-1715.

7. Hassan M, Javed M. Planktonic biomass conversion efficiency of major carps integrated farming systems. Pakistan J. Biol. Sci.1999:2(4):1564-1568.

8. Deolalikar AV, Mitra A. Effect of vermicompost on growth of fish *Labeo rohita*. Journal of Aquaculture in Tropics. 2004:19:6379.