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Effect of Vermicompost on water quality and growth of indigenous carps: A case study

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Abstract
The present experiment was conducted in perennial earthen ponds (ha) for 150 days to assess the effect of vermicompost on water quality and growth performance of indigenous carps. Both organic manures (Vermicompost and semi digested cow dung) were used @ 10,000 kg/ha/yr and control used to monitored their effect on growth performance of *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*. One fourth of doze was applied 15 days prior to fish stocking and rest in equal fortnightly installments. The fingerlings of Catla, Rohu and Mrigal were stocked @ 5000 nos. per hectare in the ratio of 4:3:3. Supplementary feed (mixture of mustard oil cake and rice bran in 1:1 ratio by weight) was given twice daily @ 1% body weight for entire period of experiment. The physico-chemical parameters were found to be within the optimum limits for carp culture in both the experimental ponds. Plankton production in both the experimental pond did not differ significantly. Maximum growth of carps in terms of weight gain, length gain and specific growth rate was maximum in the pond treated with vermicompost @10,000kg/ha/yr.

Keywords: Vermicompost, Cowdung, Carp, Plankton, Water quality

Introduction
Fishes are not only important source of nutrient rich protein for human being but also play an important role in national economy as it provides employment opportunity too in developing countries like India (Prakash, 2021). Fish production can be increased by application of supplementary feeding and by fertilizing the pond. Supplementary feeding plays an important role in intensive and semi-intensive fish culture system. Pond fertilization enhances the biological productivity by increasing the planktons that is the natural fish food. When organic manures decompose, primary nutrients like nitrogen, phosphorous and potassium (N, P, K) are released in water. These nutrients are either directly utilized by the fish or they enrich aquatic ecosystem with autotrophic and heterotrophic microbial communities (Kaur and Ansal, 2010) [6]. Organic manures if not decomposed completely before application in fishery pond may deteriorate the water quality as they utilize oxygen during decomposition. Therefore, to minimize the harmful effect of organic manure, fully decomposed organic manure should be used. Among the decomposed manure, vermincompost is rich in all types of major and minor nutrients, vitamins, enzymes, antibiotics, growth promoters etc. (Mitra, 1997; Bhusan and Yadav, 2003) [10, 2]. In terms of hydrobiology, vermicompost has higher manorial value in comparison to raw cow dung and poultry litter (Sulochana *et al*., 2009) [11]. Even if vermicompost dries up, there is no harm to its microflora hence, it is referred to as potential biological manure or biofertilizer (Meena, 2003) [9]. Moreover, vermicomposting is a farmer friendly technique, where vermicompost can be prepared from variety of locally available organic waste (cow dung, poultry waste, piggery waste, agricultural waste, etc.) by earthworms without much cost, labour and expertise (Kaur and Ansal, 2010) [6]. Thus vermicompost is a very good organic fertilizer and soil conditioner. Keeping in mind, the present study was conducted to study the effect of vermicompost on hydrobiological condition and growth of culturable fishes in comparison to traditionally used manure (cow dung).

Materials and Methods
Experimental Design
An outdoor experiment was carried out using six earthen ponds measuring about 400sq.ft for 150 days. The ponds were cleaned and limed @ 200 kg/ha/yr and filled with tube well water and allowed to stabilize for 15 days. Out of six, two ponds were fertilized with semi-digested cowdung (8-10 days old) @ 10,000 kg/ha/yr, other two were fertilized with vermicompost (prepared from cow dung by the earth worm, *Pheretima posthuma* in the Vermicompost unit of M.L.K. P. G. College, Balrampur, U.P.) @ 10,000 kg/ha/yr and rest two were used as control. One fourth of organic manure (initial doze) was applied 15 days prior to fish stocking and remaining equal splitting doses were given at fortnightly intervals in the experimental ponds. Fingerlings of

equal age group were acclimatized in a cement tank for 10 days prior to the commencement of experiment. During the acclimatization period, the fingerlings were fed on supplementary diet. The 30 fingerlings per ponds of *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* were stocked in the ratio of 4:3:3. All fishes fed with supplementary feed (mixture of mustard oil cake and rice bran in 1:1 ratio by weight) twice daily @ 2% body weight for the entire period of experiment. Fish growth was monitored after regular interval of 15 days in terms of weight and length gain and feed was adjusted according to increase in the fish body weight observed after each fortnightly sampling. A constant water level was maintained in the experimental ponds by adding tubewell water to compensate the water losses due to evaporation and seepage. Water quality parameters were measured at monthly intervals by following the standards methods of APHA (1991) [1].

Estimation of Growth Parameters:

Weight gain was measured in terms of differences between final weight and initial weight.

$$\text{Specific growth rate (\% wt gain/day)} = \frac{\text{In final body weight (g)- In initial body weight (g)}}{\text{Culture period (days)}} \text{X } 100$$

Results and Discussion

Table 1: Physico-chemical and Biological parameters (Average value ±S.E.) of water

Water Quality Parameters	Experimental Ponds		
	Control	Cow dung Treated	Vermicompost Treated
pH	7.24±0.52	7.52±0.44	8.29±0.39
Dissolved Oxygen (mg/L)	6.41±0.68	7.22±0.58	7.5±0.47
Free CO_2 (mg/L)	3.14±0.05	3.87±0.45	4.81±0.28
Alkalinity (mg/L)	178.25±0.53	241.52±0.38	311.12±0.61
Hardness (mg/L)	171.51±0.74	198.25±0.66	241.61±0.28
Soluble Phosphate (mg/L)	0.07±0.02	0.09±0.01	0.14±0.03
Nitrogen (mg/L)	0.19±0.03	0.48±0.04	0.85±0.12
Phytoplankton (No./L)	612.10±4.21	1124.12±3.38	3415.14±1.25
Zooplankton (No./L)	191.12±2.14	597.12±4.12	1812.11±4.98

The water parameters like dissolved oxygen, pH, alkalinity, hardness, free CO_2 and plankton were found in within the optimum range in both the treated ponds. But the maximum average value of pH (8.29±0.39), dissolved oxygen (8.29±0.39 mg/l), alkalinity (241.52±0.38 mg/l), hardness (198.25±0.66 mg/l), soluble phosphate (0.14±0.03 mg/L), nitrogen (0.85±0.12 mg/L), phytoplanktons(3415±1.25 no/l) and zooplanktons (1812.11±4.98 no/l) was observed under the vermicompost treated pond. While that of cowdung the value of pH (7.52±0.44), dissolved oxygen (7.22±0.58 mg/l), alkalinity (311.12±0.61mg/l), hardness (241.61±0.28mg/l), soluble phosphate (0.09±0.01mg/L), nitrogen (0.48±0.04 mg/L), phytoplanktons (1124.12±3.38 no/l) and zooplanktons (597.12±4.12no/l) was observed. In the present study, the range of water parameters and plankton production were increased significantly in the pond treated with vermicompost. Chakrabarty *et al*., (2008 & 2009) [3, 4] also recorded significantly higher plankton production in vermicompost treated ponds as compared to traditionally used organic manures and inorganic fertilizers. The results depicted significant role of vermicompost in maintaining the water quality of fishery pond.

Table 2: Growth Parameters of Indian Major Carps under cowdung and vermicompost treatment

Growth Parameters	Control	Treated with Fertilizers	
		Cowdung	Vermicompost
Catla catla			
Average Initial Weight (g)	1.48±0.05	1.47±0.06	1.49±0.08
Average Final Weight (g)	61.12±0.06	103.14±0.03	141.80±0.04
Weight Gain (g) after 150 days	59.64	101.67	140.31
Specific Growth Rate (% wt gain/day)	39.76	67.78	93.54
Labeo rohita			
Average Initial Weight (g)	1.31±0.04	1.29±0.05	1.33±0.07
Average Final Weight (g)	58.11±0.05	98.12±0.04	135.80±0.03
Weight Gain (g) after 150 days	56.80	96.83	134.47
Specific Growth Rate (% wt gain/day)	37.87	64.55	59.65
Cirrhinus mrigala			
Average Initial Weight (g)	1.42±0.05	1.38±0.03	1.41±0.06
Average Final Weight (g)	57.21±0.11	96.42±0.05	129.78±0.06
Weight Gain (g) after 150 days	55.79	95.04	128.37
Specific Growth Rate (% wt gain/day)	37.19	63.36	85.58

Till now, the information regarding efficacy of vermicompost as manure in fishculture is scanty. In India, livestock waste is the commonly used as organic manure in fishculture. Hence in, the vermicompost prepared from livestock waste like cowdund holds ample scope for develop the economically and ecologically sustainable fish farming in rural areas. It is also helpful for the socio-economic upliftment of rural population in developing countries (Kumar *et al*, 2007). The present investigation reveals steady increase in the body weight of *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* in

experimental pond treated with vermicompost as compared to cowdung treated pond and control pond (Table2). From these results, it seemed that vermicompost @ 10,000 better than the cow dung @ 10,000 for fish growth. Deolalikar and Mitra (2004) [5] also reported that efficacy of vermicompost was much better in comparable to other commercial manures used in aquaculture. Vermicompost has also been reported to result in higher survival and growth of aquatic organisms including fish and prawn (Kumar *et al*., 2007) [7] without adversely affecting the water quality. Chakrabarty *et al*., (2008 & 2009) [3, 4] also recorded significantly higher fish growth (common carp) in vermicompost treated ponds as compared to traditionally used organic manures and inorganic fertilizers. Kaur and Ansal (2010) [6] have suggested that as compared to cowdung, vermicompost can be used more effectively for manuring semi-intensive carp culture ponds without affecting the hydrobiological parameters. Hence, the findings of the present results can be helped in assessing the comparative efficiency of vermicompost with cowdung on growth performance of major carps.

Conclusion

It can concluded that as compared to cowdung, vermicompost release the nutrients easily in water which are in ready to uptake form and initiate the growth of plankton that ultimately enhances the fish growth. The present study suggests that along with the additional manorial value, the expenditure on the feed can also be reduced with use of vermicompost. Thus vermicomposting is the eco-friendly technique; hence it must be encouraged to fertilize the fish ponds at regular intervals.

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References

1. APHA. Standard methods for the examination of water and wastewater, 19th ed. American Public Health Association, Washington DC. 1998; 37:1360-71.
2. Bhusan C, Yadav B. Vermiculture for sustainable agriculture. Indian Farming Digest, 2003, 11-13.
3. Chakrabarty D, Das MK, Das SK. Growth performance of Cyprinus carpio L. in intensively different organic manures. Int. J of Environ. Res. 2008; 2:419-424. 11.
4. Chakrabarty D, Das MK, Das SK. Relative efficiency of vermicompost as direct application manure in pisciculture. Paddy Water Environment. 2009; 7:27-32.
5. Deolalikar AV, Mitra A. Effect of vermicompost on growth of fish Labeo rohita (Hamilton). Journal of Aquaculture in Tropics. 2004; 19:63-79.
6. Kaur VI, Ansal MD. Efficacy of vermicompost as fish pond manure- Effect on water quality and growth of Cyprinus carpio (Linn.). Bioresource Toxicology. 2010; 101:6215-6218.
7. Kumar P, Sagar V, Choudhary AK, Kumar N. Vermiculture. Boon for fish farmers. Fish Chimes. 2007; 27:40-42.
8. Prakash S. Mycoses infection in some fresh water carps of tarai region of Balrampur. International Journal of Scientific Research in Biological Sciences. 2021; 8(1):1-4.
9. Meena A. Vermiculture in relation to organic farming. International Agriculture, 2003, 27-30.
10. Mitra A. Vermiculture and vermicomposting of non-toxic organic solid waste application. In Azariah, J, Azariha, H., Darryi, R.J. (Eds.), Bioetics in India: Proceedings of Bioethics Workshop: Biomanagement of Bioresources Madras, 1997, 16-19.
11. Sulochana MS, Saxena RR, Gaur SR. Fish ponds fertilized with different organic manures – hydrobiological characteristics. Fishing chimes. 2009; 28:36-39.