

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.802.146>

Effect of Different Compost as Pond Manure on the Water Quality and Growth of *Labeo rohita* (ham.)

Kamla Shankar Shukla, C.M. Tripathi and Aditya Kumar Singh*

Krishi Vigyan Kendra, Ganiwan, Chitrakoot, UP, India

*Corresponding author

ABSTRACT

Keywords

Cattle dung, Vermi compost, Pit compost, Water quality, Weight gain

Article Info

Accepted:

10 January 2019

Available Online:

10 February 2019

The present study was conducted at Krishi Vigyan Kendra, Chitrakoot in earthen pond having the area of 0.017 to 0.041 ha for 120 days to study the effect of different organic manure on water quality and growth performance *Labeo rohita*. The compost comprises as vermicompost, Pit compost and raw cattle dung that is compared with control having no manure application. All the compost was used at fixed dose @ 5000 Kg/ ha in 24 split doses at 15 days interval and 5000 kg/ha compost applied at 15 days prior to stocking of fish seed for pond preparation. No feed was given to fishes as supplementary feed during the study period. The physio – chemical parameters were studied at monthly basis. The parameter increased significantly in the pond over control. The maximum weight gain of rohu was obtained in vermicompost treated pond that is 90.15 gm with highest survival of fishes (83.4%), 44.2 gm in raw cattle dung treated pond with 68.97% survival and 63.13 survival with 34.35 gm individual weight in pit compost treated pond.

Introduction

Aquaculture is the fastest growing food production sector in the world with annual growth in excess of 10 percent over the last two decades. Much of this development has occurred in Asia, which also has the greatest variety of cultured species and systems.

Organic fertilizers are used to enhance the productivity of inland aquatic resources. These fertilizers directly influence the water quality parameters which is liable to form the aquatic environment. Vermi compost is a new and valuable introduction to the list of organic fertilizers used in aquaculture production. A sustainable technology is required to get

higher production from existing agricultural resources. For long sustainability of the production potential there is a need to utilize all available resources and production system within each and every system. Utilization of byproduct of one farming system to another farming system is a need of today. Not only for sustainable farming but also to keep environment clean in which we are habituating. If we are unable to use these by products, that putrefy our local environment with bad odor, pollute air with the production of noxious gases. The byproduct of farming system when accumulated in open air it produces several hazards to the human beings like, Malaria, Asthmas, dengue and polluted drinking water. Disposal of Agri by products

through proper manner without burning and recycled them to earn more benefit without polluting the environment.

Cost minimization and effective management of farm waste through different farming system helps to increase farmer's income and profitability. Increasing cost of highly proteinaceous fish production inputs like-feed, manures and fertilizers creating an interest of farming community for utilization of animal waste in aquaculture. So many aquaculture production systems are in practice like- Intensive, Semi intensive and traditional system using different level of input use. These Manures are either directly used by fishes or through production of Phyto and Zoo plank tonic communities. The vast availability of crop, live stock, poultry and pigs waste products may play a vital role in improving the livelihood of rural community with minimizing the pollution and maximizing the production. The live stock waste including animal manure, poultry by products and agriculture Waste contains variety of plants rich in protein, lipid, carbohydrates and many trace minerals and vitamins which play crucial role in production enhancement in aquaculture system. It is also necessary to manage water quality of ponds loaded with Organic manure. The nutrient and over loading of manure produces much stress to aquatic life when the water quality get putrefied. Tolerance in relation to the fishes possess through a limit of water quality. The water quality parameter when disturbed then it causes aquatic life and even they lose their equilibrium and ultimately they die. So, we must be conscious about their alteration and keep eye to manage regularly.

Main objective of the study is to assess the effect of Organic manure on the growth of *Labeo rohita* and water quality parameters of fish pond

To study the Growth performance of *Labeo rohita* in different organic manure loaded pond.

To study the suitability of water quality of pond loaded with organic manure for fish farming

To study the judicious recycling of organic wastes for the production of high quality protein at low cost.

To analyze the water quality of aquaculture pond receives organic manures.

Materials and Methods

The fish farming unit of Krishi Vigyan Kendra, Chitrakoot, was selected for the study of the Effect of different compost as pond manure on the water quality and growth of *Labeo rohita* (ham.). The site is located at 132.98 km above mean sea level of 80° 40' and 81° 84' longitude and 24° 52' and 25° 25'.latitude. The selected ponds are situated at a single place and embankment is connected to each other. The experiment was carried out pond measuring 133 Square meters to 326 square meter area for 125 days. The 4 ponds were selected for the experiment and divided as Controlled (P-1), Vermi compost (P-2), pit compost (P-3), Raw dung (P-4). The pond was dewatered and sanitized with 200kg/ha lime powder. After 4 days interval it was filled with tube well water up to the 1.25 meter height. The pond was get prepared with selected manure at 5000 kg/ha and rest 5000kg/ha was applied after stocking at 15 days interval in 24 split doses. The pond was stocked with Indian major carp *Labeo rohita* fingerling @ 8000/ha. The average weight of fish seed was 3.00 gram/individual. The area of pond is not same for all treatment it was distributed as P-1 (326 Sqm), P-2 (217 Sqm), P-3 (133 Sqm), P-4 (177 Sqm). No supplementary feed was given to the fishes

stocked in the pond they are depending upon natural feeds. The growth and physico-chemical parameter was analyzed at monthly interval. Fish growth was measured by body length and weight gain monthly interval.

Weight gain= Body wt at the time of sampling – Initial body weight

Growth increment = Total weight gain/culture period

Sample collection method

The water sample was collected from all the study ponds from 50 cm depth at 1: 00 pm. The analysis of the water quality and growth parameters completed in between 25th Sept. to 25th Jan, 2018. The water quality parameters analyzed by standard methods in Laboratory and sample for D.O. was fixed at pond site to be taken for analysis. The water sample collected from the pond was stored in polythene containers of 5 liter capacity. pH and TDS estimation completed immediately after collection of sample. The Temperature and Transparency recorded in situ by Thermometer and Sacchi disc.

Methods of analysis

Parameter	Method
pH	As per standard methods of examination of water and waste water
Transparency	
Electrical conductivity	
Disolved Oxygen	
Hardness	
Total Alkalinity	
Growth	Average weight

Results and Discussion

Physico-chemical and biological factor of pond water play a significant role in the biology, physiology and growth of the aquatic ecosystem. So, an aquatic ecosystem, changes

in water characteristics that improve or reduce the water quality would respectively enhance or reduce the production of an aquatic crop (Diana and Lin. 1998). In the present study the water quality parameters of manure receiving pond remained within the favorable range required for Fish farming. Water temperature has prominent effect on growth rate, feed consumption and other metabolic functions of the organisms. Osborne and Riddle (1999) observed that fish growth parameters in terms of weight gain, feeding rate and feeding efficiency of grass carp showed an increasing trend with the increase in water temperature. As the sun shines over the surface of water, it starts absorbing heat and water becomes warm; the latter condition directly influences the physiological and metabolic activities of fish i.e., swimming, breathing, growth and reproduction (Jhingaran, 1982). This study water temperature ranges in between 15-28 °C

All the metabolic and physiological activities and life processes of aquatic organism are greatly influenced by water temperature. The water temperature of the pond ranges between 15°C - 28°C that was in the suitable range except minimum temperature. The Indian major carps thrive well in the temperature range of 18.3°C -37.8°C (Jhingaran, 1991).

Transparency of the study P-1 pond was ranging between 19.5-75 cm. Whereas light penetration of P-2, P-3, P-4 pond was in between 42.58 to 58.65, 38-70 and 36.5-90.1 Cm respectively this is congenial in range. The transparency of treatment pond is higher because low plank tonic organisms. In integrated fish farming organic pollutants released into the pond would minimize the light penetration and D.O. (Salt *et al.*, 1995). The use of organic manure in fish farming is based on the assumption that the manure is utilized through two pathways. The manure organic matter provides dissolved and

particulate substrates for bacteria and the bacterial laden particles provide food to the filter-feeding and detritus-consuming animals, while the mineralized fraction of the manure stimulates phytoplankton productivity similar to the action of inorganic fertilizers. The manure organic matter coated with bacteria is considered a link in the food web and should be treated as a food (Hepher and Pruginin, 1981).

In intensively manured fish ponds, both autotrophic and heterotrophic production contribute to fish growth (Schroeder, 1978, 1980), Fish health and production are associated with the pond environment. The temperature, pH, dissolved oxygen and free ammonia may have a direct adverse effect on fish condition and growth, determining the upper limit of the nutrient load into the fish ponds.

The pH of all pond ranges between 7.7 to 8.6. Minimum pH was observed in control pond and maximum pH was recorded in raw cattle dung treated pond. The pH is favorable in range. Each aquatic organism has its maximum and minimum toleration range of pH. The pH of most natural waters ranges between 5 and 10 (Boyd, 1990).

Bhatnagar and Devi (2013) enlisted the acceptable ranges of water quality parameters according to these researchers, the favorable ranges of different water parameters are: 3-5 mg L⁻¹ Dissolved Oxygen (DO), 7-9.5 pH, 50-200 mg L⁻¹ alkalinity, 75-150 mg L⁻¹ hardness, 15-35°C temperature, 30-80 cm turbidity.

The dissolved oxygen of control pond is minimum i.e. 2.83, it is probably due to low phyto planktonic population. The D.O. of the all treated pond was in the favorable range for survival to the fishes. The mean D.O. of treated pond ranges between 8.56-8.695mg/l.

The total hardness of control pond was ranges between 144 to 187mg/l with mean value to 167.7 mg/l. whereas in experimental pond it was ranges between 126-172.67 mg/l. In the vermicompost treated pond hardness was recorded higher than all ponds.

The Total alkalinity of all the pond ranges in between 304 to 584mg/l. The highest value observed in control pond with mean value of 485.2 and minimum was recorded in raw cattle dung treated pond. The higher alkalinity is probable due to natural and rock characteristics of the soil. Kaur and Ansal (2010) also reported significantly higher alkalinity in the water treated with vermicompost as compared to other organic manure (cow dung). Natural water bodies in tropical areas exhibit a wide range of fluctuation in total alkalinity which depends on the population of primary and secondary producers, seasons, location and nature of bottom soil Mandal (1976). However, for a higher production of planktons, alkalinity must be in the favorable range.

The alkalinity was not in range for proper growth of fishes. The electrical conductivity is ranging in between 0.818 and 0.726 which is congenial in range.

Organic manuring is widely practiced in carp production systems to ensure sustained supply of essential nutrient for augmenting natural pond productivity to obtain increased fish production at cheaper rates (Edwards, 1980). The growth of *Labeo rohita* in control pond was 22.25gram in 123 day culture period with the daily weight gain of 0.182 gram. The highest weight of 90.15 gram was observed in vermicompost (P-2) treated pond with an average increase of 0.733 gram/day. Whereas raw cattle dung treated pond gives 44.20 gram average weight of fish which is higher than pit compost treated pond without inorganic fertilizers and supplementary feed.

Table.1 Details of trials

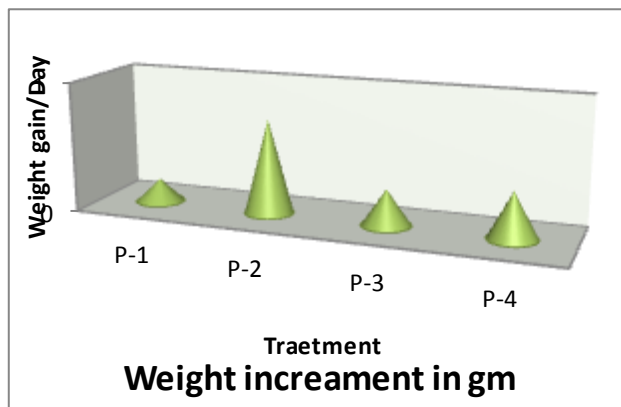
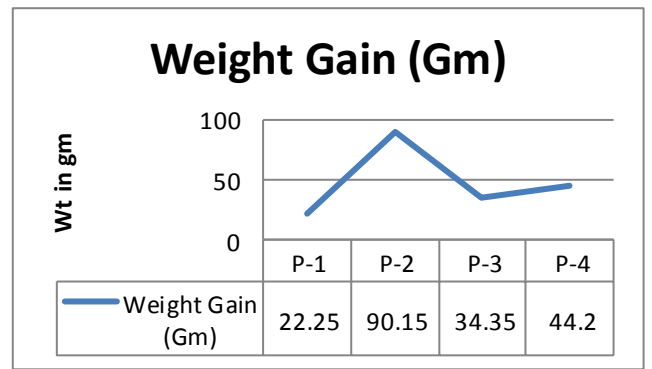
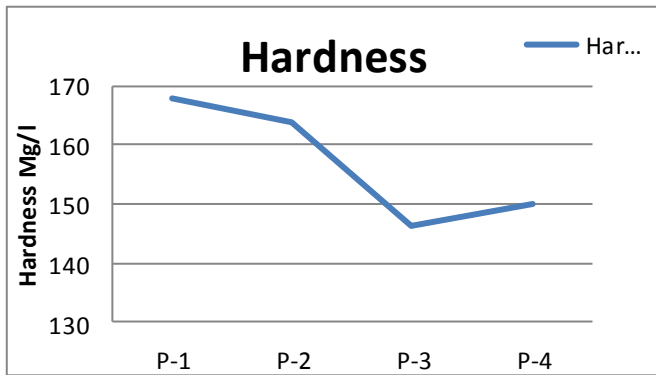
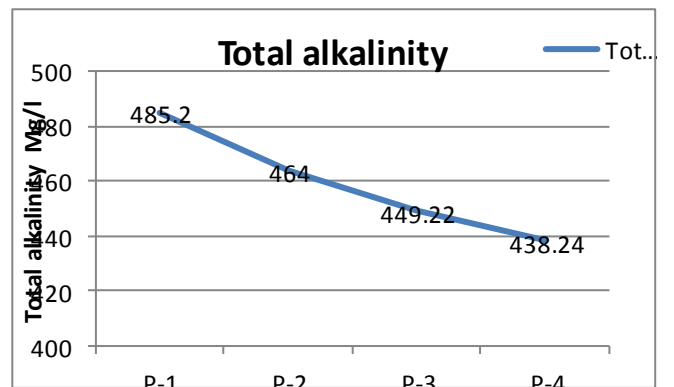
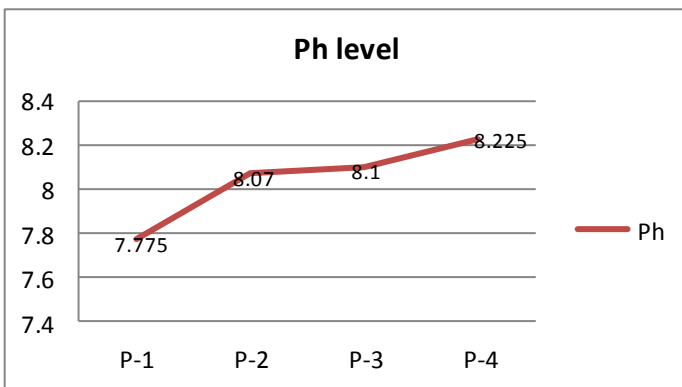
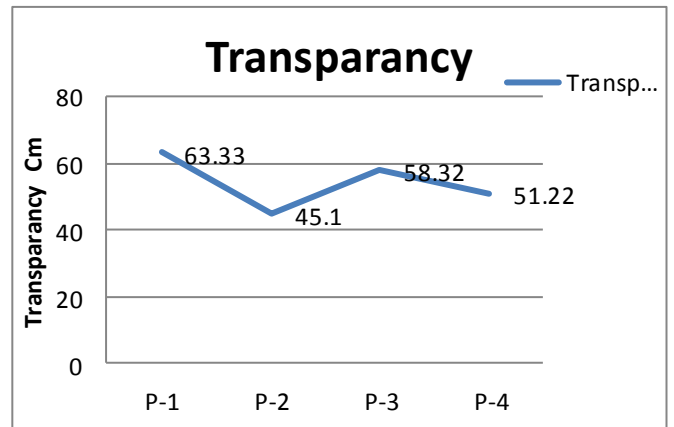
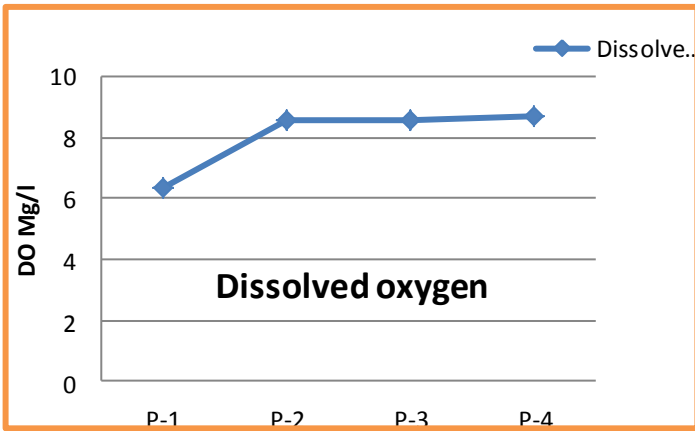
Details of pond	Treatment
P-1	Control (Without manure)
P-2	Vermi compost (5000 kg/ha)
P-3	Pit compost(5000 kg/ha)
P-4	Raw cattle dung (5000 kg/ha)

Table.2 Physico chemical parameter of study pond

Trial	Water temp °C	Transparency (Cm)	Dissolved oxygen (Mg/l)	Hardness Mg/l	Total alkalinity (Mg/l)	Ph	Electrical conductivity ds/cm
P-1	17-27 (21.75)	19.5-75 63.33	2.83-10.32 (6.325)	144-187 (167.7)	304-584 (485.2)	7.5-8.3 (7.775)	0.782-0.852 (0.818)
P-2	16.25-28 (21.56)	42-58.65 45.1	4.08-15.18 (8.56)	148-188.68 (163.885)	344-566 (464)	7.8-8.4 (8.07)	0.705-0.859 (0.760)
P-3	15-26.5 (20.88)	38-70 58.32	4.06-12.8 (8.575)	126-169.93 (146.19)	312-532 (449.22)	7.7-8.5 (8.1)	0.687-0.800 (0.730)
P-4	16-27 (21.25)	36.5-60.1 51.22	5.64-12.15 (8.695)	138-172.67 (149.94)	336-527 (438.24)	7.7-8.6 (8.225)	0.661-0.849 (0.726)

Table.3 Growth parameter of study pond

Trial	Initial wt of fish(gm)	Final wt of fish (Gm)	Growth increment (gm) 123 days culture period
P-1	3.0	22.25	0.182
P-2	3.0	90.15	0.733
P-3	3.0	34.35	0.279
P-4	3.0	44.20	0.359



Since long times, animal manures are exploited in fish ponds as a source of soluble phosphorus, nitrogen and carbon to maximize the algal growth and natural food production (Njoku, 1997). Animal manure is often used in semi-intensive systems to improve the primary production of the ponds and fish growth (Nwachukwu, 1997). Manure input and fish yield are directly related with each other (Diana and Lin, 1998; Ansa and Jiya, 2002). *Cirrhinus cirrhosus* and *Cyprinus carpio* showed maximum growth in manured ponds than control ponds (Dhawan and Kaur, 2002a; 2002b). Cow dung is found to be an effective source of organic fertilization, which positively influences the growth performance of major carps in respect of fish production (Kanwal *et al.*, 2003). High doses of cow dung and poultry manuring found to reduce the value of dissolved oxygen (DO), while optimum dose i-e 0.26 kgm⁻³ maintain the better water quality and abundance of planktonic biomass, which improves the growth of carps species (Jha *et al.*, 2004). Ponds manured with cattle dung show higher production by encouraging plankton metabolism (Terziyski *et al.*, 2007). Organic manuring proves to benefit the farmer economically as it serves to reduce 50 % cost of inorganic fertilizer and supplementary feed (Yadava and Garg, 1992).

Summery and conclusion of the study are as follows:

Water quality includes all physical, chemical and biological factors that influence the beneficial use of water. There are many water quality variables in pond fish culture. All other things being equal, a pond with good water quality will produce more and healthier fish than a pond with poor quality. Water quality within an aquaculture pond is continuously changing depending on certain conditions.

The aquaculture pond integrated with pig waste was analyzed in the present study. Study shows that the all physico – chemical properties of pond water were, with in the favorable range. The prime objectives of the study were to measure transparency, Total dissolved solids, ambient temperature, water temperature, and Hydrogen ion concentration. The present study revealed that if the aquaculture pond integrated with washings and left over of 50-55 pigs/ha. Could not disturbed the water quality and it is more economic, ecologically balanced and sustainable system of recycling of organic waste. The farmers of Bundelkhand region should adopt integrated pig-fish farming system to utilize available by products and earn more profit from limited man power and land. It is also suggested that the integrated pond should be under close monitoring. To maintain and manage water quality lime and disinfectants should be applied and replace at list 25% of water monthly to keep environmental parameter congenial to aquatic animals.

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How to cite this article:

Kamla Shankar Shukla, C.M. Tripathi and Aditya Kumar Singh. 2019. Effect of Different Compost as Pond Manure on the Water Quality and Growth of *Labeo rohita* (ham.). *Int.J.Curr.Microbiol.App.Sci*. 8(02): 1251-1258. doi: <https://doi.org/10.20546/ijcmas.2019.802.146>