RESEARCH PAPER:

Role of an environment friendly organic manure : vermicompost in aquaculture

SULOCHANA AND S.R. GAUR

Asian Journal of Environmental Science (December, 2009 to May, 2010) Vol. 4 No. 2 : 136-138

See end of the article for authors' affiliations

Correspondence to :
SULOCHANA
Indira Gandhi Agricultural University, RAIPUR (C.G.) INDIA

SUMMARY

An experiment was conducted to see the effect of a promising compost *i.e.* vermicompost of agriculture and horticulture in fish culture *i.e.* aquaculture. In this experiment, the growth and survival of fry of *Labeo rohita* in comparison to other organic manures was determined which showed maximum survival of fry (78.4%) and highest production (4549.56 kg/ha) in ponds treated with vermicompost. Water quality parameters were also studied to see the impact of different organic manures on pond water.

Key words : Vermicompost, Survival of fry, *Labeo rohita*, Sustainable aquaculture

Accepted : *August, 2009*

Use of vermicompost had given very good results in agriculture and horticulture and thus, this experiment was conducted to see the impact of vermicompost on growth and survival of fry of *Labeo rohita* which is a very delicate stage of the fish where the percentage of mortality of fish seeds is very large.

Here the effect of different organic manures *i.e.* raw cow dung, poultry manure and vermicompost on water quality parameters was also studied to understand the physico- chemical changes occurring in the pond water and how it effects the survival of fry.

MATERIALS AND METHODS

This experiment was conducted in the fish seed farm of College of Agriculture, IGKV, Raipur (C.G.) to rear fry of *Labeo rohita* to fingerlings for 100 days. Three ponds were prepared for this experiment where pond 1was treated with raw cow dung (T1), pond 2 was treated with vermicompost (T2) and pond 3 was treated with poultry manure (T3). Basal dose was applied one week prior to the stocking of fry, and then weekly manuring was done to maintain the natural productivity of ponds. Ponds were stocked with early fry of *Labeo rohita* @ 1 lakh fry/ha and fed with supplementary diet of mustard oil cake and rice bran in 1:1 ratio @ 6% body weight/day in 2 installments. Physico-chemical characteristics of water was checked every week by following standard methods of APHA, 1989. At every 10^{th} day, growth of fry was checked and recorded by determining length and weight of fry of each species. Survival of fry was determined at the end of the experiment when fingerlings were harvested. Growth of fry was determined by the following formulae given below:

$$\text{Average daily weight gain (ADG)} = \frac{\text{Net weight gain (mg)}}{\text{Duration of experiment}} \times 100$$

$$\text{Specific growth rate (SGR)} = \frac{\log_e \text{final weight} - \log_e \text{initial weight}}{\text{Experimental days}} \times 100$$

$$\text{Survival \%} = \frac{\text{Total number of surviving fish}}{\text{Total number of fish stocked}} \times 100$$

RESULTS AND DISCUSSION

The average initial weight of fry at the time of stocking was 0.16 g. Average daily weight gain (ADG) and specific growth rate (SGR) were recorded to be highest in poultry manure treatment followed by vermicompost treatment and lowest was observed in raw cow dung treatment (Table 1). Dhawan and Singh (2000) reported highest ADG (1.05g/day) in poultry manure followed by (0.98g/day) in poultry droppings and lowest (0.43g/day) in cowdung. Singh and Sharma (1999) also reported highest ADG (1.44g/day) in poultry excreta and lowest (0.47g/day) in cowdung treatment. Dhawan and Singh (2000) also reported highest in poultry manure 2.81(% day^{-1}) followed by poultry dropping 2.72(% day^{-1}) and lowest in cowdung 2.14(% day^{-1}) by *Cyprinus carpio* and 2.81(% day^{-1}) in poultry dropping, followed by 2.52 (% day^{-1}) in poultry manure and 2.19(% day^{-1}) in cowdung treatment by *Cirrhinus mrigala*. Singh and Sharma (1999) found highest SGR, 3.06(% day^{-1}) in poultry excreta treatment, followed by 2.85(% day^{-1}) in pig dung treatment

Table 1 : Growth performance of fry

	Raw cow dung	Vermicompost	Poultry manure
ADG mg day^{-1}	123.4± 0.1	297.5± 0.2	309 ± 0.4
SGR % day $^{-1}$	4.35 ± 0.12	5.23 ± 0.11	5.30 ± 0.21
Survival (%)	42.8	78.4	65
Yield (kg/ha)	1462.15	4549.56	3390.35

and 2.85(% day^{-1}) and 2.06(% day^{-1}) in ponds treated with cowdung treatment. All these findings support the present results.

It is also evident from Table 1 that the maximum survival of fry was observed in vermicompost (78.4%) which was sufficiently higher in comparison to poultry manure (65%) and cow dung (42.8%). Best survival by vermicompost may be due to least H_2S, free CO_2 and ammonical nitrogen released on decomposition and good amount of plankton production, DO level and suitable pH range whereas *vice-versa* is true for cowdung. Survival in poultry manure may be affected due to release of high amount of H_2S and ammonical nitrogen but good production of phytoplankton supplemented good DO in pond, and thus was able to balance the situation resulting into good survival. Singh and Sharma (1999) also obtained better survival in the ponds treated with poultry manure

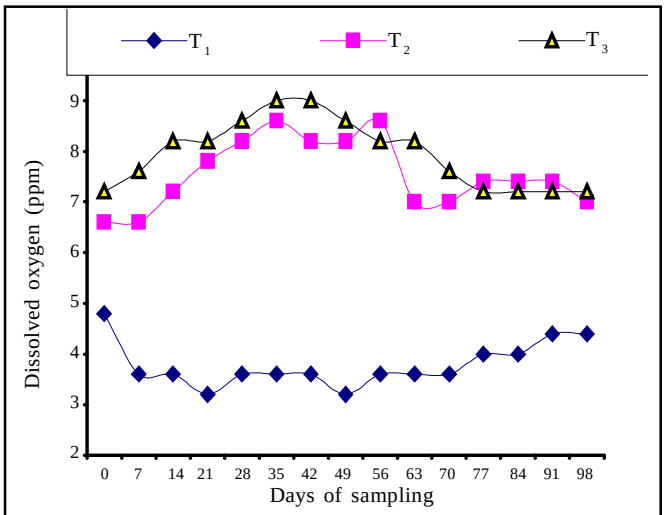

Fig. a : Dissolved oxygen level

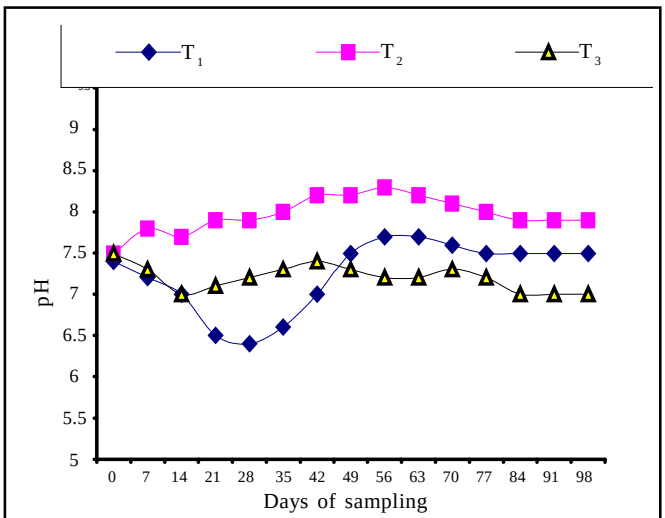

Fig. b : pH

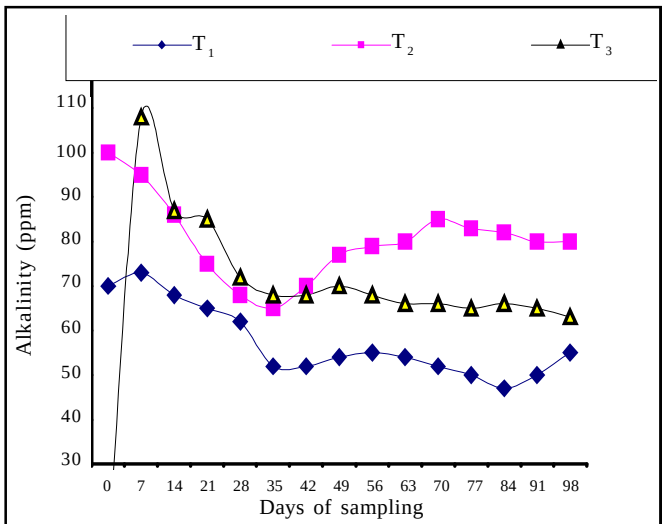

Fig. c : Alkalinity

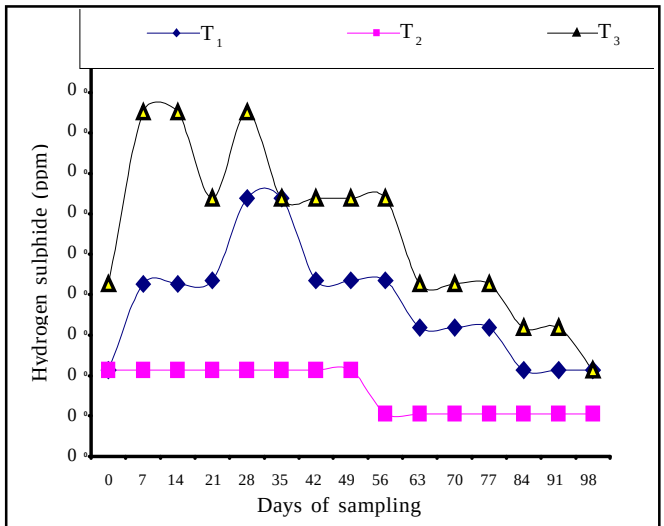

Fig. d : Hydrogen sulphide level

Fig. 1 : Status of physico-chemical characterstics during the whole experiment period

and pig dung *i.e.* 90% than cowdung which resulted into 80% survival of *Labeo rohita* fingerlings of average weight 7.0 g (8.0-8.5 cm) stocked @ 6,000 fl/ha. Dutta and Goswami (1988) stocked fingerlings of 65-110 mm in cow shed manure and pig shed manure and no manure (control) only liming @ 8,000 fl/ha. Results showed 78% survival in control and pig manured ponds whereas 60% survival of fingerlings in cow manured ponds. Fang *et al.* (1986) stocked fingerlings of silver carp, big head carp, common carp and *Carassius cuvieri* survived better in chicken manured ponds whereas *Carassius cuvieri* survival was found more in pig manured ponds.

Better growth and maximum survival contributed to highest yield 4549.56 kg ha^{-1} by vermicompost followed by poultry manure with 3390.35kg ha^{-1} . Poor yield was obtained in cowdung *i.e.* 1462.15 kg ha^{-1}. Sharma *et al.* (1988) reported higher production using organic fertilizers with supplementary diet. Singh and Sharma (1999) reported higher fish production of rohu (2663.50 kg/ha) in ponds manured with poultry excreta and pig dung (2219 kg/ha) than cowdung (798 kg/ha). Pekar and Olah (1998) also got highest production in ponds receiving poultry droppings. Dhawan and Singh (2000) also obtained higher fish production (1360.65 kg/ha) in poultry manure and (1360.35 kg/ha) poultry dropping than cowdung (820 kg/ha).

The study on hydrobiology of ponds treated with different organic manures showed that it did not produce large amount of toxic and noxicious gases which are harmful for fish growth and survival, like H_2S, NH_3 and excessive amount of free CO_2 thus, it is most efficient organic manure for fish culture Fig. 1 (a, b, c and d). In spite of some side effects, poultry manure is better than cowdung being richest source of nutrients thus it can also be used efficiently for manuring ponds.

Conclusion:

Growth performance, survival % and yield of the fingerlings reared in different manuring treatments suggest that performance of vermicompost is better in relation to aquaculture followed by poultry manure. Hydrobiology of ponds treated with different organic manures concludes that vermicompost being partially decomposed form is a good source of nutrients, which are readily soluble in water and so easily available to microflora thus, it does not produce large amount of toxic and noxicious gases which are harmful for fish growth and survival like H_2S, NH_3 and excessive amount of free CO_2 thus, it is most efficient organic manure for fish culture. In spite of some side effects poultry manure is better than cowdung being richest source of nutrients thus it can also be used efficiently for manuring ponds.

Authors' affiliations

S.R. GAUR, Indira Gandhi Agricultural University, RAIPUR (C.G.) INDIA

REFERENCES

APHA (1989). *Standard methods for the examination of water and waste water* 17th Ed. American water works association, American Public Health Assoc., Washington, D.C., 1452pp.

Dhawan, A. and Singh, R. (2000). Relative efficiency of different organic manures in relation to water quality, pond productivity and fish growth. *Aquaculture for 2000 A.D:* pp. 317-321.

Dutta, O.K. and Goswami, P.K. (1988). Investigations on cow and pig manure recycling in fish ponds. *Inland Fish. Soc. India*, **20** (1) : 37-41.

Fang, Y.X., Guo, X.Z., Wang, J.K., Fang, X.Z. and Liu, Z.Y. (1986). Effects of different animal manures on fish farming. *The First Asian Fisheries Forum*, p, 117-120.

Pekar, F. and Olah, J.C. (1998). Fish pond manuring studies in Hungary. *Integrated Fish Farming*, 163 -177.

Sharma, B.K., Das, M.K. and Das, S.R. (1988). *Environ. Ecol.*, **6** (1): 159-168

Singh, V.K. and Sharma, A.P. (1999). Comparative effect of three organic manures viz. cowdung, pig dung and poultry excreta on the growth of *Labeo rohita. J. Inland Fishery Society, India*, **31**(1):1-5.