



Journal of
**Fisheries and
Aquatic Science**

ISSN 1816-4927



Academic
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Performance Evaluation of Different Animal Wastes on Culture of *Daphnia* sp.

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ABSTRACT

Cow dung, goat dung and poultry waste are easily available animal waste. This necessitates increasing need for valorizing organic waste such as agro-industrial residues and animal manures. To identify most productive animal waste for production of zooplankton, i.e., *Daphnia* present investigation entitled Performance evaluation of different animal waste on culture of *Daphnia* sp. was carried out. Inoculate 4-5 *Daphnia* in each tub. T₀ was kept as controlled treatment which contained only bore well water. All animal wastes were analyzed at the beginning of the experiment and it was observed that groundnut oilcake had highest nitrogen (5.02%), phosphorous (0.45%) and potassium (0.85%). Among animal waste goat dung had highest amount of nitrogen (2.10%) whereas poultry waste had highest amount of phosphorous (0.40%) as well as highest amount of potassium (0.43%). It was observed that nitrogen content was highest in poultry waste (7%). Among the animal waste the highest mean production of *Daphnia* was found in T₃, i.e., which had 50 g of chicken dropping (79.00 individual mL⁻¹) and lowest in T₈ i.e., which had 25 g of Goat dung (23.33 individual mL⁻¹). Among different doses of poultry waste (chicken dropping) T₃ having 50 g of animal waste (79.00 individual mL⁻¹) yield highest number of *Daphnia* whereas lowest was recorded in T₂ with 25 g of chicken dropping (49.00 individual mL⁻¹). Among different doses of Goat dung, Treatment T₉ having 50 g of goat dung yield highest production (44.00 individual mL⁻¹) whereas, lowest was recorded in T₈ (23.33 individual mL⁻¹).

Key words: Animal waste, zooplankton, *Daphnia* sp., organic manure

INTRODUCTION

Beside high technology and availability of different resources shortage of Indian major carp seed had been identified by various agencies as one of most important limiting factor for development of fish culture in India. An increase in production of hatchling will not solve the problem rather improving the survival in the present hatchlings will increase the seed quantity. Lack of proper food item mainly zooplankton causes poor survival of spawn in nursery ponds.

Zooplanktons have been used as live food for fry and larvae of finfish and shellfish (Watanabe *et al.*, 1983). Zooplanktons are classified as rotifers, cladocerans (water fleas) or copepods. Cladocerans are desirable fish prey since they are prolific breeders as they produce about 400-600 young ones per adult in their life span of approximately 50 days as compared to copepods which produces about 250-300 young ones at 20°C. Intensive manuring of pond stimulates natural food webs thereby generating considerable quantities of phytoplankton, zooplankton and benthic

organisms (Wohlfarth and Hulata 1987). Zooplankton production on the waste was possible by passing the primary level of production. Manures supply N and P for utilization by algae and provide a substrate for zooplankton production (Wohlfarth and Schroeder, 1979; Colman and Edwards, 1987; Mims *et al.*, 1995). The stable tea rearing system is a culture medium made up of a mixture of soil, manure and water. The manure acts as a fertilizer to promote algal blooms on which the *Daphnids* feed. *Daphnia* was successfully cultured using animal waste like horse manure, poultry manure or cow dung (FAO, 1996). Cow dung and cattle urine both seems to be good for plankton production (Sabir Ali *et al.*, 2007). Organic manures usually comprise low carbon/nitrogen ratio and have fine particle sizes to allow rapid decomposition (Geiger and Turner, 1990). Cow dung, goat dung and poultry waste are easily available animal waste. A duck excreta is a good source of nutrients, which is readily soluble in water and available for plankton production (Sasmal *et al.*, 2008). Better growth rate and maximum survival contributed to highest yield by Vermicompost followed by poultry manure (Sulochana Gaur and Chari, 2007a). *Daphnia* which is important member of suborder cladocera was frequently used food source in the freshwater nurseries (i.e., for different carp). *Daphnia* contains a broad spectrum of digestive enzymes such as proteinases peptidases, amylases, lipases and even cellulose that can serve as exo-enzymes in the gut of the fish larvae (FAO, 1996). Therefore there was a need for large quantities of live food organism in aquaculture. *Daphnia* can be successfully grown on micronised rice bran; an agro-industrial residue with little commercial value (De Pauw *et al.*, 1981). This necessitates increasing need for valorizing organic waste such as agro-industrial residues and animal manures. The consistent availability of sufficient quantities of food organism is of utmost importance in continuous hatchery production. Poultry manure is found to release soluble salts continuously thus resulting in high production of plankton especially zooplankton (Sulochana Gaur and Gaur, 2007b). In this respect the collection and feeding of wild plankton had proven unreliable and not always practical. To identify most productive animal waste for production of derived zooplankton, i.e., *Daphnia* present investigation was conducted.

MATERIALS AND METHODS

Experiment started with preparation of nutrient medium which was prepared by adding animal waste, groundnut oil cake and single super phosphate into tub. Each tub was filled with five litres of water. No animal waste and inorganic material was used in T₀. Only five litres of clean water (Bore well water) was filled into it. Similarly T₁ was kept without any animal waste and it was having only groundnut oilcake and single superphosphate filled with five litres of clean water.

All other treatments were added with equal quantity of single super phosphate and groundnut oil cake. Similarly, Treatments (T₂-T₁₀) contained same animal waste having different quantities, i.e., 25, 50 and 75 g (Table 1). Beakers yeast was used as feed for *Daphnia* at 200 ppm in all treatments.

In case of all treatments where animal manures were introduced, vigorous aeration was done to allow escape of obnoxious gases. After three days of aeration inoculation of *Daphnia* was done. Inoculate 4-5 *Daphnia* in each tub. From the day of inoculation exchange of 10% of water was done everyday.

Organic and inorganic manuring was not done after inoculation of *Daphnia*. Physico-chemical characteristics of the experimental water were analyzed daily. Plankton population was estimated on daily basis.

Table 1: Composition of treatments

Treatment	Combination of ingredients
T ₀	Controlled treatment-bore well waters
T ₁	Groundnut oilcake (GOC) 100 g+Single Super Phosphate (SSP) 50 g
T ₂	Chicken dropping dose 25 g+GOC 100 g+SSP 50 g
T ₃	Chicken dropping dose 50 g+GOC 100 g+SSP 50 g
T ₄	Chicken dropping dose 75 g+GOC 100 g+SSP 50 g
T ₅	Cow dung 25 g+GOC 100 g+SSP 50 g
T ₆	Cow dung 50 g+GOC 100 g+SSP 50 g
T ₇	Cow dung 75 g+GOC 100 g+SSP 50 g
T ₈	Goat dung 25 g+GOC 100 g+SSP 50 g
T ₉	Goat dung 50 g+GOC 100 g+SSP 50 g
T ₁₁	Goat dung 75 g+GOC 100g+SSP 50 g

RESULTS AND DISCUSSION

All animal waste were analyzed at the beginning of the experiment and it was observed from Fig. 1 that groundnut oilcake had highest nitrogen (5.02%), Phosphorous (0.45%) and potassium (0.85%). Among animal waste goat dung had highest amount of nitrogen (2.10%) where, poultry waste had highest amount of phosphorous (0.40%) as well as highest amount of potassium (0.43%).

The slurry i.e., nutrient medium was also analyzed. It was observed from Fig. 2 that nitrogen content was highest in poultry waste (7%). Phosphorous value (0.37%) was found highest in slurry of cow dung.

The nutrient release was governed by the quality of manure. Manure from large ruminants such as buffalo and cattle have relatively low level of N and P content compared to pig and chicken manure (Lin *et al.*, 1997). It was observed that concentration of phosphorous (less than 0.5 ppm) will stimulate reproduction of *Daphnia* but concentrations higher than 1.0 ppm are lethal to the young.

It was observed from Fig. 3 that the maximum population density of *Daphnia* varied non-significantly with different dozes of animal waste. The highest mean population was observed at T₃ (79.00 individual mL⁻¹) followed by T₄, T₂, T₉, T₆, T₁₀, T₇, T₈, T₅, T₁ and T₀.

Among the animal waste the highest mean production of *Daphnia* was found in T₃ i.e., chicken dropping slurry with 50 g dose animal waste (79.00 individual mL⁻¹) and lowest in T₈ i.e., Goat dung slurry with 25 g dose animal waste (23.33 individual mL⁻¹). In a experiment conducted by Damle *et al.* (2010) reported highest mean population of *Daphnia* in Treatment with 50 g of poultry dung and lowest in Treatment with 25 g of goat dung. Dhawan and Singh (2000) reported higher fish production with poultry manure (1360.65 kg ha⁻¹) in poultry manure than cow dung (820 kg ha⁻¹).

Among different doses of poultry waste (chicken dropping) T₃ having 50 g of animal waste (79.00 individual mL⁻¹) yield highest number of *Daphnia* whereas lowest was recorded in T₂ with 25 g of chicken dropping (49.00 individual mL⁻¹).

Among different doses of cow dung slurry T₆ having 50 g of animal waste yield highest production (33.33 individual mL⁻¹) whereas lowest was recorded in T₅ (21.33 individual mL⁻¹) having 25 g of cow dung.

Among different doses of Goat dung slurry T₉ having 50 g animal wastes yield highest production (44.00 individual mL⁻¹) whereas lowest was recorded in T₈ (23.33 individual mL⁻¹).

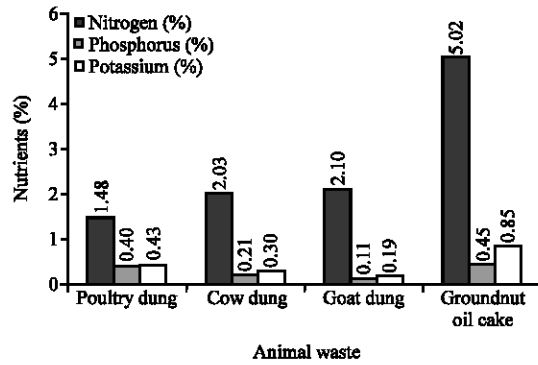


Fig. 1: Chemical composition of organic manures

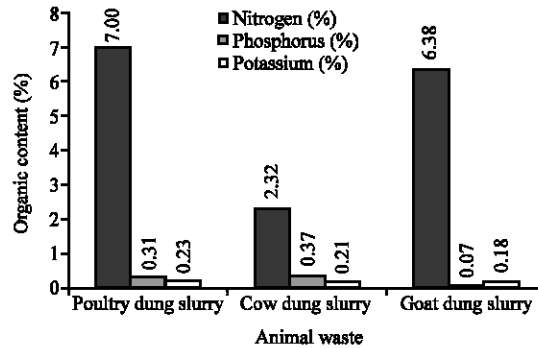


Fig. 2: Chemical composition of slurry

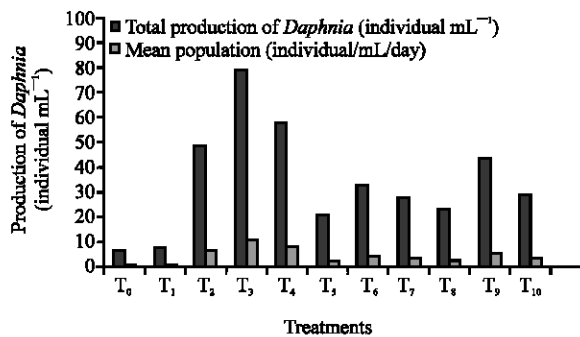


Fig. 3: Mean growth performance of population density (individual mL⁻¹) in different treatments

In earlier experiment Rottman *et al.* (2004) found that culture of *Daphnia* sp. using only beaker's yeast as feed gave significant growth.

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