Journal of Research in Biology

FicusPublishers

OPEN ACCESS

Original Research Paper

An International Online Open Access Publication group

Vermiwash mixed diet effect on growth of *Oreochromis mossambicus* (Tilapia)

Authors:
Rameshguru G[1], Senthilkumar P[2] and Govindarajan B[3].

Institution:
[1]Department of Zoology, VHNSN College, Virudhunagar-626001, Tamilnadu, India.
[2]Entomo Pathology Lab, Institute of forest genetics and tree breeding, Coimbatore-641002.
[3]Manonmaniam Sundaranar University, Thirunelveli-627012, Tamil Nadu, India.

ABSTRACT:

*Oreochromis mossambicus*fries were collected from Kullursanthai reservoir near Virudhunagar. They were acclimatized to the lab conditions at 29±1ºC for one week. *O. mossambicus* receiving CFF (Control Fish Feed) diet exhibited a growth of 140±10.58 mg in 21 days. Maximum growth was observed in fish receiving FFV (Fish Feed with 100% Vermiwash) 100 diet and it was 460.67±06.03 mg. Thus vermiwash plays asignificant role in enhancing the growth.

Keywords:
Oreochromis mossambicus, Vermiwash.

Corresponding author:
Rameshguru

Web Address:
http://jresearchbiology.com/Documents/RA0099.pdf.

Article Citation:
Rameshguru G, Senthilkumar P and Govindarajan B.
Vermiwash mixed diet effect on growth of *Oreochromis mossambicus* (Tilapia)
Journal of research in Biology (2011) 5: 335-340

Dates:
Received: 07 Sep 2011 /**Accepted:** 10 Sep 2011 /**Published:** 14 Sep 2011

Journal of Research in Biology

INTRODUCTION

Fish is the major source of protein for over one billion people around the world (Cathay *et al*., 2004). In aquaculture field, the edible fish has earned a significant position in the nutrition of man. It is rich in protein and amino acids like lysine, methionine. It contains unique unsaturated fatty acid like eicosapentaenoic acid which is known to control cholesterol in the blood. It is easily digestible and cheaper than other animal flesh (Santhanam *et al*., 1987). Food intake is a vital factor for fish growth and is dependent upon the quality or chemical composition of food (Elankumaran *et al*., 1992). Fish requires diets relatively higher in protein than those of other commercially cultured animals (NRC, 1981).

With the increasing research thrust on this aspect during recent years there has been much interest on the possibility of using various non-conventional feed sources. Experiments with the incorporation of materials of animal origin like silkworm pupae (Venkadesh *et al*., 1986; Nandeesha *et al*., 1988; Hossain *et al*., 1992), and vermicompost (Mahalakshmi., 2004) hormones like thyroxine (Mahalakshmi, 2004) and diethylstilbestrol (Nanjundappa & Varghese, 1989) and Earthworm meal (Keshavappa *et al*., 1989; Kostecka & Paczka, 2006) as substitutes for meal has also been found encouraging. The objective of the present study was to assess the growth of*O.mossambicus* by vermiwash adding diet.

MATERIALS AND METHODS

Animal collection

Healthy *O.mossambicus* fries were collected from Kullursanthai reservoir near Virudhunagar. They were acclimatized to the lab conditions at 29±1ºC for one week. During acclimatization, the fish were fed ad libitum with fish meal contained control diet daily once at 10 AM and water also changed daily.

Vermiwash preparation

The vermiwash can be collected from the body cavity of earthworms without causing any harm to them. In this method of collecting the fluid, three to four earthworms were taken in an approximately 10 cm diameter petri plate. Holding the plate in a slanting position and keeping earthworms pointing downwards, cold shock was given to earthworms by gently moving a small beaker containing a few ice cubes over the body of worms. The vermiwash released due to cold shock drips and gets collected at the lower side of the petri plate. The fluid can be pipetted out using a treated pipette with fine nozzle. This is the pure vermiwash (Radha D.Kale., 2006).

Preparation of feed

Three different fish feeds, CFF (Control Fish Feed), FFV75 (Fish Feed with 75% Vermiwash), FFV100 (Fish Feed with 100% Vermiwash), were prepared by using the same quantity of ingredients (**Table 1**).To the ingredients 1g of sodium alginate was added. It acts as a binder and does not allow the compounded feed to dissolve in water. The only difference in the feed was the quantity of vermiwash mixed. In the control diet the feed ingredients were mixed with water. But in FFV75, 75% of vermiwash and FFV100, 100% of vermiwash was used.

Experimental Design

The experiment was carried out to find out the influence of different concentration of vermiwash on growth, food consumption, assimilation, metabolism and feeding rate in fish. All the experiments were carried out in the laboratory at 29ºC±1ºC and 12:12 photoperiod. Fish was reared in round glass troughs containing 1 liter of water. 15 fish, of similar size were chosen from the stock. They were weighed and divided into five groups each containing three fish. Before the commencement of experiments, the fish were starved for 24 hours in order to facilitate to evacuate their alimentary contents. They were weighed to find out the initial live weight. The fish were subjected to five types of experimental food CFF, FFV75, FFV100 and all experiments were conducted simultaneously.

Fish in all groups were fed with 100mg of dry pelleted food. The fish were fed daily once at 10AM, the feed remains and faeces were collected separately using pipettes and dried in a hot air oven and weighed in a monopan balance. Water was changed daily. The rearing experiment was carried out for a period of 21 days. The weight of the fish was found out on 0, 7th, 14th, and 21stday to assess

Table: 1 Feed preparation composition

Ingredients	Weight (g)
Dried fish powder	42g
Ground nut oil cake powder	20g
Blood meal powder	5g
Tapioca powder	15g
Wheat flour	15g
Mineral mix	2g
Vitamins	1g
Sodium alginate	1g

the growth. The fish were not subjected to any disturbances except during feeding and water changing operations.

RESULTS

Mass budget

O. mossambicus were reared at 29±1ºC for 21 days. The fish were divided into five groups, each group with three triplicates. The first group of fish received control diet (CFF). The second, third, fourth and fifth group of fish received FFV75 and FFV100 diets. Mass budgets were prepared for all groups of fish (**Table 2, 3 and 4**).

Growth

O. mossambicus receiving CFF diet exhibited a growth of 140±10.58 mg in 21 days. Maximum growth was observed in fish receiving FFV100 diet and it was 460.67±06.03 mg.Fish receiving CFF diet consumed 685.67±0.6.11 mg of dry food. The fish receiving FFV100 diet consumed maximum food and it was 1088.33±05.86 mg and showed an assimilation of 774.67±05.77 mg.

Feeding rate

Feeding rate of fish differed in different groups of fish. Fish receiving CFF diet exhibited a feeding rate of 105.33±00.47 mg dry wt/g live wt/ day. Fish receiving FFV75 diet exhibited a feeding rate of 149.33±01.15 mg dry wt/g live wt/day and FFV100 diet exhibited a feeding rate of 159.33±01.53 mg dry wt/g live wt/ day.

Assimilation rate

Assimilation rate of fish differed in different groups of fish. The fish receiving CFF diet showed an assimilation rate of 81.67±01.53 mg dry wt/g live wt/day.The assimilation rates for fish receiving FFV75 and FFV100 diets were 106.33±02.08 and 113.67±00.47 mg dry wt/g live wt/day, respectively. Assimilation efficiency of fish in different groups did not differ much (Table 2, 3, and 4).

Table: 2 Mass budget of *O. mossambicus* fed with control diet (CFF) at 29±1ºC for 21 days.

Parameters (mg dry weight/individual)	Control
Growth (P)	140.00±10.58
Food consumption (C)	685.67±06.11
Faces (F)	155.67±10.26
Food assimilation (A)	530.00±07.65
Metabolism (R)	390.00±07.21
Feeding rate (Cr) (g live weight/day)	105.33±00.47
Assimilation rate (Ar) (g live weight/day)	81.67±01.53
Conversion rate (Pr) (g live weight/day)	21.67±01.53
Metabolism rate (Mr) (g live weight/day)	60.00±01.00
Assimilation efficiency (Ae) (%)	77±01
Gross conversion efficiency (K1) (%)	20±02
Net conversion efficiency (K2) (%)	17±01

Note: Each value ($\mathcal{X} \pm S\,D$) represents an average of 3 individuals.

DISCUSSION

Fish growth is influenced by the nutrients levels of food. The optimum and maximum feeding levels are influenced by the nature of the diet. It is dependent on the type of the food offered. Increase in availability of food having higher protein that plays a major role in growth. From the culturists point of view, a good diet would be one which is readily available, cost effective, simple and versatile in application (Vigneeswaran 2005). Surendra et al 2005 reported vermiwash very much useful in growth of legumes plants.

Several research peoples have studied the growth of fish with conventional and supplementary diet. Food supplement includes

Table: 3 Mass budgets of *O. mossambicus* fed with diet containing 75% vermiwash (FFV75) at 29±1ºC for 21 days.

Parameters (mg dry weight/ individual)	FFV75
Growth (P)	296.33 ± 07.02
Food consumption (C)	997.00 ± 10.54
Faces (F)	288.00 ± 03.51
Food assimilation (A)	709.00 ± 14.11
Metabolism (R)	412.67 ± 11.93
Feeding rate (Cr) (g live weight/day)	149.33 ± 01.15
Assimilation rate (Ar) (g live weight/day)	106.33 ± 02.08
Conversion rate (Pr) (g live weight/day)	44.33 ± 00.47
Metabolism rate (Mr) (g live weight/day)	62.00 ± 01.73
Assimilation efficiency (Ae) (%)	71 ± 01
Gross conversion efficiency (K1) (%)	30 ± 01
Net conversion efficiency (K2) (%)	27 ± 01

Note: Each value ($\mathcal{X} \pm S\,D$) represents an average of 3 individuals.

earthworm (Stafford & Tacon 1984), earthworm powder and krill meal (Toshio Akiyama *et al.*, 1984), earthworm meal (Nandeesha *et al.*, 1988), earthworm and chara plant (Elankumaran *et al.*, 1992), frozen earthworms (Oscar Pereira & Emidio F.Gomes 1995) and diets containing artemia, earthworms and liver mixed diet (James & Kunchitham Sampath 2004).

In the present work *O. mossambicus* fries were fed with pelleted diet containing different concentrations of vermiwash. However fish receiving FFV100 diet showed 2.3 times more growth than control.Radha D.Kale 2006 has observed that vermiwash is rich in amino acids, vitamins, and minerals. Similarly, in this research fish receiving FFV75 and FFV100 over fish receiving control diet. This observation reveals that, coelomic fluid mixed with balanced diet to prepare fish feed does not in any way act as a repellent in fish.

Table: 4 Mass budgets of *O. mossambicus* fed with diet containing 100% vermiwash (FFV100) at 29±1°C for 21 days.

Parameters (mg dry weight/ individual)	FFV100
Growth (P)	460.67 ± 06.03
Food consumption (C)	1088.33 ± 5.86
Faces (F)	313.67 ± 04.93
Food assimilation (A)	774.67 ± 05.77
Metabolism (R)	314.00 ± 03.61
Feeding rate (Cr) (g live weight/day)	159.33 ± 01.53
Assimilation rate (Ar) (g live weight/day)	113.67 ± 00.47
Conversion rate (Pr) (g live weight/day)	67.67 ± 01.15
Metabolism rate (Mr) (g live weight/day)	46.00 ± 00.00
Assimilation efficiency (Ae) (%)	71 ± 01
Gross conversion efficiency (K1) (%)	42 ± 01
Net conversion efficiency (K2) (%)	40 ± 01

Note: Each value ($\mathcal{X} \pm S\,D$) represents an average of 3 individuals.

However, Stafford& Tacon 1984 while rearing trout on earthworm reported poor growth. This is attributed to the coelomic fluid present in the earthworm which, according to him is unfavorable to fish. However, in the present study instead of feeding the fish with earthworm, the coelomic fluid of earthworm has been used to prepare balanced diet and this has proved to be a good diet improving consumption, conversion and assimilation in *O. mossambicus*. Satia 1974 and Austrong & Reftsio 1979 have reported that increase in body protein in rainbow trout with increasing dietary protein levels.

Sakthivel 1994 reported 14% increase in body protein with 16% increase in dietary protein.In the present work also, increase in the protein, lipid and carbohydrate in the diet, increased the protein, lipid and carbohydrate of the carcass. Gross and net conservation efficiency also increased with increase in the amount of vermiwash (CFF) exhibited a gross and net conservation efficiency of 20% and 17%, respectively. From the above observation it is concluded that vermiwash can be used to prepare fish diets. It does not repel the food consumption and decrease growth. Instead it enhances consumption, assimilation, growth and conservation efficiency in fish. As it is rich in vitamins, minerals and amino acids, vermiwash can be used a safe and suitable medium for the preparation of fish diets.

Table: 5Growth of *O. mossambicus* reared in diet containing different concentrations of vermiwash.

Days	CFF	FFV75	FFV100
1st day	3018.67±19.86	3029.67 ± 14.01	3034.68 ± 11.02
7th day	3071.00±21.59	3132.33 ± 13.65	3216.67 ± 21.59
14th day	3111.67±11.24	3235.67 ± 23.18	3355.00 ± 22.61
21th day	3185.67±15.70	3326.00 ± 20.95	3482.33 ± 09.29

BIBLIOGRAPHY

Austrong E and Refstio T. 1979. Effect of a varying dietary protein levels in different families of rainbow trout. Aquaculture 18:145-156.

Cathy A, Roheim, Robert J, Johnston, Jessica G and Holger D. 2004. Consumer preferences for ecolabeled sea food: Results of a connecticut survey. Food marketing policy center Deaprtment of Agriculture and Resource Economics College of Agriculture and natural Resources, Uni. of Connecticut. 4-11.

Elankumaran S, Pandi B and Palanichami S. 1992. The dietary influence on food utilization in the fresh water fish *Oreochromis mossambicus* and *Cyprinus carpio communis*. J Ecobiol., 4(4):271-275.

Hossain M A, Islam MN and Alim MA. 1992. Evaluation of silkworm pupae meal as dietary source for cat fish (*Heteropneustes fossilis*) In: fish nutrition in practice. Kaushik S J and Luquent P (Eds). 785-791.

James R and Kunchitham Sampath. 2004. Effect of food type on growth and fertility in ornamental fish, *Xiphophorus helleri*. Israeli J Aquaculture 56 (4):264-273.

Kesavappa GY, Devaraj KV and Seenappa D. 1989. Evaluation of three animal meal based feeds for rearing catla fry. Proc. Nat. Freshwat. Aqua: Bhubaneswar, India. 143-144.

Kostecka J and Paczka G. 2006. Possible use of earthworm *Eisenia fetida* biomass for breeding aquarium fish. *European J Soil Biology* 42(1):231-233.

Mahalakshmi G. 2004. Effect of dietary thyroxine supplementation on the physiology of *Oreochromis mossambicus*. M.Phil dissertation, Madurai Kamaraj University, Madurai.

Nanjundappa T and Varghese TJ. 1989. Effect of diethylstilbestrol on growth and food conversion of common carp *Cyprinus carpio* (Linn.).Indian Acad. Sci., 98(2):85-88.

Nandeesha MC, Srikanth GK, Basavaraja N, Keashavanth P, Varghese TJ, Kubra Bano, Ray AK and Radha D kale. 1988. Influence of earthworm meal on the growth and flesh quality of common carp. Biological Wastes 26(3):189-198.

NRC. 1981. Nutrient requirements of cold water fishes. Nutrient requirements of domestic animal series. National academy of sciences, Washington. DC. 83.

Oscar Pereira J and Emidio F Gomes. 1995. Growth of rainbow trout fed a diet supplement with earthworms, after chemical treatment. Aquaculture International 3(1):36-42.

Partima Rao, Asblesha P and Anjali D. 2005. Consumption pattern of fish and sea food in a selected population in Hyderabad, Andra Pradesh. J Aquatic biology 20(1):175-178.

Radha D Kale. 2006. Vermicompost- Crown jewel of organic farming. Published by N D Kale, Bangalore-23.

Saktivel M. 1994. Growth, Carcass composition and Haematological parameters in the fresh water fish *Heteropneustes fossils* fed at different dietary levels. J Ecobiol., 6(3):179-185.

Santhanam R, Sukumaran N and Natarajan R. 1987. A manual of freshwater aquaculture. Oxford and FBH publishing co.pvt.ltd, NewDelhi-2.

Satia BP. 1974. Quantitative protein requirements of rainbow trout. Proc. Fish. Cult., 36:80-85.

Stafford EA and Tacon GJ. 1984. Nutritive value of the earthworm *Dendrodrilus subrubicundus* grown on domestic sewage in trout diets. Agricultural wastes 9(4):249-266.

Surendra Suthar, Choyal RR, Sushma Singh and Sudesh. 2005. Stimulatory effect of earthworm coelomic fluid (vermiwash)on seed germination and seedling growth of two legumes. J Phytological Research 18(2):291-222.

Toshio Akiyama, Takesh Murai, Yasuhiro Hirasawa and Takeshi Nose. 1984. Supplementation of varius meals to fish meal diet for chem salmon fry. Aquaculture 37(3):217-222.

Venkadesh B, Mukherji AP, Mukhopadhyay PK and Dehadrai PV. 1986. Growth and metabolism of the cat fish *Clarias batrachus* (Linn,) fed with different experimental diets. Proc. Indian Acad. Sci., 95(4):457-462.

Vigneeswaran M. 2005. Studies on food utilization and fecundity of guppy (*Lebistes reticulates*) fed with bioencapsulated Artemia franciscana, M.Phil dissertation, V.H.N.S.N.College, Virudhunagar.