

## Effects of fertilization and feeding on the growth of *Tilapia rendalli* reared in concrete ponds

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### Abstract

An experiment to study the effects of fertilization (without feeding) and feeding (without fertilization) on the growth of *Tilapia rendalli* was conducted in six, 20 m<sup>2</sup> concrete ponds at Bunda college fish farm in May 1999.

Thirty fish of mixed sex were stocked in each pond. The experiment was laid out in a completely randomised design with two treatments, application of goat manure (without feeding) and feeding a formulated diet (without applying manure). The diet in the second treatment was formulated using soybeans, maize bran, vitamin and mineral premix. Each treatment was replicated three times.

Overall, fish that were reared on natural food (manure without feeding) gained significantly lower ( $p < 0.05$ ) weights than fish that were fed formulated diet (without applying manure). Fish in treatment 1 gained  $10.25 \pm 3.73$  while in treatment 2, fish gained  $20.80 \pm 2.87$  in a period of 84 days. These results suggest that to attain higher fish growth supplemental feeding may be required. However, the economic benefits of providing supplemental diets needs to be ascertained.

**Key words:** *Tilapia rendalli*, fertilization, feeding, growth

### Introduction

*Tilapia rendalli* is one of the commonly cultured species in Malawi. To boost natural food in ponds, fertilisers (inorganic and organic) are usually applied. Pond fertilisation is a common practice that is utilised in semi-intensive and extensive aquaculture in the tropics (Pillay 1992). Although fertilisation is an ancient and much researched practice, questions still remain as to the dynamics of pond systems in relation to fertilisation. This makes it difficult, if not impossible, to standardise and provide guidelines on the amount and type of fertiliser to be added to the system including when to add the fertiliser, frequency of application, and the expected output from such interventions (Pillay 1992).

The reasons are manifold. Firstly, release of nutrients from the different types of fertilisers occurs at different rates and is dependent on temperature, soil conditions, other water quality parameters, and the microbial flora in the case of organic manure. Secondly, utilization of nutrients in different production cycle(s) is

difficult between systems. This is affected by physical conditions such as temperature and the composition of the biological community, interaction between fish species and the interaction between fish species and the species cultured (De Silva *et al.* 1995).

Organic manure acts as fertilizers providing nutrients and improves soil texture. Hence a combination of organic manure and inorganic fertilisers is considered more effective than using either of these alone (Pillay 1992).

Studies on effect of fertilisation on growth of *T. rendalli* have never been reported in Malawi. This study aimed at comparing the effects of fertilising the pond (without feeding) and feeding (without application of manure) on growth of *T. rendalli*.

### Materials and methods

The study was conducted at Bunda College Fish Farm in May 1999. Thirty fingerlings obtained from the same farm were stocked in six 20 m<sup>2</sup> experimental ponds. The experiment had two treatments, application of manure (without feed-

ing) and feeding (formulated diet). The treatments were replicated three times. For Treatment 1 (manure feeding) goat manure was applied to ponds at 0.2 kg/pond two weeks prior to stocking. In these ponds no feed was provided to fish. On the other hand in Treatment 2 (formulated diet) a diet was formulated (using Pearson square) with soybeans, maize bran, mineral and vitamin premix as ingredients. The diet had 30% crude protein (CP) and mineral and vitamin premixes were incorporated at a rate of 0.05%. Proximate analysis of the various ingredients and the formulated diet was done as the values are presented in Table 1.

Data on fish weight taken every fortnight were analysed using Analysis of variance (ANOVA). The GLM procedure, Statistical Analysis Systems SAS (1988) was used to test differences in mean weights. The weights were separated using the Duncan's Multiple Range Test.

## Results

The two treatments had differential effect on the growth of fish. Fish that were fed on the formulated ration performed better than the fish that were grown on the goat manure. Fish that were reared on formulated diet grew significantly higher than fish that were reared

on goat manure ( $p < 0.05$ ) (Table 2).

Water temperature ranged between 19 and 29 °C throughout the experimental period while pH varied between 7.2 and 8.9.

## Discussion

The two treatments had differential effects on growth of *T. rendalli*. The fish that were fed on the formulated ration performed better than the fish that were reared on goat manure only. These results are in line with what Likongwe (1983) reported that better growth of fish is obtained with feeding than just fertilizing the pond water.

The natural diet enhanced by goat manure failed to produce similar results as formulated diets, suggesting that the latter may still be required to have higher yields. However, the benefits of supplying formulated feeds can only be ascertained after carrying out economic analyses of the two treatments.

It may thus be concluded in this study that the overall growth performance of *Tilapia rendalli* reared on two treatments, goat manure and fed with formulated ration differ significantly.

## References

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**Table 1.** Results from proximate analysis of feed ingredients, goat manure, and formulated diet

Component analyzed	Maize bran (%)	Soybean (%)	Goat manure (%)	Formulated diet (%)
Dry matter (D.M.)	90.00	92.00	68.0	91.0
Crude Protein (C.P.)	10.90	48.90	8.2	30.0
Crude Fiber (C.F.)	4.20	6.42	-	4.87
Ether Extract (E.E)	-	21.25	-	-
Ash	3.10	4.51	3.75	4.20

**Table 2.** Mean weight (g) of *Tilapia rendalli* fed formulated diets and that reared on manure<sup>1</sup>

Treatment	Initial wt	Sampling Time (Days)					
		14	28	42	56	70	84
Formulated Diet	9.19 <sup>c</sup>	15.11 <sup>a</sup>	18.48 <sup>a</sup>	19.39 <sup>a</sup>	23.33 <sup>a</sup>	27.79 <sup>a</sup>	29.99 <sup>a</sup>
Manure	9.57 <sup>b</sup>	10.55 <sup>b</sup>	11.42 <sup>b</sup>	13.14 <sup>b</sup>	15.19 <sup>b</sup>	16.77 <sup>b</sup>	19.82 <sup>b</sup>

Means with same letters are not significantly different ( $p > 0.05$ )

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