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## Influence of maternal size on the hatching rate of tilapia (*Oreochromis niloticus*) eggs

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### Abstract

This experiment compared the number of eggs produced and the hatching rates of different maternal sizes of *Oreochromis niloticus* to determine if their sizes really affect its hatching rates.

Analysis of Variance (ANOVA) showed that there was significant difference in the number of eggs produced ( $P < 0.05$ ). Highest mean of the number of eggs produced was obtained from Treatment 2 with a mean of 932.00 followed by Treatment 3 with a mean 899.33 and Treatment 1 with a mean of 335.33.

Analysis of Variance (ANOVA) revealed that hatching rates from the different maternal sizes of *O. niloticus* has no significant differences ( $P > 0.05$ ) among treatments. The hatching rate in Treatment 1 was 91.93%; Treatment 2 was 89.85%; and Treatment 3 was 93.82%.

**Keywords:** Tilapia, maternal size, hatching rate

### 1. Introduction

Tilapia are native to Africa, but have been introduced in many countries around the world. They are disease-resistant, reproduce easily, have good feeding behavior and tolerate poor water quality with low dissolved oxygen levels. Most tilapia grows in brackish water and even in sea water. These characteristics made tilapia suitable for aquaculture in most developing countries. They are most often grown in ponds, cages and rice fields.

Tilapia aquaculture production has grown rapidly and is expanding at an extremely high rate worldwide. With this situation, it is vital to produce sufficient amounts of seed to meet the increasing demand of tilapia farmers. Status of tilapia culture in many countries revealed that there is a gap between seed supplies and farmer's demand. But tilapia seed producers are also usually faced with a number of constraints that limit the management of mass seed production (Little *et al*, 1993 [7]; Bhujel, 2000 [1]). Some of these include; early maturation, low fecundity and successive reproductive cycles, etc.

However, mass production of tilapia fingerlings requires successful implementation of a number of activities and procurement of adequate numbers of good quality broodfish of known lineage with proper age and size will be the primary step. Hence, the age and size at first maturity of tilapia vary considerably between species, and even within strains of some species (Macintosh and Little, 1995 [8]; Bhujel, 2000 [1]). But under favourable natural conditions, Nile tilapia reaches their sexual maturity at a size of 20-30cm which is about 150-250 g (Trewavas, 1983 [15]). Still, they may mature at small sizes under stressful environmental conditions.

Generally speaking, the size at first maturation of Nile tilapia females under aquaculture conditions ranges from 30-50g as has been reported by Siraj *et al*, (1983 [14]), Lester *et al* (1988 [6]), De Silva and Radampola (1990 [3]).

On the other hand, female age and size contributes on the size and number of eggs produced by tilapia.

In general, larger females produce larger eggs but female age is thought to be more important. Little (1989 [7]) found that small Nile tilapia broodfish produces many more eggs, with shorter spawning intervals, than larger fish. So it is necessary however, to determine whether it is better to use small broodfish, which could collectively yield more eggs per culture unit, or large broodfish with higher individual egg production but at longer intervals. And as such, this study will determine if there was an effect of maternal sizes on the hatching rate of eggs.

### 2. Materials and Method

#### 2.1 Experimental Animals

Fast Strain Nile Tilapia breeders were used and were obtained from Freshwater Aquaculture Center.

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## 2.2 Experimental Set-up

There are three treatments compared in the study. Treatment 1 had a breeder size range of 50-90 g; Treatment 2 had a breeder size range of 100-150 g; Treatment 3 had a breeder size range of 160-200 g. Each treatment was placed in spawning tanks and was all filled with 0.5 m volume of water and was replicated three times.

## 2.3 Selection and Stocking

Sexually matured breeders of *O. niloticus* which were ready to spawn were selected from the broodstock ponds and weighed immediately after selection. Ready to spawn breeders usually have pinkish to reddish protruding genital pore with fully opened and slightly distended abdomen. Selected breeders were then stocked to a 1m x 2m spawning tanks with stocking density of 1 male: 3females. Flow-through water was provided to stimulate breeding and good water circulation.

## 2.4 Feeding and Monitoring

Breeders were fed twice a day to enhance reproductive performance and increase seed production. After, 4 days of stocking, each spawning tanks were monitored every 2 days to check if breeders were mouthbrooding for collection. This will be done with the rest of the breeders until all of them had spawned.

## 2.5 Collection and Incubation

If the breeders were observed to be mouthbrooding, they will be hauled to collect the eggs in their mouth. Collected eggs will be transferred in a basin to be counted manually. After counting, it will then be placed in artificial incubators for further rearing.

## 2.6 Data analysis

Data gathered were analyzed using one-way Analysis of Variance (ANOVA) and Treatment means were compared using the least significant difference (LSD).

## 3. Results and Discussions

Statistical analysis showed that Treatment 1 significantly differed from Treatment 2 and Treatment 3. This might be attributed to the size of the breeders as recent studies showed that larger female tilapia not only produce larger eggs but also produce greater number of eggs than smaller females (Jalabert and Zohar, 1982<sup>[5]</sup>; Rana, 1988<sup>[12]</sup>). However, no significant difference was found between Treatment 2 and Treatment 3 ( $P>0.05$ ).

Analysis of Variance (ANOVA) on the hatching rates from the different maternal sizes of *O. niloticus* revealed that there was no significant difference ( $P>0.05$ ) on the hatching rates among treatments. The hatching rates were Treatment 1 (91.93%); Treatment 2 (89.85%); and Treatment 3 (93.82%). The results of this experiment showed that maternal sizes had no effect on the hatching rates of tilapia eggs. The highest hatching rate was attained in bigger breeders. This is due to the fact that larger female breeders usually produced more eggs than smaller breeders, so it is also expected that they would have high hatching rates compared to smaller ones. It was also revealed in previous studies that large eggs contained more yolk and even led to larger fry with better growth and higher resistance to starvation and severe environmental conditions (Rana, 1988<sup>[12]</sup>).

## 4. Conclusion and Recommendation

This experiment concluded that maternal sizes had no effect on the hatching rates of tilapia eggs. It also showed that larger breeders are better for hatchery seed production. However, smaller breeders could also be used in small-scale farming. For further studies, conducting it in aquaria is hereby recommended for easy monitoring of the breeders and to minimize stress for egg collection. Hapa method could also be done for ease hauling of the breeders.

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