



Study on Induced Breeding in *Oreochromis niloticus* (Nile Tilapia) through Hypophysation Technique

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Abstract

Producing fish to spawn by artificial methods is called induced breeding. *Oreochromis niloticus* (Nile tilapia) are induced to spawn by the injection of pituitary extract, a process called Hypophysation. Hypophysation is a technique of induced breeding in *Oreochromis niloticus* by injecting pituitary gland extract. In hypophysation, the pituitary gland extract is injected into intramuscular/pectoral fin region of fish. The gland induces the fish to breed. When the pituitary gland of the same species is used, the hypophysation is called homoplastic. Induced breeding is practised in a wide variety of species, with Hypophysation we can get pure seeds in large number in all seasons. With this technique we can produce hybrid varieties of species. This technique shows high fertilization rate (~85%) and Hatching rate (~80%) this study explores about procedure and result of hypophysation technique.

Keywords: Pituitary Gland; *Oreochromis niloticus*; Fertilization; Hybrid Varieties; Homoplastic

Introduction

Oreochromis niloticus it is also known as the Nile tilapia. The global population is increasing and, in order to maintain at least the current level of per-capita consumption of aquatic foods (20.2 kg in 2020, FAO, 2020), total fisheries and aquaculture production reached all time record of 214 million tonnes in 2020, slight increase (3%) from the previous 2018 record (213 million tonnes). *Oreochromis niloticus* is also a subject of renewed interest in Malaysian folk medicine in the search for a better cure for diseases and ailments. Amino acids and fatty acids, found in high concentrations in the fish, might have contributed to its pharmacological properties [1]. *Oreochromis niloticus* is a predacious, ambush feeding fish that has a carnivorous - specifically omnivorous - diet. It is a generalist species that preys on any available source of food that is attainable. The skin of tilapia used to cure burns [2].

Materials and Methods

Materials Required

Healthy tilapia fish, Acetone, Sterile blade, syringe, Distilled water, Cotton, Centrifuge, alcohol.

Method

This research study done at Government Degree and PG College (A), Siddipet (Department of M.Sc Fisheries) of Telangana state. This paper presents around four month study i.e from (May-2023 to September-2023).

Hypophysation Involves the Following Steps

- Collection of pituitary gland
- Preparation of pituitary extract

- Selection of breeders
- Injection of pituitary extract
- Breeding
- Hatching

Collection of Pituitary Gland

In the first step in hypophysation is the collection of

pituitary gland. The gland is collected from mature Tilapia (*Oreochromis niloticus*) fishes. The pituitary gland is located on the ventral side of the brain. Then the head is dissected out to expose the brain. The pituitary gland is isolated from the ventral side of the brain. The pituitary glands are stored in alcohol for better use (Figure 1) [3,4].



Figure 1: Collection of pituitary extract from tilapia fish.

Preparation of Pituitary Extract

The glands are macerated in a tissue homogenizer with a little distilled water. The homogenate is diluted with distilled water. The preparation is centrifuged at about 1000rpm for 5 minutes. The supernatant is the pituitary extract. It is preserved in glycol [5].

Selection of Breeders

Mature males and females are selected and stocked for hypophysation. Two males and one female form one unit for hypophysation [6].

Ratio of Male and Female is 2:1

Injection of Pituitary Extract

The selected males and females are kept on a table, the extract is injected intramuscularly at the base of the pectoral fin or pelvic fin or caudal fin. About 0.5 to 2ml of extract is given for breeders weigh-ing upto 10 kg. The female is given two doses, namely the first dose is preparatory dose and second one resolving dose. About 4 hour's interval is given between the two doses. The male is given only one dose (Figure 2) [7].



Figure 2: Injecting pituitary extract to brooder fish.

Breeding

After injection of the pituitary extract the breeders are introduced into a breeding hapa. The breeding hapa is a rectangular mosquito net cloth enclosure. The breeding hapa

is built at our college premises. It is suspended in a pond water with the help of four poles. To provide the running water similar to river conditions is maintained in the hapa with the help of electric motors. The breeders mate in the hapa. They breed in 14-17 hours [8].

Hatching

In 18-25 hours, the eggs are fertilized. The fertilized eggs are transferred to a hatching hapa which is at our PG Department. The hatching hapa is made up of two rectangular mosquito nets. It is suspended in water. The hatching hapa consists of an inner hapa and an outer hapa. The eggs are hatched in the inner hapa. The hatchlings wriggle out through meshes of the inner hapa and reach the outer hapa. The shells and dead eggs present in the inner hapa are removed. The

hatchlings are kept in the outer hapa. Hapa for three days. Then they are transferred to nursery ponds at behind our college premises in cement tanks and reared the seeds till they attained fingerling stage. The remained hypophysation extract is stored in the refrigerator (Figure 3) [9].

$$\text{Fertilization rate} = \frac{\text{Number of fertilized eggs}}{\text{Number of estimated eggs}} \times 100$$



Figure 3: Hapa and Storage of pituitary extract.

Precautions for Induce Breeding

- To avoid diseases and parasitic infections, breeders should be properly washed with KMnO₄ solution (0.5 g in 100 liters of water) for a few minutes. After this they should be kept in formalin (200 mg/ l of water) for one hour.
- Breeder should be protected from mechanical injuries during handling.
- Water condition should be favorable having temperature about 24 to 31°C and turbidity about 100 to 1000 ppm. Flowing water with higher O₂ content is of great use. The intensity and duration of light also affect the induced breeding and spawning. Pituitary glands taken from the same or related species as the recipient species are said to be more effective [10-15].

Result & Discussion

Here we can get best quality of fish seeds. Several advantages are there in induced breeding. A high quality fish seed of a particular species can be produced. The fish with maximum growth rate can be produced by genetic manipulations. Huge number of seeds can be produced i.e. 5,00,000 to 1 million at a time. At a time, several breeders can be bred at a single location with different species types. Induced breeding with Hypophysation we can get pure seeds in large number in all seasons. With this technique we can produce hybrid varieties of species. This technique

shows high fertilization rate (~85%) and Hatching rate (~80%) this study explores about procedure and result of hypophysation technique. Hybrids with high growth rate can be produced by artificial inducement and by applying several genetic techniques like gynogenesis, androgenesis, sex reversal etc. By hastening reepithelialization, improving burn-related pain, and decreasing treatment-related costs, Nile tilapia fish skin could benefit the resource-poor public health systems of developing countries [1]. It is a fact that the first and foremost prerequisite for successful intensive fish cultivation and development of Inland Fisheries is an assured supply of pure quality of fish seed. This method should profitably be utilized in making the important economic estuarine varieties of fishes to breed and obtain seed for brackish water fish farming [3,15-20].

Conclusion

The breeding technique is most effective where we can get desired quality of seeds with almost same size so that we can get huge crop by culturing. Tilapia is a lean source of protein that is full of various vitamins and minerals. The skin of tilapia is used to cure burns and wounds [21-24].

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