GONAD MORPHOLOGY OF NILE TILAPIA:

THAILAND AND TAIWAN STRAINS

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INTRODUCTION

Tilapia is widely recognized as one of the most important fish species for aquaculture. Tilapia species can tolerate a wide range of salinity. *Tilapia mossambica* can tolerate 0-40 ppt, while, *Tilapia nilotica* can tolerate saline water if properly acclimated.

Biona (1982) and Dureza et al. (1982) reported on Nile tilapia as a potential species for culture under saline conditions. However, research also suggests that Nile tilapia reproduction is inhibited at higher salinity levels.

This study describes gonad morphology of Thailand and Taiwan strains. Understanding of the gonad structure would elucidate basic information on reproduction of the strains.

MATERIALS AND METHODS

Nile tilapia of Thailand and Taiwan strains reared in brackish water ponds for three months were studied.

The gonads were taken from samples of Thailand and Taiwan strains of Nile tilapia. Specimens were fixed in 10 % buffered formalin solution. After fixation, the specimens were dehydrated in ethyl alcohol. Then, specimens were infiltrated in paraffin and sectioned at five microns thickness using a rotary microtome. Sections were deparaffinized in xylene and run onto slides in water. Staining was done following the procedure for Delafield Hematoxylin-eosin.

Slides were examined by microscope under low and high power objectives.

RESULTS AND DISCUSSION

Tilapia nilotica reaches maturity in the first year of life and the general pattern of gonad development in *Tilapia nilotica* conforms to that of other teleosts (Babiker and Ibrahim, 1979). The Nile tilapia has a pair of bilateral gonads suspended from the dorsal portion of the body cavity. In both male and female, gonads are found ventral to the kidneys.

The Nile tilapia gonads rise as a pair to form the genital ridge composed of promordial germ cells and surrounded by connective tissues (Cequina, 1990). The gonads grow to differentiate female and male structure with the proliferation of primordial germ cells.

Ovary

The ovaries are paired, sac-shaped organs suspended from the wall of the coelom. The outermost covering of the ovary is a membrane, the visceral peritoneum. The inner covering is the tunica albuginea which is composed of blood vessels and connective tissues.

Oocytes of two distinct phases are observed. The primary growth phase and secondary growth phase.

Primary growth phase

In the primary growth phase, oocytes have a thin follicular epithelium and the amount of cytoplasm is small in contrast to the large nucleus. The large nucleus contains small round nucleoli which are located on the inner side of the nuclear membrane. The nucleus and the nucleoli are basophilic.

Secondary growth phase

The oocytes in the secondary growth phase are bigger. Yolk vesicles appeared in the cytoplasm. These ring-like vesicles which appear as vacuoles are distributed in the cytoplasm. The yolk granules are characteristic of the final stage of vitellogenesis and oocyte development. Yolk granules which are acidophilic occupy the cytoplasm.

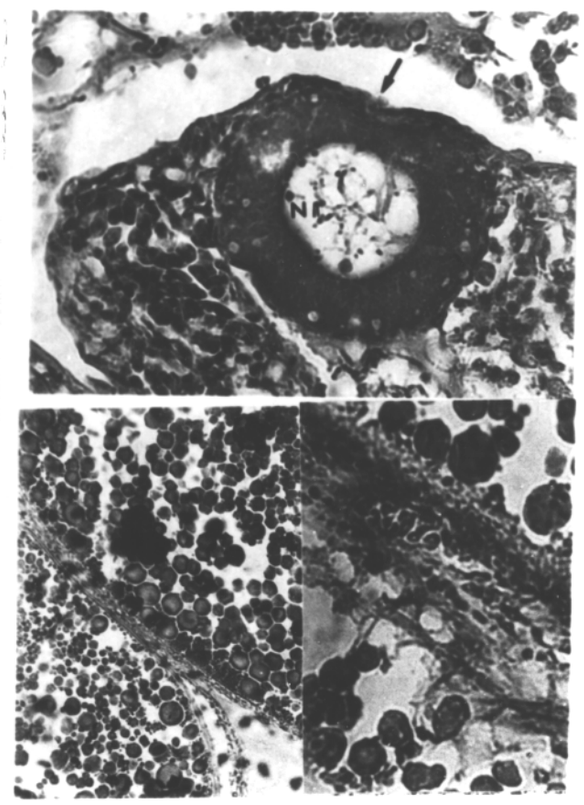

Figure 1. Oocytes in the primary growth phase (PGP) with an arrow showing the peripheral nucleoli (NI), (H&E x 400) and secondary growth phase (SGP) showing the yolk vesicles (LY) with an arrow (H&E x 200) and yolk granules (YG) in the cytoplasm (H&E x 400) of Nile Tilapia Thailand strain.

Ovarian morphology of Thailand and Taiwan strains

Oocytes in the primary and secondary growth phase are observed in Thailand and Taiwan strains. In both strains, oocyte cytoplasm shows acidophilic and basophilic reactions. Some oocytes with large yolk vesicles and no yolk granules were observed in the cytoplasm. Cequina (1990) reported no yolk granule formation at higher salinities starting at 16 ppt salinity level. The study shows ovarian morphology of Thailand and Taiwan strains cultured in brackish water with no yolk granule formation.

Testes

The testes of Nile tilapia are also paired sac shaped organs covered by the visceral peritoneum and the tunica albuginea, where connective tissues and blood vessels are found.

The seminiferous tubules contain spermatogenic cells. These spermatogenic cells are clustered to form one spermatocyst where cells undergoing spermatogenesis are observed.

Spermatogonia cells, which are usually large, are found at the base of the tube. The cytoplasm stains lightly in color. Spermatocytes contain cytoplasm which stains darker than spermatogonia. Spermatids which are in the tubular lumen can be identified by their smaller size. Finally, spermatozoa or sperms develop.

Testis morphology of Thailand and Taiwan strains

Testes undergoing spermatogenesis are observed in both Nile tilapia Thailand and Taiwan strains. The testis morphology of Thailand and Taiwan strains cultured in brackish water appear similar. Spaces are observed in seminiferous tubules containing spermatogenic cells.

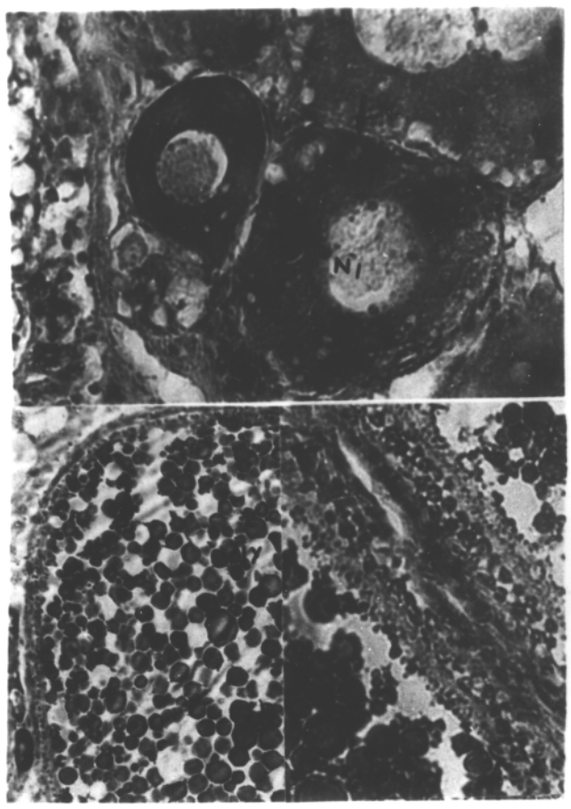

Figure 2. Oocytes in the PGP with arrow showing peripheral nucleoli (NI) H&E X 400, and SGP showing yolk vesicles (LY) H&E X 200 and yolk granules (YG) in the cytoplasm (H&E X 400) of Nile tilapia Taiwan strain.

Figure 3. Male Nile tilapia Thailand strain showing spermatogenesis in tubules (with arrow), H&E x 400.

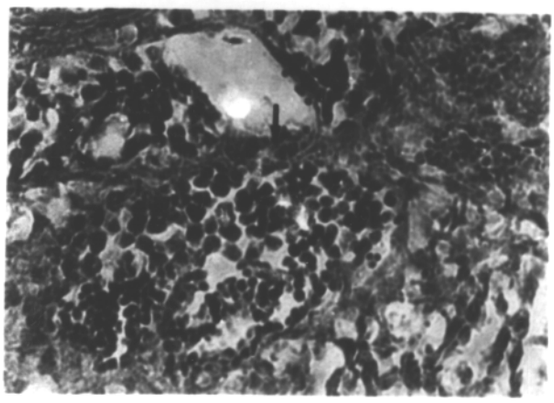

Figure 4. Male Nile tilapia Taiwan strain showing spermatogenesis in tubules (with arrow) H&E x 400.

SUMMARY AND CONCLUSIONS

In the ovary, oocytes of two distinct phases are observed, namely, primary growth phase and secondary growth phase. In the testis, cells undergoing spermatogenesis were observed.

Observation of no yolk granule formation oocytes explain the poor reproduction of Nile tilapia in saline water.

The gonad structure in both female and male Nile tilapia cultured in brackish water are similar. Gonad morphology of Thailand and Taiwan strains of Nile tilapia raised in brackishwater are not different.

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