

A study on yolk proteolysis and oocyte hydration in freshwater fish *Clarias gariepinus*

Luni S. and Sehgal N.

Department of Zoology, University of Delhi, Delhi, India
Email: neetasehgal@mailcity.com

Introduction:

The process of oogenesis in fish involves oocyte growth, maturation, hydration and ovulation. Full grown oocytes respond to the maturation inducing steroid (MIS) secreted by the follicle cells during resumption of meiosis. During this process, besides breakdown of germinal vesicle, morphological and volume changes also occur in oocyte. The changes in oocyte volume range from slight in most fresh water and euryhaline species to several fold in marine species. High increase in oocyte volume (3.1-8.4 fold) is associated with marine species that produces pelagic eggs while lower oocyte volume increase (1-3 fold) in species that produce benthic eggs. The studies suggest that increase in oocyte volume is due to increase in osmolality which occurs either due to proteolysis of yolk protein or due to increase in inorganic ions, leading to an increase in uptake of water by the developing oocytes. In freshwater fish species a limited oocyte volume increase was reported during the preovulatory period in rainbow trout, *Barbus tetrazona* and *Rasbora trilineata*, while others like *Cichlasoma nigrofasciatum*, *Carassius auratus*, *Gymnocorymbus ternetzi* and *Coregonus lavaretus* (Greeley et al., 1986) do not show any increase in volume.

Methods:

Gravid female catfish *Clarias gariepinus* of similar size were divided into groups and injected with GnRH. At different time points (0 hr, 9 hr, 13hr and 17 hr) fishes in each group were decapitated and ovaries excised. Cluster of 20-30 eggs were taken as a sample and wet wt. and dry wt. measured for gravimetric analysis. SDS PAGE of yolk proteins extracted at different time points was performed to analyze proteolysis pattern.

Results and Discussion:

Clarias gariepinus females ovulate eggs after 9-13 hrs of GnRH injection. A significant increase in oocyte water content was observed at 9 hr 13 hr and 17 hr (Fig. 1a) but the maximum increase was just before the ovulation. A significant change is observed in protein content of the ovulated oocyte from the

vitellogenic oocytes (Fig. 1b). To analyse the proteolysis of yolk protein, electrophoresis was performed. An electrophoretic shift (Fig. 2a, 2b) was observed in a major protein band of vitellogenic and ovulated oocytes indicating proteolysis of yolk proteins.

Fig. 1(a) Hydration in oocytes at different time points

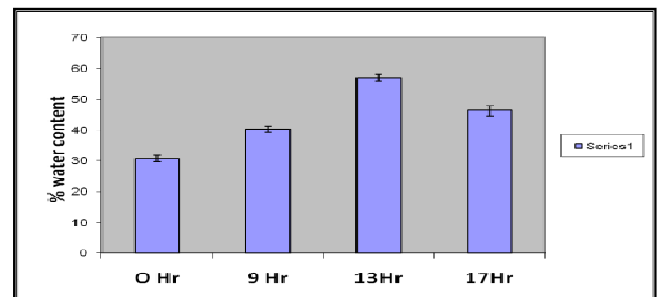


Fig. 1(b) Protein content in Vitellogenic after GnRH injection and Ovulated oocytes

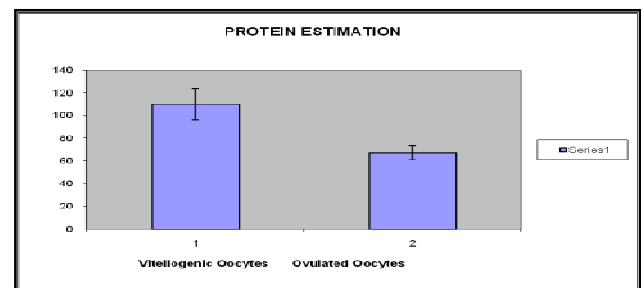


Fig. 2(b) SDS PAGE: Electrophoretic profile in of yolkproteins of Vitellogenic (VgO) and Ovulated (OvuO) oocytes. Marker (M)

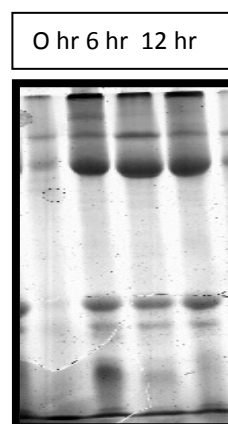
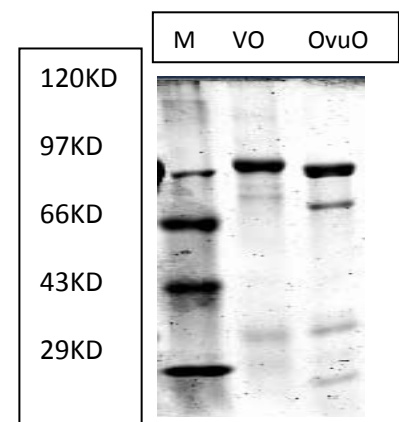


Fig. 2(a) SDS PAGE: Yolk proteolysis pattern during ovulation at different time points





Conclusion:

In *Clarias gariepinus* oocytes at maturation and during ovulation show a significant increase in water content. The increase in water content might be a result of increase in the osmolality of oocytes due to increase in the free amino acids liberated as a result of yolk protein proteolysis as evident by the electrophoretic pattern.

References:

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