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Observational study of embryonic development in *Lymnaea acuminata*

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Abstract
Embroyonic development in snail is a dynamic process that includes the transformation of fertilized ovum into miniature shelled organism in a confined transparent egg capsule. The just layed egg was observed with uncleaved zygote containing yolk, animal pole, the vegetal pole, and no polar body was present. The first polar body was observed just after laying 30 minutes, which on later followed by the first cleavage division about 120-130 minutes approximately, leading to form 2-cell stage. The embryonic cell divided was followed with the formation of gastrula, trochophore, veliger and before hatching miniature shelled snail was clearly visible, the complete process of embryonic development took 11-12 days, observed in the laboratory in the fresh water snail L. acuminata.

Keywords: *Lymnaea acuminata*, embryonic development, freshwater snail, egg capsule, uncleaved zygote, polar body formation

Introduction

The snail plays a significant role in ecology as an ecosystem engineers in maintaining the health and functioning of ecosystems, the distribution and abundance of freshwater snaila are also influenced by the environmental components, such as water, temperature, turbidity, pH Dissolved Oxygen (DO), hardness, etc. Sanil also serve as intermediate hosts for parasites that causes diseases in both humans and animals (Mukherjee, 1986; Raut, 1986, Jahan and Rahman, 1996) [5, 9, 10]. Thus, its reproduction and embryonic development have direct public health impact. So, the study of embryogenesis and growth of L. acuminata not only contributes to understanding molluscan development biology also contribute in population control (Dube, *et al*., 2023) [3]. The morphological and behaviroural aspects of the development of Lymnaea well observed by (Morril, 1982, Voronezskaya *et al*., 1999) [8, 15]. They mentioned the mechanism of copulation, oviposition, breeding parameters like eggs, egg capsule, cleavage and larval development in P. gyrina and a detail observation on the egg capsule of fresh water pulmonates gastropods, its hatching from eggs by rupturing the egg membrane by their radula in L. stagnalis, physidae, *Lymnaeidae* and Planorbidae Bondesen (1950) [1]. L. acuminata undergo developmental stages of trochophore and veliger phases when in the egg capsule (Mescheryakov, 1990) [7] These egg capsules are transparent and allow easy observation they are fluid filled which supply the nutritional needs to the embryo.

Mollusca are widely used as experimental models as for their relatively simplicity in organization of various organ systems. They have been used as model animals, they are also choice of study for embryonic development (Canton and sloof, 1977; Browder, 1980; Victor and Balamban, 2001) [2, 14].

The present study focuses on the embryonic development of the *Lymnaea acuminata*, its egg structure, cleavage, blastula, gastrula, trochophore, veliger and hippo/ juvenile understanding its embryogenesis and early growth is essential for ecology, population control and parasitology. (Ruppert *et al*., 2004; Sarker *et al*., 2007) [12, 13] observed the stage by stage embroyonic development in the Lymnaea in the controlled laboratory conditions for comparing populations, and designing interventions that target vulnerable life stages.

Material and Methods

The specimens were collected from salim ali lake near Delhli gate, Chhatrapati Sambhajinagar, they were brought to laboratory and acclimated for 2-3 days, kept in plastic tub with containing tab water. The active L. acuminata was selected and separated in petri dish. The laid eggs were collected in the petri dish and observed under microscope the different developmental stages.

Result

Eggs were laid in the tub were collected in the patri dish, all the eggs in same egg mass and same developing stages, eggs were laid early morning, the number of eggs laid were 40-80 approximately. The eggs were oval in shape with transparent egg mass so the embryonic development was visible and easily taken image under microscope. The eggs were isolecithal with moderate amount of yolk in it.

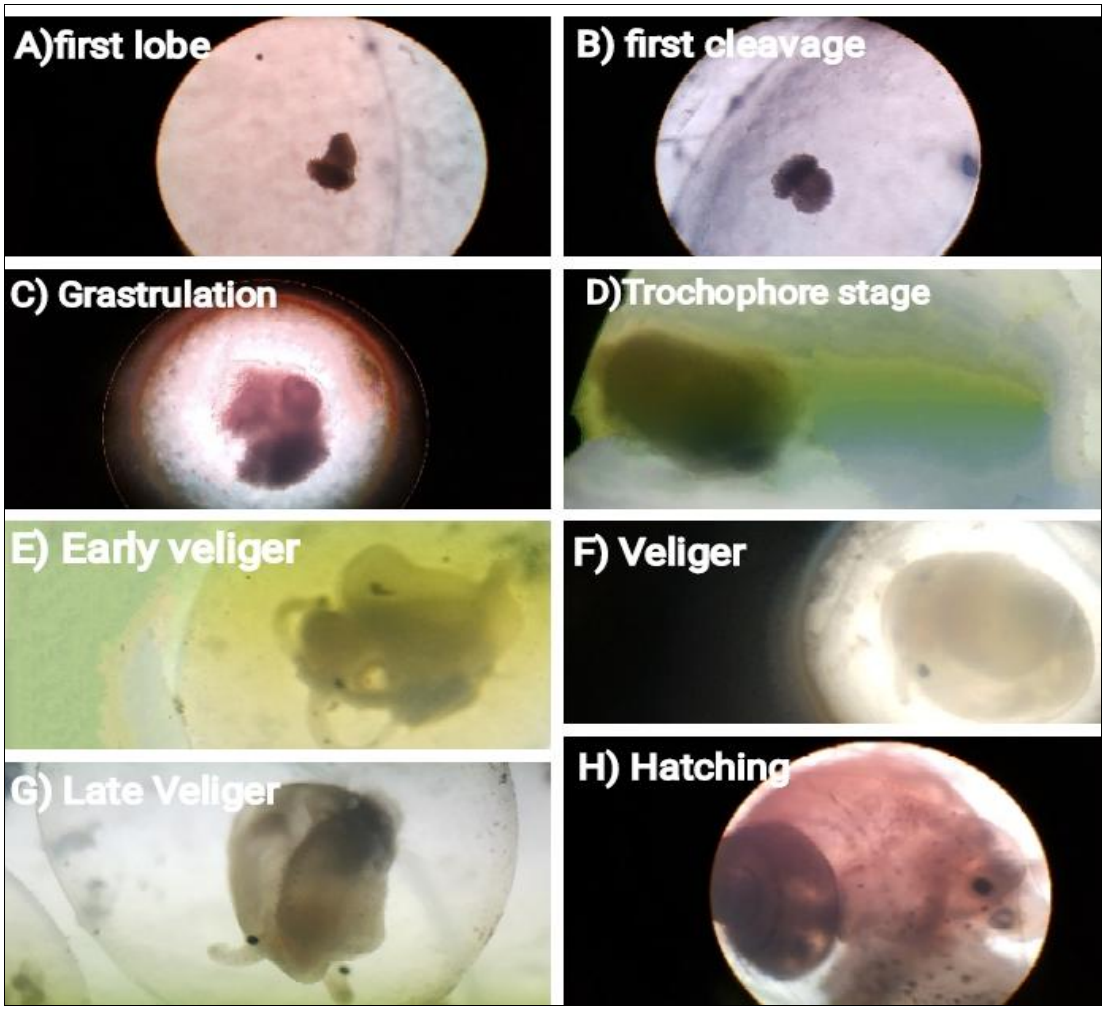

Fig 1: Image A, is first lobe, Image B. First cleavage, Image C, Grastulation 1-2 days, Image D. Trochophore, early veliger, veliger, veliger, Hatching

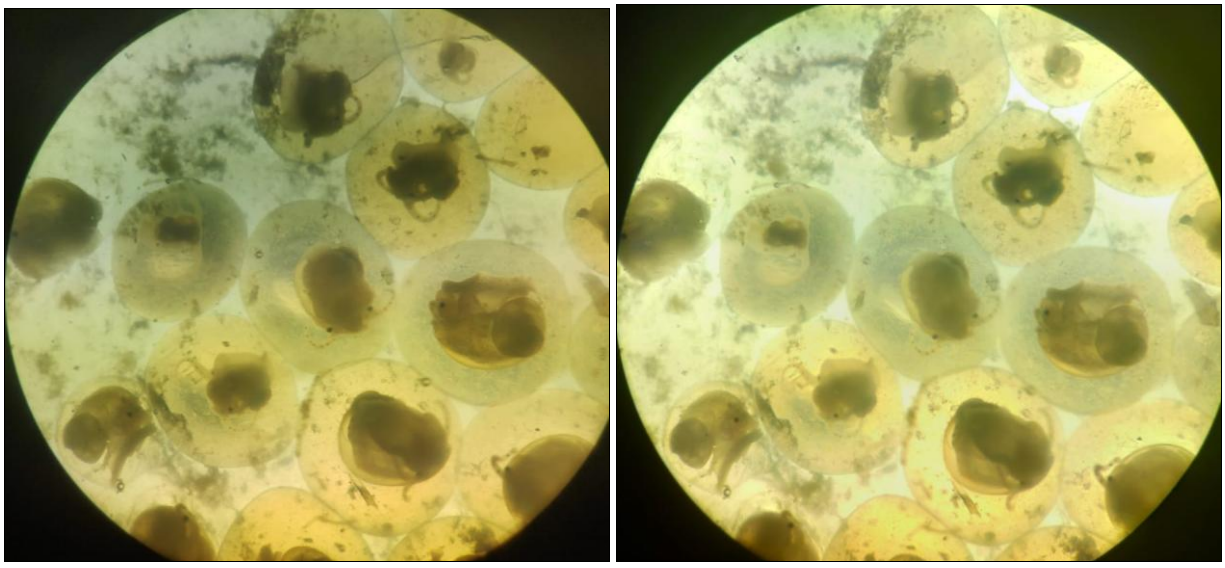

Fig 2: Image showing all the different developmental stages

Discussion

In the present study of embroyonic development the *L. acuminata* eggs laid in gelatinous egg capsules containing iso-lecithal eggs with clear animal and yolk-rich vegetal poles (Sarker *et al*., 2007) [13]. Cleavage with holoblastic pattern forming two cells, producing micromere/macromere quartets and occasional polar lobes (Ruppert et al., 2004; Sarker *et al*., 2007) [12, 13].

Sarker *et al*. (2007) [13] observed the extrusion of polar lobes at the time of the first cleavages: the first polar lobe and polar body appear within 15–25 minutes after laying, with the first cleavage following after polar-lobe within 115-130 minutes. After 5- to 6 hours post laying embryos reached 8–16 cell stages, with the subsequent cleavages yield trochophore type forms within 2–3 days under laboratory conditions (Sarker *et al*., 2007) [13].

The gastulation progress was not recorded embryo progress towards the appearance of the rudiment of the foot and rudiment in the velar area. On the 3-day begning of the trochophore and early veliger by 4 day with elongated muscle foot and shell gland, the shell gland forms early during veliger transition followed by secretion and coiling of shell (Sarker *et al*., 2007) [13]. The embryo showed the revolving movements like spiral which indicated the development of trochophore stage. The miniature snail with complete external structure by 6-7 days under favaourable condition, but under unfavourable condition the haching duration goes till 10-11 days in some studies (Sarker *et al*., 2007; Jigyasu and Singh, 2010) [6, 13].

Conclusion

L. acuminata follows certain embryonic development pattern from zygote, cleavage followed by trochophore and veliger like stages inside gelatinous egg capsule. It completes its embryonic development in 6-7 day in favourable condition.

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