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Research Article

EFFECT OF WATER TEMPERATURE ON EGG DEVELOPMENT OF COMMON CARP (*CYPRINUSCARPIO*)

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ABSTRACT

This experiment on effect of water temperature on development of common carp egg, was conclueter with common carp egg collected and incubated in three places Viz., Chinese hatchery, indoor plastic trough and outdoor plastic trough. The outdoor plastic trough was covered by a polythene sheet to keep the water warmer during day as well as at night. The holes were made in the polythene sheet to ensure sufficient aeration. The temperatures were recorded in the Chinese hatchery, indoor trough and outdoor trough were 23-25°C, 22-23°C and 26-29°C respectively. It could be observed that the eggs incubated in the outdoor trough hatched 3h earlier when compared to the eggs that are incubated in the Chinese hatchery and indoor plastic trough. This quicker hatching can be attributed to higher temperatures observed in the outdoor trough covered with polythene sheet.

INTRODUCTION

Fish reproduction is regulated by the environmental parameters. Generally, Indian major carps spawn during the south monsoon season, which is favorable for survival of the embryos and hatchling. Abiotic Environmental factors such as temperature, Dissolve oxygen, pH, rate of water flow have influence on successful breeding, hatching, survival and growth of fish. Temperature is the main environmental factor affecting the maturation and embryonic development of fish eggs. (Nwosu and Holzlohnev, 2000).Optimal temperature maintenance for common carp brood after inducement with hormone and egg incubation is necessary to maximize the fish seed production. It also determines certain morphological features, hatching rate and the behavior of larvae upon hatching (Bagenal and Braun, 1978). The temperature requirement varies intra-specifically and inter-specifically for various developmental stages such as spawning, hatching, embryonic, efficiency of yolk utilization, larval and adult development (Herzig and Winkler, 1986). The temperature requirements for the development of egg varies from species to species and hence it is important to determine the optimum temperature for the incubation of egg.

The common carp (*Cyprinuscarpio*Linnaeus (1758)) has been one of the oldest domesticated species of fish for food.It is the third most widely cultivated and commercially important freshwater fish species contributing to 9% of the world's total finfish aquaculture production (FAO 2013). Common carp has an excellent growth rate, omnivorous habit, breeding in confined waters, hardy nature and easy adaptation to artificial feeds. Best growth is obtained at water temperature of 23-30°C and can survive in cold winter periods. Common carp are omnivorous, benthic in nature and suitable for polyculture farming. Daily growth can be 2 to 4% of body weight (bw). Carps can reach 0.6 to 1.0 kg bw within one season in subtropical/tropical polyculture. Polyculture carp system is an old practice in South Asia, especially in India, Bangladesh and Pakistan, and it is the main aquaculture system in this region (Reddy *et al.,* 2002).In polyculture fish ponds, it grows to about 1 kg within one year. In a tropical climate, it spawns throughout the year while in the pond environment there are two peak periods: one between January and March, and the other during July and August. The eggs are minute and adhesive in nature, while in tropical conditions it achieves maturity within 12 months (Alikunhi, 1966).The study was planned to investigate the effect of water temperature in hatching of common carp egg.

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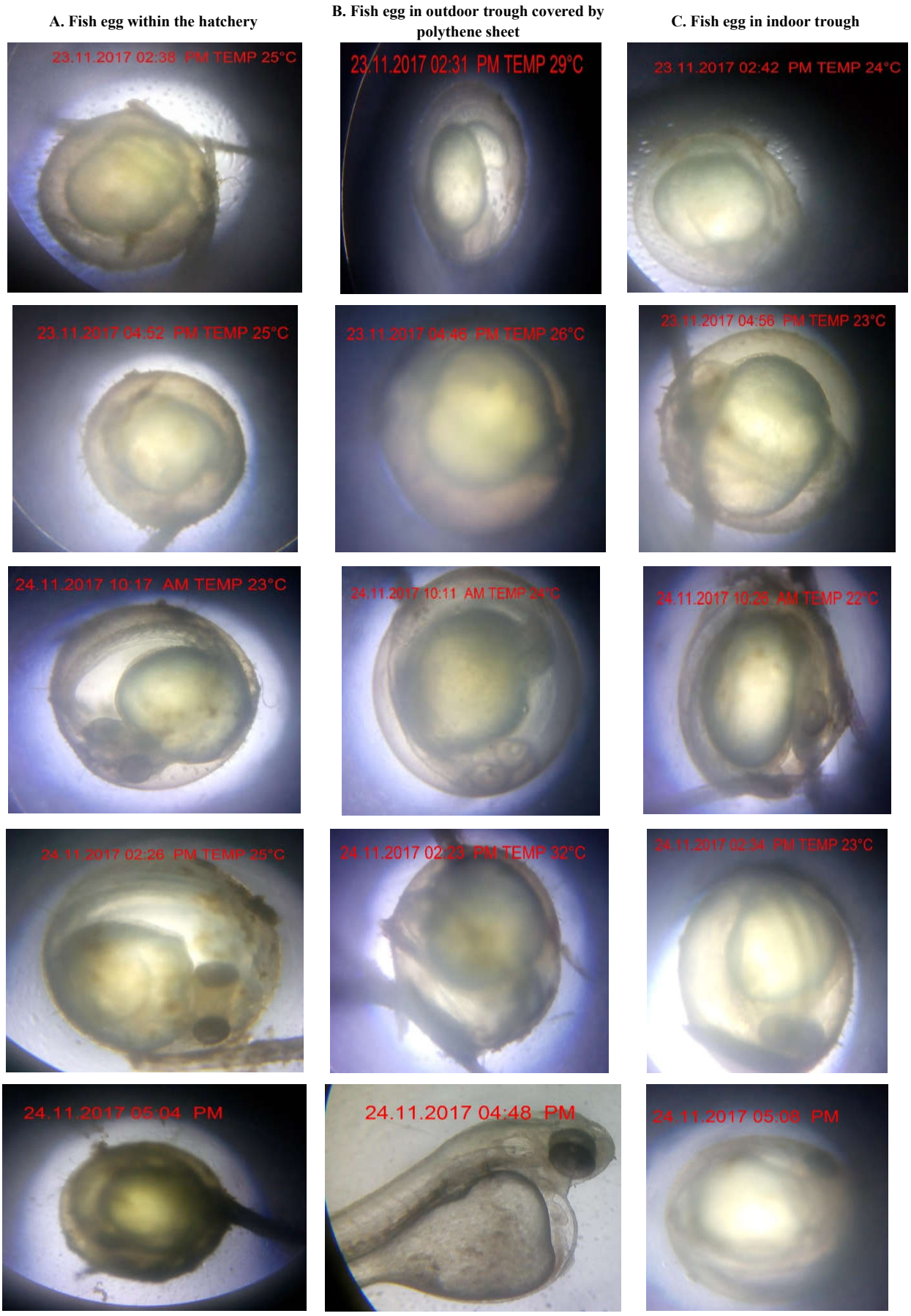

Fig 1 Different stages of egg development (A) Egg development within the hatchery; (B) Fish egg in trough placed outdoor covered by polythene sheet and (C) Fish eggs in trough placed indoor

MATERIALS AND METHODS

Experimental fish

The experiment was conducted on common carp (*Cyprinuscarpio*) in Erode Centre for Sustainable Aquaculture, Tamil Nadu Fisheries University, Bhavanisagar, Erode district. Matured common carp female with average body weight (BW) of 1.5 Kg ± 80 g and male of 750 ± 45gwere selected for breeding purpose.

Selection and handling of brood stock

Mature and healthy brooders at the ratio of 1:2 (Female:Male) were selected according to the ripeness of females and milt oozing condition of the males, for the breeding purpose. The collected brood stock was then transferred to the spawning hatchery.

Hormone administration

WOVA-FH was used as the hormone for induced breeding of fish. It was procured from the firm biostadt India limited, Mumbai and is available in liquid form in bottles. It is combination of Salmon Gonadotropin Releasing Hormone Analogue and Domperidone Injection. Recommended dose for female and male is 0.1-0.3 ml/kg and 0.3-0.5 ml/kg body weight respectively. The hormone was injected in base of the dorsal fin. The dose of WOVA-FH injection was administered in the evening around at 4 P.M.

Breeding and spawning

After administration the hormone to the fish was released into the Chinese hatchery in the ratio of 2:1 (Male: Female). The spawning takes place 16 h after injecting the hormone. To the Chinese hatchery floating aquatic weed water hyacinth (*Eichhorniacrassipes*) was added as a medium for egg adhesion.

To understand the influence of temperature, it was planned to conduct an experiment with three experimental units. One was the control, the hatching tank used for breeding, the other was a plastic trough with eggs, and kept in door in the lab. For the last unit, another plastic trough was taken with eggs, covered by a polythene sheet. This polythene sheet which would entrap heat and keep it warmer than the other two experimental tanks by trapping heat during day. Holes were made at several places in the sheet to ensure sufficient oxygenation of the water in the plastic trough. Temperature was monitored once in three hours and egg development was also observed with a light microscope.

RESULT AND DISCUSSION

After spawning the common carp eggs get attached to the roots of *Eichhorina* due to its sticky nature. The experiment was conducted in three tubs each with freshly spawned common carp eggs attached to the *Eichhorina* roots. These three tubs were placed in three place Viz., the hatchery (the temperatureranged between 23 - 25°C), the outdoor tub (the temperature is ranged between 26- 28°C) and the indoor tub (the temperatureranged between 22 - 23°C). Once in three hours the development was noted until hatching.

The common carp eggs which was kept in the outdoor hatched 3 hours earlier when compared to the eggs that are trough kept in indoor trough and Chinese hatchery. The common eggs that are kept in Chinese hatchery, indoor trough and outdoor trough the temperature was maintained around 23-25°C, 22-23°C and 26-29°C respectively. This was in accordance earlier reports recording the optimum temperature for the embryonic development of common carp being 26-28°C for better development, growth and survival of common carp (Kossakowski, 2008). Similarly, more authors studied the range of temperature used for incubation of common carp in the hatchery was24-30°C by El-Hakim, El-Gamal (2009), 25-28°C by Rothbard and Yaron (1995), 23°C by Horvath *et al*. (1992), 20-25°C by Ouyang Hai (1991) and22-24°C by Albrecht (1986). Temperature affects the quality, size of eggs produced and survival rate of larvae (Kupren *et al.,* 2011; Nowosad *et al.,* 2014). Increase in water temperature leads to decrease in the hatching duration and earlier hatching of *C. carpio*eggs (Usman *et al.,* 2015). The percentage of hatchability of eggs and incubation period decreased with increase in temperatures from 26 to 30°C (Sapkale *et al.,* 2011). The other water quality parameters such as dissolved oxygen, pH and ammonia may not have significantly influenced hatching period and the decrease in hatching period is highly attributed to temperature increase (Valeta *et al.,* 2013**)**. So the temperature is an important factor determining egg and larval development as it influences metabolic rate (Blaxter, 1992; Kamler, 2008) and cellular function (Somero and Hofmann, 1997). Increase in temperature is known to speed up metabolism through biochemical activity stimulated by heat energy (Beveridge and McAndrew, 2000) which results in enhanced development of the fish eggs. Thus it could be concluded that keeping the hatching tank little warmer would improve the rate of egg development and also fasten the hatching process.

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