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A COMPARATIVE STUDY ON THE HATCHING OF COMMON CARP EGGS IN HAPA AND HATCHERY (MODEL CIFE D-80)

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ABSTRACT

Common carp eggs were incubated to study the efficiency of hatching in hapa and hatchery. During incubation period the recorded temperature was 21–28°C and 20–31°C, dissolved oxygen 6–9 ppm. and 3-5 ppm., total alkaljnity 180–250 ppm. and 28-62 ppm. respectively in the hatchery (model C.I.F.E. D-80) and hapa. CO_2 was totally absent in the hatchery, but recorded 3–10 ppm. in the hapa. The flow of water was maintained at 1.25 l/minute/jar in the hatchery. Under the above environmental conditions the eggs hatched in 42–51 hrs. in the hatchery and 61–81 hrs. in the hapa from egg to spawn thereby establishing the hatchery to be a better hatching system for carp eggs

INTRODUCTION

The environmental conditions under which Indian major carps breed were studied by Mookerjee (1945). Subsequent research has led to the development of vertical jar hatchery in which eggs were kept floating. Studies conducted at C I.F.E. indicated that the temperature, silt, dissolved oxygen, pH CO_2 have an important role in determining the development and hatching of the fertilized eggs. Earlier researchers have demonstrated that the increase in temperature accelerates the metabolic activity of thc developing embryos and reduces the hatching time (Hayes, 1949; Kinne & Kinne, 1962). The temperature fluctuations cause wide variation in mortality of developing eggs the experiments conducted at Fresh Water Fish Farm, Balabhadrapuram, during 1974-79 have shown that higher temperature causes mortality of fertilised eggs (Personnel communication, Dwivedi & Sinha). The dissolved oxygen plays a very important role on the development (Kinne & Kinne, 1962; Silver *et al* 1963). Alderdice et al. (1958) have shown retardation of salmon eggs caused due to the low dissolved oxygen level. A richly oxygenated environment accelerates the embryonic development (Kinne & Kinne, 1962).

In order to assure supply of oxygen to the developing eggs water flow is also essential because oxygen in a still medium can not be supplied by diffusion alone. Wickett (1954), working on fish eggs found high mortality when water flow was less. Water is believed to accelerate the development of the salmonid eggs by delivering oxygen to surface on the chorion (Silver, *et al.* 1963). In turbid water the developing eggs or embryos as well as food organisms may be smothered, by deposits of silt (Smith, 1957). In addition, coordination present in the natural breeding grounds were also studied. The common important factors are cloudy weather, low temperature, freshwater rich in oxygen and flow of water due to the rain. There are other parameters also but they have not been considered essential for these experiments.

MATERIALS AND METHODS

In order to develop a controlled system, efforts were made to create conditions which are generally present in natural breeding grounds. In addition, other extraneous substances like silt, sediment load and metabolites produced during the process of embryo development which can have adverse effect on hatching were removed The controlled carp hatchery model (CIFE D-80) and hatching hapas were used to conduct the experiments.

The experiments were conducted at Khutela Bhata Fish Seed Farm, Durg, (M P.) in February 1981. The hatchery at Khutela Bhata consists of water tanks, vertical jars and feeder channel. The spawn from hatching jars flows into a common duct and is collected in a plastic pool. The unit consists of triple layer LDPE (low density polyethylene) containers. They are poor conductors of heat, unbreakable, noncorrosive, easy to clean and are light in weight. The water in hatchery was taken from a tubewell and pumped into overhead tanks. In these overhead tanks compressed air was diffused to raise the level of dissolved oxygen. The overhead tank had a common duct to feed the individual hatchery jars directly. The rate of water flow was regulated through main and subsidery valves and mild aeration was used in these jars. Due to aeration enough supply of oxygen was assured for developing embryos.

Later common carp breeding was conducted. For breeding, one female and two males were introduced in a breeding hapa at 6 p.m. when temperature of water was 28°C in the pond. The water hyacinth was used as a substrate for the egg fixation. Breeding took place at 4 a.m. and eggs were allowed to remain in the hapa for water hardening. As soon as breeding took place the hatchery was also put into operation so that environmental conditions of temperature,

oxygen water flow were stabilized. The oxygen of tubewell water was 0.8 ppm. This water was stored, aerated and dissolved oxygen raised to 6 ppm. The rate of water flow was adjusted to 1.25 l. per minute in each jar and hatchery was ready to receive the eggs. The total quantity of weeds along with eggs were divided into two equals. The first half of the weeds were distributed in 6 hatchery jars. There were approximately equal number of eggs in all the jars. The second half of the weeds were distributed in three hapas which were fixed in same breeding pond. In order to obtain a comparative picture during the experiment the water from hatchery and hapa were analysed for the estimation of dissolved oxygen, carbon-dioxide and total alkalinity (Table).

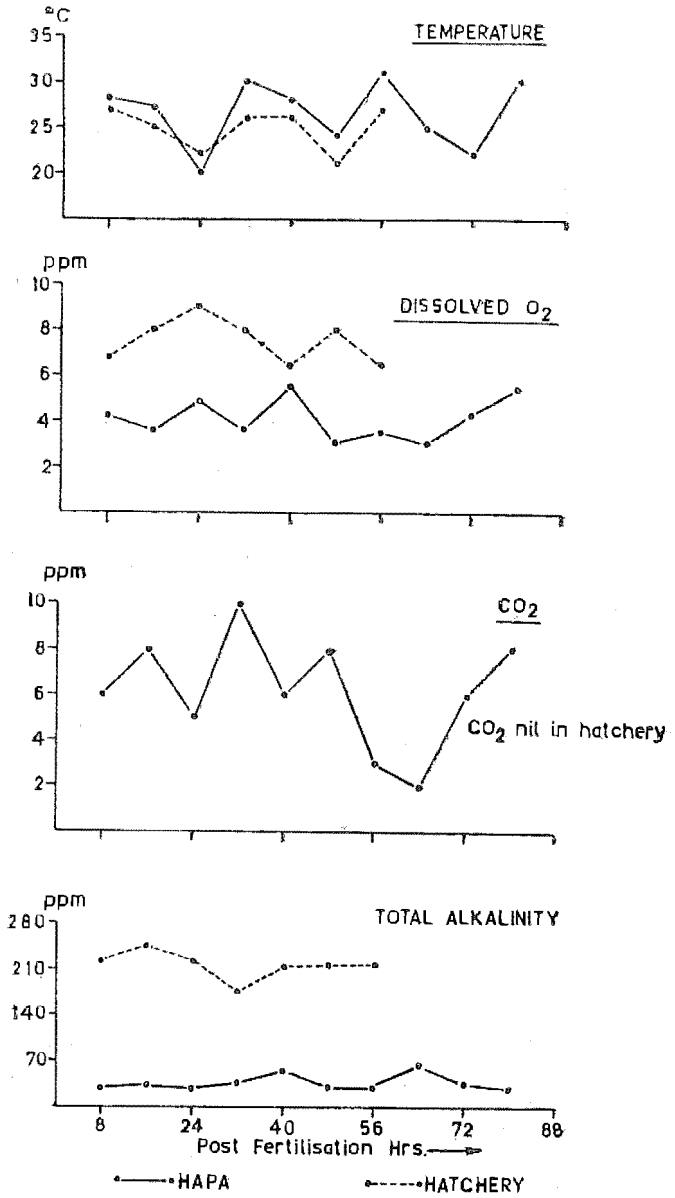
Table : Comparative study of hatching in Hatchery and in Hapa

	Experiment no-1		Experiment no-2		Experiment-3		Mean	
	Hatchery	Hapa	Hatchery	Hapa	Hatchery	Hapa	Hatchery	Hapa
No. of eggs/litre	285	30	285	30	285	30	285	30
Hatching time in hours	42-52	62-80	43-50	60-82	42-50	61-80	42-51	61-81
Hatching %	92	60	95	62	90	60	92	61
Temperature range °C	21-27	20-28	21-28	20-30	21-28	20-31	21-28	20-31
DO ppm.	6-8.5	3-5	6-9	3.4-5	6-9	3-5	6-9	3-5
Co_2 ppm.	nil	3-9	nil	3-10	nil	3-10	nil	3-10
Total alkalinity ppm	190-240	30-60	180-250	28-62	180-240	28-62	180-250	28-62
Water flow in litre/minute	1.25	nil	1.25	nil	1.25	nil	1.25	nil

RESULTS AND DISCUSSIONS

The comparative study shows major increase in the rate of the egg metabolism and hatching percentage. In the hatchery jars hatching started 42 hours after fertilization and was completed within 52 hours. The total hatching rate was more than 95% and the temperature range was 21-28°C. In the hapa hatching started 60 hours after fertilization and continued upto 80 hours. The hatching rate was 61% and the temperature range was 20-31°C.

The results clearly indicate that controlled conditions are favourable which results in reduction of 20 hours in hatching period by Vertical Jar Hatchery (Model CIFE D-80). This model proved ideal by manipulating the environmental conditions and stabilizing the environment, and metabolism of the developing embryos is increased. This in turn resulted in reduction of hatching period. The technique can be adopted for increasing carp seed production at the fish seed farms in the country.



COMPARATIVE STUDY OF HATCHING TIME IN HATCHERY & HAPA

The commercial model of the hatchery has been developed by the Institute through M/s. Sinterplast Containers, Kalol, North Gujarat, which has been installed at different parts of India. The system add new dimensions to increase the fish seed production. It may be pointed out that fish seed requirement in India is about 16 billion fish fry whereas our production is only one billion, therefore the hatchery is extremely useful.

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