Breeding Practices and rearing response of *Clarias gariepinus* under hatchery condition

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The breeding goal of any hatchery programme should be to adopt methods that will produce good quality and quantity seed which can survive better, grow faster and adverse environmental conditions. This study was conducted to determine the artificial breeding performance and early larvae rearing with application of optimum dosage of stimulatory materials ovaprim hormones, HCG and PGCH for induce spawning rate in *C. gariepinus* at private catfish hatchery. The series of three experimental diet and feeding level on the growth performance and survival rate of first-feeding larvae was assessed. Decapsulated Artemia, custard cake formulation and fresh water zooplankton was tested in triplicate. 9 plastic trays was used, 4 days hatched larvae (0.023 g) was stocked at 250 /L. The breeding performance was determined on base of quantity of eggs obtained, fertilization, hatchability and survival rate %. While growth performance was determined on the basis of weight obtain and survival rate %. The result reviled that stimulated with OH obtained better eggs quantity (20647) followed by HCG (16630), while the lowest quantity (6598) was in PGCH. The fertilization and hatchability was not affected by the hypofaisation materials (p>0.05). The growth performance of early larvae showed significant variations (p<0.05) between feeds item. The survival rate was significantly affected by feed type. The highest survival rates (53.5%) observed when Artemia used followed by (50.9%) custard cake, while the lowest (33.1%) in case of zooplankton depend.

**Key words:** Breeding, Clarias gariepinus, Larvae, growth performance

**Introduction**

Now a day's African catfish *Clarias gariepinus* is an important species in an aquaculture practices among Sudanese farmers. The preferably may refer to several advantage such as a wide feeding range, fast growth, resistance to low oxygen concentration and high tolerance to environmental condition which is considerable easier for producers (Ibrahim, 2016; Hagar, 2017). The only one source and supply of catfish fry and fingerlings is comes from natural resources, which is may results many problems such as mix species, size considered, diseases transfer and growth stunting due to hardy adaptable to harsh environment (Hagar, 2015). However, the lack of adequate technical practice in breeding and early rearing larvae constitutes a prohibited for sustainable production. For this consideration many studies was done to produce larvae through induce breeding by using stimulatory (Mehdi and Mousavi, 2011; Mylonas et al., 2010.). While bottleneck are the mortality and loss during incubation, early feeding and cannibalism among larvae, juveniles and fries and deformity during this stage Verreth. (1994). According to (Ibrahim, 2016) high mortalities during the catfish larval rearing period are common. These mortalities are often related to feeding practices which do not meet the nutritional requirements of the larvae. To overcome this problems, there is need, therefore, for development in certain aspects of rational nursing and rearing techniques of hatching larvae for their quality and quantity production. While there is many efforts regarding with this attempt but a research gap has been a seriously found for suitable breeding, nursing and rearing technique for *C. gariepinus*. Therefore, in the present study, stimulation

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Materials and Methods

Study area and maintenance of brooders

This trial was conducted at private hatchery, located at Jabil Aulia locality, Khartoum, Sudan. The C. gariepinus used for the trial originally obtained from the White Nile. A total of 30 pair of sexually mature healthy brood stock one year old(949 – 978 g) were collected. Fish were divided in to three groups 10 pair in each. The selected brood stock were sexually distinguished the readiness spawning on basis of external features and release of eggs upon gentle pressure on the abdomen as suggested by Verreth. (1993).Selected fish treated with 1mg/L KMnO4 and kept in fiberglass tanks (1000 L) with well aerated and conditioning environment for acclimatization period. Fish were fed with commercial catfish feed (37% crude protein) at 2% of their body weight daily. Water in each tank was gradually replaced every 48 hours with fresh dechlorinated water.

Hormonal preparation and dose administration

One group was injected with ovaprium hormone (OH), second group was treated with Human Chorionic Gonadotropin (HCG) while in the third group the homoplastic hypophysation acetone dried pituitary gland crude hormone (PGCH) were prepared and used. The dose according to the (Ferman and Volivar, 1991). Table 1 mentioned the stimulatory substances and their doses and method of application. Various doses were followed in the experiment intramuscularly. The induction and administration of the hormones dose were done between 6pm and 7pm in the same day. Each injected fish was returned into it is tank.

Egg, milt collection, evaluated and fertilization

8 hours later after injection the stripping of matured eggs took place. The milt could not be obtained from the males by stripping, probably because of the testicular anatomy, a number of 30 male were sacrificed and their ready testes were collected and cute into several pieces and pressed gently by a cloth to collect the milt for immediately used. Before fertilization take place the total weight of eggs was measured, the number were count and the percentage to female body weight were evaluated. The stripped eggs and milt were mixed thoroughly in a plastic bowl with gentle shake for five minutes. Each stripped eggs was fertilized separately. Before incubation the dried fertile eggs were soaked in 5% NaCL to dissolve the matrix tissue which holds the eggs together and allows the eggs to move freely as individual eggs. The eggs were cleaned thoroughly 3 times with hatchery water to eliminate the dissolved matrix tissue or mucus and debris, any dead eggs. Incubation of fertilized eggs was carried out in 3 woody trays (65×40×10 cm), with nylon mesh net (0.8mm) suspended at the bottom floor of the trays for spreading of the fertilized eggs. Each tray in hatching system was equipped with an aerator and a water flow system. Hatching occurred after 25 – 35 h later. The hatching larvae depends on their yolk as feed source until completely absorbed within 2 to 3 days. In day 4 the tray were removed with the egg shells and un-hatched eggs. While the hatched larvae clustered at dark corners of the incubation tank with black sheet cover. Aeration was supplied continually; water temperature, pH and dissolved oxygen were adjusted at 28±10C, 6.95 and 4.9 mg/l, respectively. Determination the weight of stripped eggs, the percentage of eggs weight to female body weight, the number of eggs, fertilization %, hatchability % and the survival rate % according to Ibrahim (2016).

Nursing and rearing of larvae

After four days from hatching larvae the first nursing and rearing stage was carried out in 9 plastic trays (70×40×15 cm). Three feeding type decapsulated Artemia, custard cake formulated (48.8% crude protein) and fresh filtered Zooplankton were prepared, formulated and tested to evaluate the rearing performance and survival rate of 4 days hatched larvae (0.023 g).The fish larvae was distributed and stocked at 250 /L, each experimental diet was tested in replicate group. The larvae were kept in darkness and fed to excess 5 times per day. During the experiment, water temperature was maintained between 27 and 29 °C, dissolved oxygen ranged from 6 to 7 mg/l. the tanks of fish group fed with custard cake was cleaned twice daily by siphoning off the feces and uneaten food. On the last day of the rearing period, each fish (45 Days old) per tray was weighted. Other growth parameters were measured such as final weight, weight gain and relative growth rate. Survival rates were determined by counting all the remaining fish in each tank. Every three days from starting of experiment, 100 larvae from each tank were randomly sampled and individually weight using electronic top loading balance.

Statistical analysis

The data on breeding performance and nursery practices were statistically analysis used SPSS program, all
experiments were done by one way Analysis of Variance (ANOVA) and Duncan’s test to determine differences between the means.

Results and discussion

Seed production

The stimulation and hypofaisation of *C. gariepinus* female OH, HCG and PGCH showed significant differences (p<0.05) in some reproductive performance Table 2. The result reviled that a large quantity of eggs were found in T1 (20647) (68.1g), while the lowest number of eggs was observed in T3 (6598) (21.1g). The fertilization and hatchability percentage of eggs was not affected by the hypofaisation materials used (p>0.05). The present study confirmed the findings of Nwokoye et al. (2007); Haniffa and Sridhar (2002); Mehdi and Mousavi (2011) and Mylonas et al. (2010). Nwokoye et al. (2007) reported percentage fertilization of 98.31% and 96.01% for *C. gariepinus* induced ovaprim and HCG respectively. They stated that ovaprim was more economical than HCG for producing catfish larvae and greatly expand the commercial production of African catfish larvae. There are some advantages of ovaprim application such as repeatable application with cut down efficiency, coupled with action at a higher level on the hypothalamus pituitary gonadal axis, and ovaprim can be synthesized in pure form (Chatakondi et al., 2011). Other research finding a proved that low ovulation and survival rate percentage of *C. gariepinus* larvae has been after injected with PGCH extract (Mehdi and Mousavi, 2011). Adebayo (2006) reported that the fertilization rate of pure breed *C. gariepinus* and the hybrid one induced with ovaprim and HCG resulted in high % 88.4% and 60.3 respectively, with low % of fertilization 35.2% and 31.9 respectively. Biochemically ovaprim induces the secretion of luteinizing hormones (LH), stimulating finaluocyt maturematuration and ovulation (Zohar and Mylonas, 2001). Although HCG and PGCH are the most widely used hormones to inducefish spawning, their drawbacks were variability in its quality, limitedsupplies, action on a lower level in the hypothalamus pituitary gonadal axis, and probability to transmit disease from donor to recipient fish receiving PGCH (Dunham et al., 2000 and Chatakondi et al., 2011). Because of these disadvantages purify catfish pituitary in sort of OH was developed to inducespawning in catfish (Green and Yant, 2011). The survival rate of hatchlings from hatching up to two days excluding deformity percentage was significantly affected by different hypofaisation materials used (p<0.05) the high survival rate resulted in T1 followed by T2 and T3. These results were close to the rate of survival of hatchings of 49 to 58.7% recorded by Rahmatullah et al. (1983) in *C. batrachus* and Dunham (2012) in *C. gariepinus*. Previous studies on *C. gariepinus* larvae production had hatching rates ranging from 20 - 57.1% (Kristanto, 2004; Hutson, 2006; Ballenger, 2007; Phelps et al., 2007 and 2011; Durland et al., 2009 and Kristanto et al., 2009). The current finding was higher than that obtained by the above authors.

Larval rearing:

The nursery and rearing management stage of *C. gariepinus* larvae was carried out after completely absorbed of yolk sac and fry larvae conditionally start to feed. The growth performance and survival rate of *C. gariepinus* larvae at rearing investigation Table 3 showed highly significant variations among the different feed items (p<0.05). In respect of final weight, weight gain and daily weight gain of larvae the highest value was obtained at larvae fed decapsulated Artemia and the lowest was in freshwater zooplankton feed depended. The given results confirmed those of (De leeuw, 1985); (Emata, 1993) and (FAO, 1996). The survival rate of larvae was significantly affected by different feed type. The highest survival rates of larvae (53.5%) was observed when decapsulated Artemia was used followed by (50.9%) custard cake, while it was the lowest (33.1%) when freshwater zooplankton are used. This agreed with the findings of Duray and Bagarino (1984); (Emata, 1993), that live organisms such as Artemia, reduces mortality thereby increasing survival rates of early stages of catfish. On the other hand Alam and Mollah (1988) reported that catfish larvae fed on live fed (Artemia and zooplankton) exhibited significantly superior growth than artificial feeds. The 53.50% survival rate for larvae fed Artemia diet in this study was higher than 44.32% recorded by Lamai (1999). Alam and Mollah (1988); Ovie (2003) and Saengphphan (2005) observed that the growth and survival of fish larvae and fry are enhanced when fed live forms of planktons. The regular mortality observed in the first week of this study could be attributed to the

<table>
<thead>
<tr>
<th>Group</th>
<th>Ovulation stimulator</th>
<th>Dose per 1 kg of female body weight</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>OH</td>
<td>0.5 ml × 4 times distilled water</td>
</tr>
<tr>
<td>2</td>
<td>HCG</td>
<td>0.5 IU per g body weight</td>
</tr>
<tr>
<td>3</td>
<td>PGCH</td>
<td>1 pituitary from donor fish has similar weight with recipient fish</td>
</tr>
</tbody>
</table>

Table 1. Substances used as ovulation stimulators, their doses and method of application.
critical period of changing the feeding from yolk sac to preying on exogenous feed and/or to stress during transfer from the incubation to the rearing tanks as suggested by Guoxiong (1997) and Hagår, (2017). The water quality parameters were within desirable range for survival and growth of fishes suggested by Haylor (1992), who recommended that temperatures of 25°-30°C is adequate for freshwater fish rearing. However, it was observed that after feeding with custard cake diet, the water became cloudy and this created pollution and imbalance in nutrient content of the custard cake, hence lowering the growth rates and increasing mortalities. Several problems were associated with natural live feed organisms such as availability (Saha et al., 1998). Such problems many hatchery technician dependence on formulated feed (Henken et al., 1986 and Girriet et al., 2002). Some researchers argued that many fish larvae fed with formulated feed attend poor growth and lower survival rates. Such fish can be included C. gariepinus larvae (Hagår, 2017), Cyprinidascarpio (Szlaminskaans Przybyle, 1986), Clariasmacrocephalus, (Fernin and Bolivar, 1991), Clarias batrachus. (Giri et al., 2002), Pletobagrusfulvidraco (Wolnickiet al., 2005).

Finally can concludedthat the nutritional and feeding types are appear to be the corner stone and key factors for successful larval rearing. In catfish larval diets many alternative feeds type may selected according to availability and economic wise depend on survival rate obtain.

### References


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### Table 2. Reproductive performance of C. gariepinus female treated with T1 (OH), T2 (HCG) and T3 (PGCH). (Means ± SE).

<table>
<thead>
<tr>
<th>Variable</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of fish before spawning (g)</td>
<td>949.40± 57.6</td>
<td>978.60± 59.2</td>
<td>987.0± 62.6</td>
</tr>
<tr>
<td>Weight of fish after spawning (g)</td>
<td>881.25± 59.4</td>
<td>922.5± 61.8</td>
<td>965.8± 59.7</td>
</tr>
<tr>
<td>weight of eggs (g)</td>
<td>68.1± 6.3</td>
<td>56.0± 8.1</td>
<td>21.1± 3.7</td>
</tr>
<tr>
<td>Eggs weight to female body weight %</td>
<td>7.5± 0.9</td>
<td>5.9± 1.1</td>
<td>2.06± 0.3</td>
</tr>
<tr>
<td>Number of eggs</td>
<td>20647± 1961</td>
<td>16630± 2393</td>
<td>6598± 1208</td>
</tr>
<tr>
<td>Fertilization %</td>
<td>87.4± 1.3</td>
<td>87.4± 1.3</td>
<td>89.7± 1.0</td>
</tr>
<tr>
<td>Hatchability %</td>
<td>84.2± 2.1</td>
<td>85.6± 2.7</td>
<td>86.3± 2.5</td>
</tr>
<tr>
<td>Survival rate %</td>
<td>59.4± 4.9</td>
<td>51.0± 4.5</td>
<td>39.7± 6.1</td>
</tr>
</tbody>
</table>

Means with similar superscripts in a raw are statistically significantly indifferent (p>0.05); those with different superscripts are statistically significantly different (p<0.05).

### Table 3. Growth performance of C. gariepinus larvae fed different feeds. (Means ± SE).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Artemia</th>
<th>Custard Cake</th>
<th>Zooplankton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight g</td>
<td>0.022± 0.004</td>
<td>0.023± 0.002</td>
<td>0.024± 0.003</td>
</tr>
<tr>
<td>Final weight g</td>
<td>0.608± 0.038</td>
<td>0.342± 0.034</td>
<td>0.230± 0.021</td>
</tr>
<tr>
<td>Weight gain g</td>
<td>0.586± 0.038</td>
<td>0.319± 0.034</td>
<td>0.207± 0.024</td>
</tr>
<tr>
<td>Daily weight gain g/d</td>
<td>0.013± 0.001</td>
<td>0.007± 0.001</td>
<td>0.005± 0.001</td>
</tr>
<tr>
<td>Relative growth rate</td>
<td>96.5± 0.4</td>
<td>93.2ab± 0.8</td>
<td>89.4b± 2.1</td>
</tr>
<tr>
<td>Survival rate %</td>
<td>53.5± 5.6</td>
<td>50.9± 2.7</td>
<td>33.1± 5.8</td>
</tr>
</tbody>
</table>

Means with similar superscripts in a raw are statistically significantly indifferent (p>0.05); those with different superscripts are statistically significantly different (p<0.05).


temperature on the induced spawning of channel catfish and the production of channel xblue catfish hybrid fry. Aquaculture 273: 80-86.


