Journal of Animal and Veterinary Sciences
2018; 5(1): 1-5
http://www.openscienceonline.com/journal/javs

Open Science

Effect of Different Doses of Ovulin Hormone on the Induced Breeding Performance of *Clarias gariepinus*

Hassan Faruk Maradun[1, *], Faruk Umar[2], Adamu Ibrahim[3], Ahmad Mubarak[1], Ibrahim Jabbo Zarau[4], Sahabi Abdurrahman Muhammad[1]

[1]Department of Fisheries and Aquaculture, Usmanu Danfodiyo University, Sokoto, Nigeria

[2]Department of Water Resources, Aquaculture and Fisheries Technology, Federal University of Technology, Minna, Nigeria

[3]Department of Biological Sciences, Kebbi State University of Science and Technology, Aliero, Nigeria

[4]Aquaculture and Biotechnology Programme, National Institute for Freshwater Fisheries Research, New Bussa, Nigeria

Email address

mrhafam@yahoo.com (H. F. Maradun)

[*]Corresponding author

To cite this article

Hassan Faruk Maradun, Faruk Umar, Adamu Ibrahim, Ahmad Mubarak, Ibrahim Jabbo Zarau, Sahabi Abdurrahman Muhammad. Effect of Different Doses of Ovulin Hormone on the Induced Breeding Performance of *Clarias gariepinus*. *Journal of Animal and Veterinary Sciences.* Vol. 5, No. 1, 2018, pp. 1-5

Received: March 6, 2018; **Accepted**: March 22, 2018; **Published**: April 27, 2018

Abstract

The study was conducted to determine the effects of different doses of ovulin on the induced breeding performance of *Clarias gariepinus*. The experiment was set up in a completely randomized design (CRD). 12 broodstocks were used for the experiment (9 females, 3 males) and the broodstock were distributed into three treatments (Treatment A was injected with 0.3ml/kg, Treatment B was injected with 0.5ml/kg and Treatment C was injected with 0.7ml/kg) and each treatment was replicated three times. The result showed that Treatment C had the highest mean values for fertilization rate (88.12%) and was significantly different from the other treatments. It also has higher value for Hatching rate (82.07%) but lower rates for larval survival (83.60%). Treatment B had the highest value for larval survival with 85.20% followed by Treatments A and C with mean values of 84.23% and 83.60% respectively. The present investigation demonstrated that *C. gariepinus* can successfully be induced to ovulate at 0.3ml Ovulin per kg body weight, lower than the recommended 0.5ml/kg dosage, ensuring high quality eggs and more normal larvae.

Keywords

African Catfish, *Clarias gariepinus*, Induced Breeding, Synthetic Hormone, Ovulin

1. Introduction

The African Catfish is widely considered as the leading cultured fish in Nigeria. Some of the credentials of African catfish are: high growth rate reaching market size of 1 kg in 5–6 months under intensive management conditions: highly adaptable and resistant to handling and stress; can be artificially propagated by induced spawning techniques for reliable mass supply of fingerlings; commands a very high commercial value where it is highly cherished as food in Nigerian homes and hotels (Olaleye, 2005; Megbowon *et al.* 2013). According to Ezenwaji (1985); Oladosu *et al.* (1993) African catfish (*Clarias*) is the most sought after fish species among fish farmers and consumers because it commands a very good commercial value in Nigerian markets.

The success of fish farming enterprises is premised by the availability of good quality fish seeds. This is because as the marketable adults are sold out from the farm, young ones are provided to replenish the stock for the sustenance of the business. In recent past, the source of fingerlings has been collection from the wild, i.e. natural waters, but the difficulties and problems associated with this method of fingerlings procurement such as; being laborious, seasonality

in availability, time consuming, disease infestation and uncertainty in the species collection, unreliability with respect to sustenance of commercial fish farming (Shepherd, 1988; Dada *et al*., 1994).

Artificial propagation of fish, especially catfish, therefore, remains the most promising and reliable way of ensuring availability of good quality fish seed all year-round. African catfish hardly reproduces in captivity (Howerton, 2001). But with the popular induced breeding (artificial method of spawning, incubation and hatching of eggs under controlled environmental conditions) technique, has been made possible to produce fish seed all year round (Ayinla, 1988). The various hormones used in induced breeding of African catfish include pituitary extract or hypophysis from similar or different fish, Deoxycorticosterone Acetate (DOCA), Ovaprim, Ovulin, Ovatide, Human Chorionic Gonadotropin (HCG), Ovopel, Dagin and Aquaspawn (Brzuska & Adamek, 1999; Cheah & Lee, 2000; Zohar & Mylonas, 2001; Adebayo & Popoola, 2008). The commercially available synthetic inducing hormones in readymade form containing GnRH and dopamine blocker receptor (ovaprim, ovopel, dagin and aquaspawn) are becoming very popular and found to be efficient in successful spawning of fishes. Several studies have been reported on testing the effectiveness of using different doses of these synthetic hormones for induced breeding of catfish (Olubiyi, *et al.* 2005; Sahoo, *et al.* 2005; Achionye-Nzeh & Obaroh, 2012; Shinkafi & Ilesanmi, 2014; Hafeez-ur-Rahman, *et al.* 2015; Marimuthu, *et al.* 2015), but little is documented on testing different doses of Ovulin in catfish breeding. Ovulin is a new, commercially available synthetic inducing agent that is in ready-made form manufactured by Ningbo Sansheng Pharmaceutical Company Ltd. China. It contains Domperidone and S-GnRH analogue. It is injected at the manufacturer's recommended dose of 0.5mg/kg body weight in female and half dose in male fishes. The aim of the present study, therefore, was to test the effectiveness and determine the minimum effective dose of ovulin on the induced breeding performance of *C. gariepinus.*

2. Methodology

2.1. Broodstock and Management

The experiment was carried out at the hatchery section of Happy Island Garden, Sokoto. The broodfish for the experiment were conditioned at the hatchery complex of the farm and were fed commercially produced industrial feed (Coppens) at 3% body weight twice daily for two weeks prior to the start of the study. Water quality parameters such as Temperature, pH and dissolved oxygen were monitored during the period of the experiment. The Water temperature was determined using mercury-in-glass thermometer, pH and Dissolved Oxygen (DO) were measured using pH and oxygen meter respectively (APHA, 2000).

2.2. Experimental Setup

The experiment was setup in a Completely Randomized Design (CRD) and 12 broodstocks in total were used for the experiment (9 females, 3 males). The broodstock were distributed into three treatments (Treatment A was injected with 0.3ml/kg, Treatment B was injected with 0.5ml/kg and Treatment C was injected with 0.7ml/kg) and each treatment was replicated three times.

2.3. Injection of Hormone

Ovulin was used to induce ovulation in the broodstock and was injected according to the treatments; 0.3, 0.5 and 0.7ml/kg body weight of the female fishes while half dosage was administered to the male broodstock. Injection was carried out intramuscularly above the lateral line towards the dorsal section and pointed towards the ventral side (Viveen *et al.* 1985).

2.4. Collection of Eggs and Milt

Checking of ovulation started 6 h after injecting the fish with hormone and continued at one-hour intervals (Brzuska, 2004). Females were tested for ovulation by hand stripping of the abdomen (Richter *et al*. 1987). The collection of eggs and milt were done according to the procedure of (Viveen *et al.* 1985) thus; the eggs were collected from each ovulated female through stripping by gently pressing the abdomen of the fish. The eggs were collected into clean bowls labelled according to the treatments. Milt was obtained by sacrificing the males. Each male was dissected carefully and their milt sac obtained. A small incision was made on the lobes of the testes with a sharp razor blade and the milt was squeezed into a dry Petri dish containing the collected eggs.

2.5. Artificial Fertilization, Incubation and Hatching

Dry method of fertilization was used where the milt obtained from the male fishes was squeezed onto the stripped eggs obtained from the females accordingly and stirred gently and thoroughly using plastic spoon for about 1-2 minutes to allow contact and adequate fertilization (Megbowon *et al*. 2013), after which normal saline was added before spreading the eggs on the spawning nets in the incubation units for incubation (Delince *et al.* 1987; Viveen *et al.* 1985).

Two grams of the fertilized eggs were collected from each replication and distributed in a single layer on the spawning nets in the well aerated incubation bowls provided for the experiment for easy assessment of breeding performance (Brzuska, 2004; Gadissa & Devi, 2013; Okoro *et al.* 2007). The viable and dead eggs were determined and counted. The viable eggs were translucent while the non-viable eggs were white and opaque and these were carefully removed by siphoning. Hatching started at about 20 hours after incubation and lasted for about 6 hours. Percentage hatchability was estimated 24 hours after hatching was completed. One hundred of the hatchlings from each bowl were weighed, their weights multiplied by total weight of larvae in each bowl to estimate total hatchability per bowl. Three days after yolk sac was absorbed, larval survival was also estimated.

2.6. Data Collection

Data on the following parameters were collected;

Fecundity: This was estimated according to Haylor & Oyegunwa (1993) as;

Total weight of eggs x no. of eggs per gram

Fertilization rate: This was determined according to Adebayo & Popoola, (2008) as follows;

$$\text{Fertilization Rate (\%)}: \frac{\text{Number of fertilized eggs}}{\text{Total number of eggs collected}} \times 100$$

Hatching rate: This was calculated according to Adebayo & Popoola (2008) as follows;

$$\text{Hatching rate (\%)}: \frac{\text{Number of hatched eggs}}{\text{Total number of eggs fertilized}} \times 100$$

Larval survival rate: This was calculated thus;

$$\text{Larval survival rate (\%)}: \frac{\text{Total number of larvae - Number of dead larvae}}{\text{Total number of larvae}} \times 100$$

2.7. Data Analysis

Data obtained on fertilization rate, hatching rate and larval survival rate were analyzed using one-way analysis of variance (ANOVA) and treatment means were separated using Duncan multiple range test where significant differences exist ($p<0.05$) by using SPSS package version 20.

3. Results

The mean weight of the broodstocks used for the experiment was 813.33g, 746.67g and 770.00g for Treatments A, B and C respectively (Table 1). Treatment A was injected with 0.3ml/kg body weight of ovulin hormone, Treatment B was injected with 0.5ml/kg body weight ovulin and Treatment C was injected with 0.7ml/kg body weight ovulin. The dosage administered according to the weight of the broodstocks was 0.24ml for Treatment A; 0.37ml for Treatment B and 0.54ml for Treatment C. Spent weight recorded was 657.33g for Treatment A, 584.67g for Treatment B and 557.33g for Treatment C.

Table 1. *Initial weight, spent weight and dosage during induced breeding of C. gariepinus using ovulin.*

	Treatments		
Parameters	**A**	**B**	**C**
Treatment dose	0.3	0.5	0.7
Initial weight	813.33±119.30	746.67±55.08	770.00±86.60
Dosage	0.24	0.37	0.54
Spent weight	657.33±140.91	584.67±41.40	557.33±71.60

Table 2. *Induced breeding performance parameters of C. gariepinus using ovulin.*

Parameters	**Treatments**		
	A	**B**	**C**
Weight of eggs (g)	155.67±32.96^{a}	183.67±15.57^{ab}	212.00±16.70^{b}
Latency period (h)	12.53^{a}	11.03^{ab}	9.67^{b}
Fertilization rate (%)	72.73±6.06^{a}	80.62±3.45^{ab}	88.12±2.44^{b}
Hatchability rate (%)	74.10±6.83^{a}	79.84±2.35^{a}	82.07±1.10^{a}
Larval survival (%)	84.23±3.95^{a}	85.20±4.69^{a}	83.60±3.10^{a}

Means with different superscripts on the same row are not significantly different ($P>0.05$)

The result of the induced breeding performance of *C. gariepinus* was presented in Table 2. The result showed that in terms of egg weight statistically significant difference ($p<0.05$) exist between the treatments under consideration in which treatment C has the highest mean value (212.00g) followed by treatment B with 183.67g while the least value was obtained in treatment A (155.67g). However, there was no significant difference ($p>0.05$) between treatment B and A and also between treatment B and C. Latency period was observed to be higher for treatment injected with least amount of hormone (treatment A) with a mean value of 12.53h while treatment C that was injected with higher amount of hormone was observed to have lower latency period (9.67h) and there was significant difference between the treatments ($P<0.05$). However, no significant difference ($p>0.05$) exist between treatment B and A and also between treatment B and C.

The result further showed that fertilization rate was higher in treatment injected with higher amount of hormone (Treatment C) with a mean value of 88.12% and was significantly different ($p<0.05$) from the treatment injected with lower amount of hormone (Treatment A) that has a mean value of 72.73%, but there was no significant difference ($p>0.05$) between treatment B and A and also statistically similar ($p>0.05$) result was observed between treatment B and C.

Mean hatching rate was observed to be higher for treatment C (82.07%) followed by treatment B (79.84%) and the least value

was obtained in treatment A (74.10%) but there was no significant difference ($p>0.05$) between the treatments. In terms of larval survival there was also non-significant difference ($p>0.05$) between the treatments with treatment B having the highest value (85.20%) followed by treatment A (84.23%) while treatment C has the least value of 83.60%.

4. Discussion and Conclusion

Synthetic hormone (ovulin) successfully induced spawning in *C. gariepinus*. The dosage of the hormone administered influenced the weight of eggs produced as the increase in dosage resulted in more eggs being produced and this varied with the size. Similar results were obtained by Bruton (1979) and Sharma *et al. (*2010) for *C. gariepinus* and *C. batrachus* respectively. The dosage of the hormone administered also influenced the latency period in the experiment as the increase in dosage resulted in reduced latency period. This was consistent with what was observed by Achionye-Nzeh and Obaroh (2012). The 88.12% fertilization recorded in this experiment may be an indication of the efficacy of ovulin used as Adebayo and Popoola (2008) reported fertilization rate of 84.50% for *C. gariepinus* using ovaprim while Haniffa and Sridhar (2002) reported fertilization rate of 70% for *Channa punctatus* also using ovaprim. The high hatching rate (82.07%) and larval survival rate of 84.23% recorded in this experiment was higher than what was obtained by Shinkafi and Ilesanmi (2014) for *C. gariepinus* using ovaprim and Sahoo *et al.* (2005) for *C. batrachus* using ovatide.

The present investigation demonstrated that *C. gariepinus* can successfully be induced to ovulate at 0.3ml Ovulin per kg body weight ensuring high quality eggs and more normal larvae. And the dosage of 0.3ml/kg body weight of ovulin synthetic hormone could be used as an appropriate spawning agent for successful breeding and seed production of *C. gariepinus*.

References

[1] Achionye-Nzeh, C. G., & Obaroh, I. (2012). Ovaprim doses effects on eggs of African Mudfish *Clarias gariepinus*. *International Journal of Life Science and Pharma Research,* 2 (2), 6-9.

[2] Adebayo, O. T., & Popoola, O. M. (2008). Comparative evaluation of efficacy and cost of synthetic and non-synthetic hormones for artificial breeding of African catfish (*Clarias gariepinus*, Burchell 1822). *Journal of Fisheries and Aquatic Science,* 3 (1), 66-71. https://dx.doi.org/10.3923/jfas.2008.66.71

[3] APHA, (2000). *Standard Methods for Examination of Water and Wastewater*, 21st edn. American Public Health Association, Washington, DC, USA, 1268.

[4] Ayinla, O. A., & Akande, G. R. (1988). Growth response of Clarias gariepinus (Burchell, 1822) on silage based diets. Nigeria Institute for Oceanography and Marine Research (NIOMR), Lagos.

[5] Bruton, M. N. (1979). The breeding biology and early development of *Clarias gariepinus* (Pisces: Claridae) in lake Sibaya, South Africa with a review of breeding species of the subgenus Clarias. *Journal of Zoology Transaction of the Zoological Society of London*. 25 (1). https://dx.doi.org/10.1111/j.1096-3642.1979.tb00056.x

[6] Brzuska, E. (2004). Artificial propagation of African catfish (*Clarias gariepinus*): The application of a single dose of pellets containing D-Ala, ProNEt-mGnRH and dopamine inhibitor metoclopramide. *Czech Journal of Animal Sciences,* 49 (7), 289-296.

[7] Brzuska, E., & J. Adamek (1999). Artificial spawning of European cattish (*Silurus glanis* L.); stimulation of ovulation using LHRH-a, Ovaprim and carp pituitary extract. *Aquaculture Research*, 30: 59-64. https://dx.doi.org/10.1046/j.1365-2109.1999.00301.x

[8] Cheah, M. S., & Lee, C. L. (1980). Induced ovulation of the Australian eel-tailed catfish *Neosilurus ater* (Perugia) with ovaprim. *Asian Fisheries Science,* 13, 87-96.

[9] Dada, A. A., Mohammed, S., & Madu, C. T. (1994). Fish breeding and transportation techniques. *Paper presented at the workshop proceeding in aquaculture* (p. 112). Abuja: National Institute for Freshwater Fisheries Research (NIFFR) and Federal Agricultural Coordinating Unit (FACU).

[10] Delince, G. A., Campbell, D., Janssen, J. A., & Kutty, M. N. (1987). *Seed production* (Vol. ARAC/87/WP/13). Port Harcourt, Nigeria, Nigeria: African Regional Aquaculture Centre.

[11] Ezenwaji, H. M. G. (1985). African *Clarias* taxonomy implication for field work. *Proceeding of the 4th Annual Conference of the Fisheries Society of Nigeria (FISON)*. Port-Harcourt, Nigeria. 26th -29th November 1985, pp. 191-196.

[12] Gadissa, S., & Devi, S. P. (2013). Evaluation of spawning induction of African Catfish (*Clarias gariepinus*) by heteroplastic hypophysation. *International Journal of Aquatic sciences,* 1 (1), 22-25.

[13] Haniffa, M. A., & Sridhar, S. (2002). Induced spawning of spotted Murrel (*Channa punctatus*) and Catfish (*Heterobranchus fossilis*) using human chorionic gonadotropin and synthetic hormone (ovaprim). *Veterinary Archive,* 72 (1), 51-56.

[14] Haylor, G. S., & Oyegunwa, O. (1993). The onset of air breathing and the development of accessory breathing organs in the Africa catfish *Clarias gariepinus* (Burchell) in relation to temperature. *Aquaculture and Fishery Management,* 24, 253-260.

[15] Marimuthu, K., Satthiyasilan, N., Aminur Rahman, M., Arshad, A., Gokul Raj, M., & Arockiaraj, J. (2015). Induced ovulation and spawning of African catfish *Clarias gariepinus* using ovaprim. *Journal of Environment and Biotechnology Research,* 1 (1), 2-9.

[16] Megbowon, I., Fashina-Bombata, H. A., Akinwale, M. M.-A., Hammed, A. M., Okunade, O. A., & Mojekwu, T. O. (2013). Breeding performance of *Clarias gariepinus* obtained from Nigerian waters. *IOSR Journal of Agriculture and Veterinary Science,* 6 (3), 6-9. https://dx.doi.org/10.9790/2380-0630609

[17] Okoro, C. B., Nwadukwe, F. O., & Ibemere, I. (2007). The use of ovaprim in oocyte maturation and ovulation in *Clarias gariepinus* (Burchell, 1822). *African Journal of Applied Zoology and Environmental Biology,* 9, 83–84.

[18] Oladosu, G. A., Ayinla, O. A., Adeyemo, A. A., Yakubu, A. F., & Ajani, A. A. (1993). Comparative study of reproductive capacity of the African Catfish species Heterobranchus bidorsalis, Clarias gariepinus and their Hybrid. Port Harcourt: African Regional Aquaculture Centre Tech. paper 92.

[19] Olaleye, V. F. (2005). A review of reproduction and gamete management in the African catfish, *Clarias gariepinus* (Burchell, 1822). *Ife journal of Science,* 7 (1), 63-70. https://dx.doi.org/10.4314/ijs.v7i1.32158

[20] Olubiyi, O. A., Ayinla, O. A., & Adeyemo, A. A. (2005). The effects of various doses of ovaprim on reproductive performance of the African catfish *Clarias gariepinus* (Burchell) and *Heterobranchus longifilis* (Valaenciennes). *African Journal of Applied Zoology and Environmental Biology, 7*, 101-105.

[21] Richter, C. J., Eding, E. H., Goos, H. T., De Leeuw, R., Scott, A. P., & Van Oordt, P. W. (1987). The effect of pimozide/LHRHa and 17a-hydroxyprogesterone on plasma steroid levels and ovulation in the African catfish, *Clarias gariepinus*. *Aquaculture,* 63 (1), 157-168. https://dx.doi.org/10.1016/0044-8486(87)90068-8

[22] Sahoo, S. K., Giri, S. S., & Sahu, A. K. (2005). Effect on breeding performance and egg quality of *Clarias batrachus* (Linn.) at various doses of ovatide during spawning induction. *Asian Fisheries Science,* 18, 77-83.

[23] Shepherd, C. J., & Bromage, N. R. (1988) Intensive fish farming. Blackwell science Ltd., 404.

[24] Shinkafi, B. A., & Ilesanmi, B. D. (2014). Effect of varying doses of ovatide on the breeding performance of African catfish (*Clarias gariepinus* Burchell, 1822) in Sokoto, North-western Nigeria. *Asian Journal of Animal Sciences,* 8 (2), 56-64. https://dx.doi.org/10.3923/ajas.2014.56.64

[25] Viveen, W. J., Richter, C. J., Van Ordt, P. G., Jansen, J. A., & Huisman, E. A. (1985). *Practical manual for the culture of the African Catfish Clarias gariepinus.* The Hague, Netherlands: The Netherlands Ministry for Development Corporation, Section for Research and Technology.

[26] Zohar, Y., & Mylonas, C. C. (2001) Endocrine manipulation of spawning induction in cultured fish from hormone to gene. *Aquaculture,* 197, 99-139. https://dx.doi.org/10.1016/S0044-8486(01)00584-1.