DETERMINATION OF BREEDING PERFORMANCE OF AFRICAN CATFISH *CLARIAS GARIEPINUS,* USING SYNTHETIC AND NON -SYNTHETIC HORMONES

***Jega, I. S., *Mustapha, K. M., * Bawa, D. Y. *Gana, A. B., *M. N. Wade and +M. Y. Abubakar**
*Department of Forestry and Fisheries, Faculty of Agriculture, Kebbi State University of Science and Technology, P.M.B. 1144, Aliero, Kebbi State, Nigeria.
+Department of Fisheries and Aquaculture, Usmanu Danfodiyo University, Sokoto
**ibrahimshehu77@yahoo.com; +2348039370546*

ABSTRACT
This research was conducted to evaluate the effectiveness of two different hormones injected for induced spawning of Clarias gariepinus. Three females and 6 males of Clarias gariepinus were collected from Abdulsalam Fish Farm in New Bussa, Kainji, Niger State. The pituitary gland was extracted from four of the male brood fish, weighed so as to get a corresponding weight to that of the recipient fish. The experiment was laid in a Completely Randomized Design (CRD) with three treatmentsT1= 100%ovulin/ (0.5ml/kg), T2 = 100% Pituitary Gland Extract/ (PGE 2mLkg) and T3 = 50% ovulin +50% PGE/(0.4ml/kg). Result indicated that 100% Ovulin performed significantly better ($p<0.05$) in all the parameters investigated except in hatchability rate. Fertility rates of the eggs were higher in Ovulin (96.56±2.51) than in PGE treated fish especially at mixed hormone (ovulin 50%+ PGE 50%) where the percentage mean values were 95.21±3.51 and 94.82 ±4.50, respectively. The cost of hormone was highest in mixed hormone (₦1840) which subsequently affected its net profit, followed by PGE (₦1600) and least in Ovulin (₦320) which had the highest net profit. Result showed that the use of Ovulin hormone was found to be more cost effective and efficient in the induced breeding of C. gariepinus.
Keywords: Fish breeding, Ovulin, Pituitary Gland Extract, Hatchability, Survival.

INTRODUCTION

The clariid Catfishes from wild and farmed sources are economically important food fish and have gained much prominence. The African catfish, *Clarias gariepinus*, from a biological perspective, is undoubtedly one of the most ideal aquaculture species in the world (Gadisa and Devi, 2013). It is widely distributed, thrives in diverse environments (temperate to tropical), hardy, grow fast and has a high yield of tasteful flesh. The uses of synthetic and non-synthetic hormones have been reported in different regions with recommendations of different doses. Others have also reported the potency of pituitary extract from Catfish in induced breeding of *C. gariepinus*. However, not much has been reported on comparative studies on the ovulation rate, fertilization, hatchability of the egg, availability and cost implications of using pituitary gland Extract hormones. Such information, however, is needed for the farmer to make a choice regarding which hormonal materials to use on the farm to maximal profit. The results from this research shall guide farmers to make informed choices regarding hormonal material to use for better results in artificial reproduction by induced breeding.

Today, many fish farmers in Nigeria are unable to produce their own fingerlings due to financial, technical and logistical demands and have relied on the government that pays little or no attention. Also, the use of synthetic hormones in excess causes over maturation of the oocytes. Hormonal sex reversal can become a stressful process resulting in low survival rate, delayed sexual maturity and also reduces the fertility of the fish (Dewan and Doha, 1979). Due to these difficulties, fish breeders and farmers are unwilling to use these hormonal preparations under farm conditions. The aim of this research is to evaluate the effectiveness of two different hormones injected for induced spawning of *Clarias gariepinus.*

MATERIALS AND METHODS

The experiment was carried out at Kebbi State University of Science And Technology Aliero (KSUSTA) Fisheries Hatchery Unit. A total of three females and 6 males of *Clarias gariepinus* were collected from a private fish farm (Abdulsalam Fish Farm) in New Bussa, Kainji, Niger State, and they were transported to KSUSTA in plastic cans containing water. The temperature of the water was

reduced by adding of ice block as this help to minimize stress on the fishes. The pituitary gland were extracted from four of the male brood fish and weighed so as to get a corresponding weight to that of the recipient fish. Each of the glands were crushed in a mortar using a pestle. 2mL of 0.9% normal saline solution were added, and glands suspension was collected into a 2mL syringe. The freshly collected pituitaries were immediately injected into the female catfish.

RESEARCH DESIGN

The experiment was laid in a Completely Randomized Design (CRD) with three treatments, each with three replications. The treatments are T1= 100%ovulin/0.5ml/kg), T2 = 100%Pituitary gland Extract/ PGE 2ml/kg) and T3 = 50% ovulin +50% PGE (0.4ml/kg).

SPAWNING PERFORMANCE PARAMETERS

Spawning performance parameters were calculated as:

Fertilization Rate (FR) = $\%\frac{\text{number of fertilized eggs}}{\text{total number of eggs (fertilized and unfertilized)}} \times 100$

Hatchability Rate (HR %) = $\frac{\text{Number of hatchlings}}{\text{Total number of eggs fertilized)}} \times 100$

Survival rate (SR %) = $\frac{\text{Number of live hatchlings 72hrs after hatching}}{\text{total number live hatchlings just after hatching}} \times 100$

COST BENEFIT ANALYSIS

The comparisons of the economic performance of various hormones were assessed based on the following assumptions that the cost of producing fry was calculated based on the cost of hormones, the price of fry is #10 and that all costs were based on the current prices in Kebbi state, Nigeria.

DATA ANALYSIS.

Data obtained were pooled for each treatment means and compared by one way ANOVA to test significant differences ($p<0.05$) in cost evaluation, spawning, hatchability and survival using Turkey HSD.

RESULTS

Effect of water quality parameters on induced breeding of *Clarias gariepinus*

The temperature range was from 28.1-28.5^{0}C while pH ranged from 7.0-7.4 Dissolved oxygen ranged from of 6.1-6.2mg/L (Table 1).

Table .1: Water Quality Parameters taken from the experimental tanks during incubation and hatching period.

Parameters (Mean)	**T1 (ovulin)**	**T2 (PGE)**	**T3 (Ovulin +PGE)**
Temperature (^{0}C)	28.5±0.7	28.2±0.29	28.1±0.33
pH	7.4±0.17	7.3±0.1	7.0±0.00
Dissolved oxygen (mg/L)	6.2±0.17	6.2±0.14	6.1±0.14

Breeding Performance of *Clarias gariepinus* administered differently with Ovulin, Pituitary Gland Extract (PGE) and mixed hormone (ovulin + PGE)

The results of trials are summarized in Table 2. The spawning and hatching of fry were observed in *Clarias gariepinus* treated with ovulin, PGE and mixed hormone (ovulin +PGE). *Clarias gariepinus* injected with ovulin (T1) had the higher percentage fertilization (96.56±2.51%) which was not significantly ($p< 0.05$) different with T2, whereas the lower percentage fertilization was observed in T3 (94.82±4.51%) and it differed significantly ($p<0.05$) with T1.The higher hatching rate was observed in T2 (75.69±2.50) which differed significantly ($p<0.05$) with T3 (62.71±173) from which the least hatching rate was recorded. The higher survival rate was recorded in T1 (97.98±21.19) and lower in T2 (83.90±11.50) even though they do not differed significantly ($p<0.05$).

Table 2. Breeding Performance of *Clarias gariepinus* administered differently with Ovulin, Pituitary Gland Extract (PGE) and mixed hormone (ovulin + PGE)

Parameters	Body weight (g)	Hormonal dose (ml)	No of eggs fertilized	Fertilization (%)	Hatchability (%)	Survival (%)	Hatching period (hrs)	Latency period (hrs)
T1 (ovulin) 100%	800	0.4	572±2.52^{a}	96.56±2.51^{a}	69.15±19.00^{ab}	97.98±21.19^{a}	72.33±0.57	9.00±1.00
T2 (PGE) 100%	900	1.8	564±3.51^{ab}	95.21±3.51^{ab}	75.696±2.50^{a}	82.50±13.89^{a}	72±0.00	8.33±0.58
T3(ovulin+PGE) 50%+50%	700	0.28	561±4.51^{b}	94.82±4.50^{b}	62.71±1.73^{b}	83.90±11.50^{b}	72.66±0.57	8.33±0.57

Means with different superscripts in each vertical axis differs significantly (P<0.05) from each other

Comparison of economic performance of Ovulin, PGE and mixed hormone (ovulin + PGE)

The economic evaluation (Table 3) revealed that hormone sources have a highly significant effect on net production of *Clarias gariepinus.* The cost of hormone was significantly different (p<0.05) between the three treatments, where the higher cost was observed in T3 (₦1840), and least in T1(₦320). Significant difference (p<0.05) was also observed between the three treatments with respect to value of fry where the higher value of fry was recorded from fry produced from ovulin (₦3870) and lower value was recorded in fry produced from mixed hormone (T3=₦2950). However T3 recorded lower Net profit (₦1110) with a least cost benefit ratio of (1.6). There was significant (p<0.05) difference between all the treatments in incidence of cost, where higher incidence of cost was recorded in T3 (1.6) and lower cost was observed in T1 (0.83).

Table 3: Cost analysis of using different hormones to produce *Clarias gariepinus* fry

Parameters	Net production (No. of fry)	Value of fry (₦)	Cost of hormone (₦)	Net profit (₦)	Cost benefit ratio	Incidence of Cost
T1 (ovulin)	387^{a}	3870^{a}	320^{c}	3550^{a}	12.00^{a}	0.83^{c}
T2 (PGE)	352^{b}	3520^{b}	1600^{b}	1920^{b}	2.2^{b}	4.54^{b}
T3(ovulin+PGE)	295^{c}	2950^{c}	1840^{a}	1110^{c}	1.6^{c}	6.23^{a}

a,b,c values with different superscripts in each column are significantly different (p<0.05)

DISCUSSION

All the spawners irrespective of their size and weight responded well to hormonal injection and spawned at 8-9hrs (latency period) at temperature range of 28.1-28.5 ^{0}C which is also in accordance with Madu 1989, who suggested the best temperature range for optimum output of *C. gariepinus* species as 25-31^{o}C. The value for the Dissolved oxygen (DO) content ranged from 6.1- 6.2mg/Land agreed with that of Ufodike and Garba 1992, who stated that the minimum constant value of 5.0mg/L DO is sufficient for most organisms and stages of aquatic life. The percentage fertilization of *C. gariepinus* injected with Pituitary Gland Extract and ovulin was 95.21±3.51% and 96.56±2.51%. This is slightly higher than that reported by Adebayo and Popoola (2008), but similar to that reported by Olumuji and Mustapha (1996) in that treated with ovulin. This could be attributed to species difference and culture systems. The percentage fertilization of *Clarias gariepinus* injected with combined hormone (ovulin +PGE) at 50% + 50% was 94.82 %.

The hatching rate was higher in T2 (75.696±2.50%) and lower in T1, and T3 which was a combined inducer also recorded a lower hatchability rate of (62.71±1.73%) and there was significant difference (p<0.05) in the hatchability rate of all the treatments. These values do not agree with Olaniyi and Akinbola (2013) who reported the hatching rates of 46.3% in Ovulin and 25.99% in PGE in *Clarias gariepinus* .

In this experiment, ovulin showed a better percentage survival (97.98±21.19%) of fry compared with PGE (82.50±13.89%) and mixed hormone (83.90±11.50%). This was not in agreement with the results of Olukayode *et al.* (2017) who did similar research on African catfish where ACPE (92.60%) was recorded with the highest survival rate, and lowest survival rate in Ovulin (63.45%).

The cost benefit ratio is higher in Ovulin and lower in mixed hormone with lower net production. In the same vein, Ovulin has higher Net profit (₦3550) and *C. gariepinus* treated with mixed hormone

had lower value (₦1110). Based on this, it is suggested that fish seed production can be encouraged through the use of Ovulin which is more readily available with less cost when compared with other treatments.

CONCLUSION

The study revealed that synthetic hormone is more cost effective than PGE and mixed hormone (ovulin + PGE) in all trials. Also high spawning trials and high percentage fertilization and that of survival rates were observed in fishes spawned using Ovulin.

REFERENCES

Adebayo, O.T, and 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.

Dewan, S. and S. Doha. (1979). Spawning and fecundity of certain pond fishes. *Bangladesh J. Agril*., 4(1): 1-8.

Gadissa S, Devi L. (2013). Evaluation of Spawning Induction of African Catfish (*Clarias gariepinus*) by Heteroplastic Hypophysation .*International journal of fisheries and aquatic studies*. 1(1):22-25.

Madu, C. T.(1989). Hatchery management of the mudfish, *Clarias anguillaris* (L.). PhD Thesis, University of Jos, Nigeria, 215.

Olaniyi, C.O, Akinbola, D.O. (2013). Comparative Studies on the Hatchability, Performance and Survival Rate of African Catfish (*Clarias. gariepinus*) *Journal of Biology, Agriculture and Healthcare* Larval Produced: Using Ovaprim and Catfish Pituitary Extract Hormones.

Olumuji O.K, Mustapha M.K (1996). Induced Breeding of African Mud Catfish *Clarias Gariepinus* (Burchell, 1822) using Different Doses of Normal Saline Diluted Ovaprim, ovulin and combine inducer. *Journal of Aquacult*. Res. Dev. 3(4):1000133.

Ufodike, E. B. and Garba, A. J. (1992). Seasonal variation in limnology and productivity of Tropical Highland fish pond in Jos Plateau, Nigeria. *Journal of Aquatic Sciences* 7:29–34.