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A comparative Assessment of ova prim and ova tide on the Breeding performance of catfish (*Clarias gariepinus*).

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Abstract

The effect of ovaprim and ovatide on the breeding performance of catfish (*Clarias gariepinus*) in Benue state, Makurdi, Nigeria was investigated from the month of July to August, 2016. The female brood stocks weighed 1.0-1.2kg and the males weighed 1.2-1.5kg.Twelve (12) female and six (6) male brooders were obtained from Ocepson's farm and Aqua-heaven fish farms respectively in Makurdi. The doses of 0.8ml/kg, 0.5ml/kg and 0.3ml/kg of ovaprim and 0.3ml/kg, 0.2ml/kg and 0.1ml/kg of ovatide were used to determine the dosage that would give the best output in fecundity, fertility and hatchability in the fish. The females treated with 0.8ml/kg of ovaprim had the highest fecundity of 92, 600 eggs and this was significantly different ($p<0.05$) when compared with doses of 0.5ml/kg and 0.3ml/kg. The females treated with 0.1ml/kg of ovatide had the highest fecundity of 89, 100 eggs but there was no significant difference ($p>0.05$) with 0.2ml/kg and 0.3ml/kg. The fertilization rate of 84.47% was the highest at 0.8ml/kg in ovaprim and showed no significant difference ($p>0.05$) with the other doses. In ovatide, fertilization of 81.82% was the highest at 0.1ml/kg and it showed a significant difference ($p<0.05$) when compared with the rest of the doses. The highest hatchability rate of 62.45% was observed in ovaprim at 0.1ml/kg and showed no significant difference ($p>0.05$) between 0.5ml/kg but showed a significant difference ($p<0.05$) in 0.3ml/kg. In ovatide, hatchability of 70.21% was the highest at 0.1ml/kg and showed significant difference ($p<0.05$) when compared with the rest of the doses. Ovaprim hormone at the dosage of 0.8ml/kg and ovatide hormone at the dosage of 0.1ml/kg gave the best result in Makurdi, Nigeria.

Key words: comparative assessment, ovaprim, ovatide, breeding, *Clarias gariepinus*.

Introduction

Fish is very important in the diet of many Nigerians. It is high in nutritional value with complete amino acids, vitamins, and minerals (Amao *et al*., 2006; Akinrotimi *et al*., 2007). The demand for fish in Nigeria outstrips the local production and going by this, Nigeria imports over 900,000 metric tons of fish while its domestic catch is estimated at 450,000 metric tons per year (Ozigbo *et al*., 2013). The African catfish species are the most widely accepted, highly valued, and a major species of fish that are being cultured in Nigeria (Adewumi and Olaleye, 2011). These species have several advantages such as good growth, fast growth, resistance to low oxygen and considerable ease in farming (Van de Nieuwegiessen *et al*., 2009).

Most fish farmers do not know how to produce their own fingerlings; they tend to procure fish seed from a distance of which cost of production and transportation is high. And this often leads to low production as well as scarcity of quality fingerlings which has been one of the major constraints for the expansion of catfish culturing in Nigeria.

The breeding of the fish by using spawning agents to stimulate ovulation is the most promising and reliable way of ensuring availability of good quality fish seed for all year round and sustainability of the fishery products (Brzuska, 2003). Various natural hormones such as Carp Pituitary Gland (CPG), Deoxycorticosterone Acetate (DOCA), and Human Chorionic Gonadotropin (HCG) or synthetic hormones such as ovaprim, ovatide, ovapel, Dagin, Aqua spawn and many others have been used to induce breeding successfully (Zohar and Mylonas, 2001). Some of these spawning agents are either difficult to quantify, ineffective, have a short shelf life or expensive as reported by Olubiyi *et al*., (2005). According to Nwokoye *et al.*, (2007), ovaprim is the most widely acceptable and readily available hormone used as spawning aid to induce ovulation in well-conditioned brood fish because it has been found to be very effective. The manufacturer's recommended dosage is 0.5ml per kilogram body weight of the fish. Similarly, ovatide is another hormone used as spawning aid to induce ovulation in fish and its manufacturer's recommended dosage is 0.2ml per kilogram body weight of fish (Sahoo *et al*., 2005).

Whenever a fish farmer or breeder embarks on induced breeding of fish, the aim is to have a successful spawn and eventually produce a large number of fish fry. This cannot be achieved unless the breeder knows the most effective hormone and the right dosage to use to induce the fish. Hence, the need to compare and assess ovaprim and ovatide hormones on the breeding performance of *Clarias gariepinus*. This will provide information on the most effective doses of both hormones for the ovulation, fecundity, fertility as well as hatchability of *Clarias gariepinus*.

Materials and Methods

Study Area

The research was conducted in Toc's Mini Fish Hatchery (A private hatchery situated behind Tilley Gyado College, Northbank, Makurdi, Nigeria), located on latitude 7.7493N and longitude 8.5508E (Fig. 1).

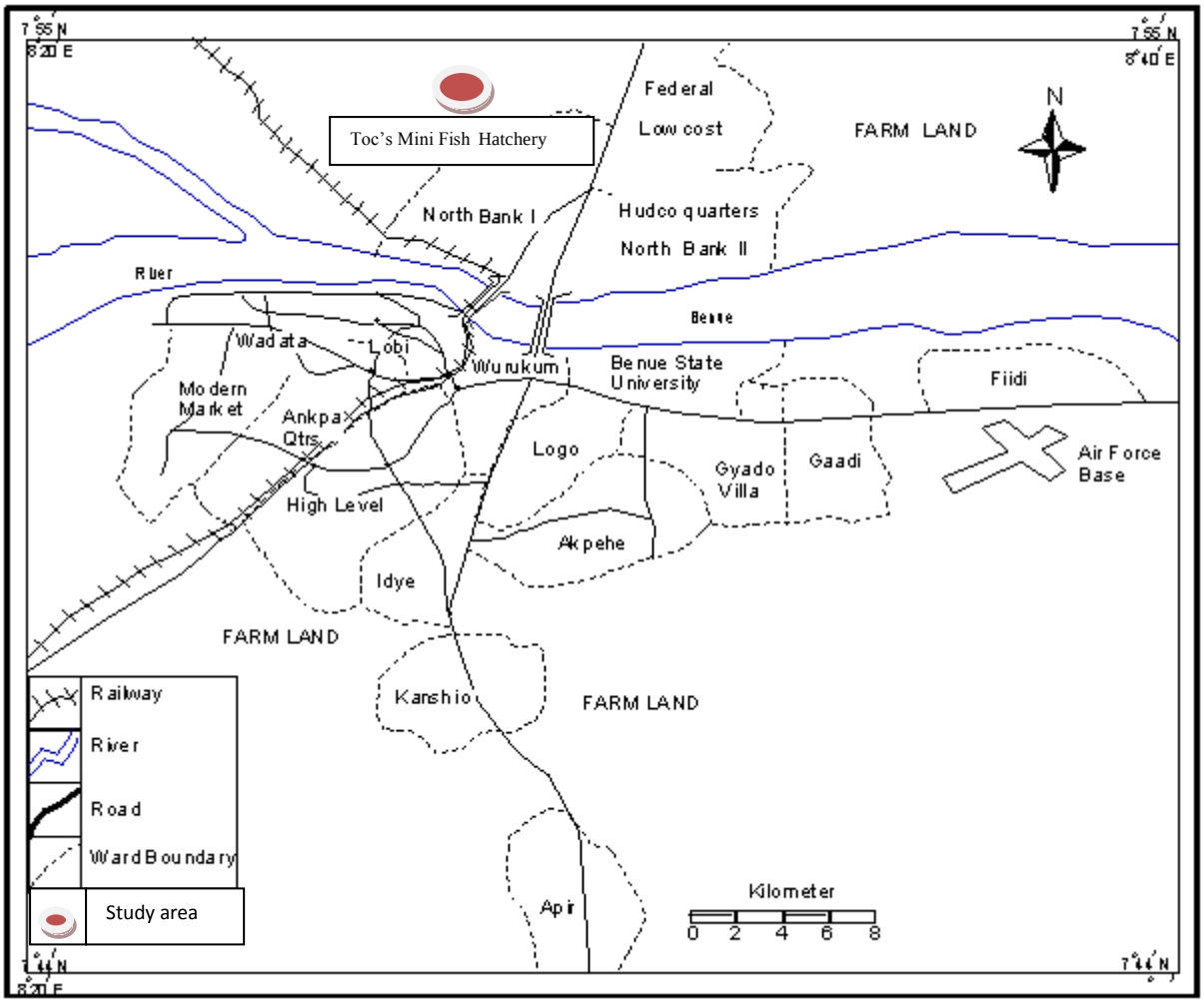

Fig 1: Map of Makurdi Showing the Study Area (source: Google map).

Brood Stock procurement

Thirty (30) healthy brood stocks of the African Catfish (*Clarias gariepinus*) comprising of 20 females and 10 males were purchased from two different farms in Makurdi to avoid inbreeding. The females were gotten from Ocepson's Farm along Federal University of Agriculture Road, Makurdi, while the males were gotten from Aqua-heaven Farm, behind cattle market, Makurdi. All brood stocks were selected by examining their external

morphological characteristics. Both males and females were acclimatized in separate earthen ponds of 6 x 6 x 2 meters for 3 weeks during which they were fed with a formulated diet of 40% crude protein twice daily at 5% of total fish biomass. The fish samples were weighed with a sensitive electronic weighing balance (Camry Emperors) of 1500g maximum capacity and their weights were taken in grammes.

Experimental Design

Twelve (12) females and six (6) males were selected randomly at the ratio of 2:1 with three (3) treatments and three (3) replicates each for ovaprim and ovatide. Ovaprim consisted of Treatment A: 0.8 ml/kg^{-1} body weight, Treatment B: 0.5 ml/kg^{-1} body weight, and Treatment C: 0.3 ml/kg^{-1} body weight. Ovatide consisted of Treatment O: 0.3 ml/kg^{-1} body weight, Treatment P: 0.2 ml/kg^{-1} body weight, and Treatment Q: 0.1 ml/kg^{-1} body weight.

Selection of Brooders

Twelve (12) female and six (6) male brooders with weight between 1.0kg-1.5kg were selected. A female was considered to be ripped if the sex organ was reddish and the abdomen was well protruded and eggs oozed out freely when the abdomen was gently pressed while a male was considered to be ripped if the tip of the genital papilla was reddish in colour (Olubiyi *et al*., 2005)

Hormone Injection

Selected female brooders were injected using a 1 and 2ml graduated syringes inserted intramuscularly at an angle of 30-45^{o} at the dorsal fin with different doses (Treatments) of ovaprim and ovatide. A single injection was given to the female brooders from the three purposive doses of Ovaprim and Ovatide hormones but the males were not administered with hormones. The female brooders were treated with inducing agent at evening so that the brooders ovulated in the morning. The Injection was at the interval of 30

minutes to avoid the fish from attaining latency period at the same time.

Stripping and Fertilization

The females were stripped by gently pressing the abdomen between 8-11 hours after injecting the fish. This was carried out by holding the fish at head with a wet towel and holding the tail with unwet towel. The ovulated eggs were stripped into a dry plastic bowl and 8.5g of eggs were collected from each sample into each labelled bowl for easy identification.

The males of the Catfish were sacrificed to obtain their milt (sperm) by dissecting them with a dissecting blade. The milt was washed with 10ml of normal saline to removed blood stain, enable gentle movement of sperms, reduces the stickiness of eggs and to prolong the fertilizing capacity of the milt. The eggs obtained from the stripping were weighed, followed by mixing the sperm with eggs and washing the sperm sac into the eggs carefully for about 30-60 seconds by shaking the plastic plate and adding equivalent volume of clean water to rinse the fertilized eggs.Thus fecundity was calculated using this formula as described by Brzuska (2003) as follows:

$$\text{Stripping (\%)} = \frac{\text{weight of stripped eggs}}{\text{Body weight}} \times \frac{100}{1}$$

Incubation

The fertilized eggs were evenly spread over the kakaban (nylon mosquito net mesh size of 2 mm) and placed in a hatchery tank (10 litres plastic trough containing about 7-8 litres of water).

Estimation of Percentage Fertilization, and Hatchability Rates of African Catfish *Clarias gariepinus.*

After 20-24 hours of fertilization, dead and unviable eggs which had turned whitish were collected after removal of the spawning netting by siphoning and were

counted and percentage fertilization was estimated. The fertilized eggs were counted in other to calculate the percentage fertilization as described by Adebayo and Popoola, (2008) as follows:

$$\text{Fertilization (\%)} = \frac{\text{Number of fertilized eggs}}{\text{Total number of counted eggs}} \times \frac{100}{1}$$

Percentage hatchability was calculated after the period of 20-24 hours using a 500ml beaker, where the un-hatched eggs were estimated and this was used to calculate hatchability as described by Haniffa and Sridhar, (2002) as estimated below:

$$\text{Hatchability (\%)} = \frac{\text{Number of hatchlings}}{\text{Total numbers of eggs counted}} \times \frac{100}{1}$$

Data Analysis

The fecundity, fertilization, and hatchability rates of fry were analyzed by using Simple percentages. Also, Analysis of Variance (ANOVA) was employed to compare the doses of Ovaprim and Ovatide used using Statistical Package for Social Sciences (SPSS).

Results

Egg Weight, Mean Incubation and Latency Period

The highest weight of stripped eggs was 185.50g in ovaprim and 178.20g in ovatide injected with 0.8ml/kg and 0.1ml/kg respectively. The least egg weight obtained was 166.25g in ovaprim and 162.70g in ovatide injected with 0.5 and 0.3 respectively. The latency period was between 8-10 hrs and the incubation period was between 20-24 hrs (Table 1).

TABLE 1: The Fish Weight, Mean Egg Weight, Mean Incubation and Latency Period during breeding of *Clarias gariepinus*.

Hormone Doses (ml/kg)	Female weight (kg)	Male weight(kg)	Mean egg weight (g)	Mean latency period (hrs)	Mean incubation period (hrs)
			OVAPRIM		
0.8	1.0±0.029[a]	1.2±0.101[a]	185.20±0.20[a]	8.16±10.00[a]	20.66±40.00[a]
0.5	1.0±0.031[a]	1.5±0.203[b]	166.25±0.25[b]	11.66±20.00[b]	23.00±25.00[b]
0.3	1.0±0.029[a]	1.2±0.122[a]	178.30±0.26[a]	10.00±12.00[b]	22.66±27.00[b]
P value	p>0.05	P<0.05	P<0.05	P<0.05	P<0.05
			OVATIDE		
0.3	1.2±0.019[a]	1.3±0.100[a]	162.70±0.24[a]	8.33±12.500[a]	20.83±30.00[a]
0.2	1.0±0.031[a]	1.5±0.201[b]	175.60±0.23[b]	11.50±15.00[b]	22.83±32.00[b]
0.1	1.1±0.029[a]	1.2±0.022[a]	178.20±0.26[b]	10.00±11.00[b]	22.50±38.00[b]
P value	p>0.05	P<0.05	P<0.05	P<0.05	P<0.05

Fecundity Rate of Ovaprim and Ovatide

The highest fecundity rate of 92,600 eggs was observed in the fish injected with 0.8ml/kg of ovaprim, followed by the one injected with 0.3ml/kg with a fecundity rate of 89,150 eggs and the least fecundity of 83,125 eggs was observed in the fish that was injected with 0.5ml/kg (Fig. 2). The results showed that there was a significant difference ($p<0.05$) between TA and TB, also between TB and TC but there was no significant difference ($p>0.05$) between TA and TC. The highest fecundity was observed in the fish that was

injected with 0.1ml/kg of ovatide with 89,100 eggs, followed by the fish that was injected with 0.3ml/kg with 86,200 eggs and the least fecundity of 81,250 eggs was observed in the fish that was injected with 0.2ml/kg (Fig. 2). The results showed that there was no significant difference ($p>0.05$) between the three treatments.

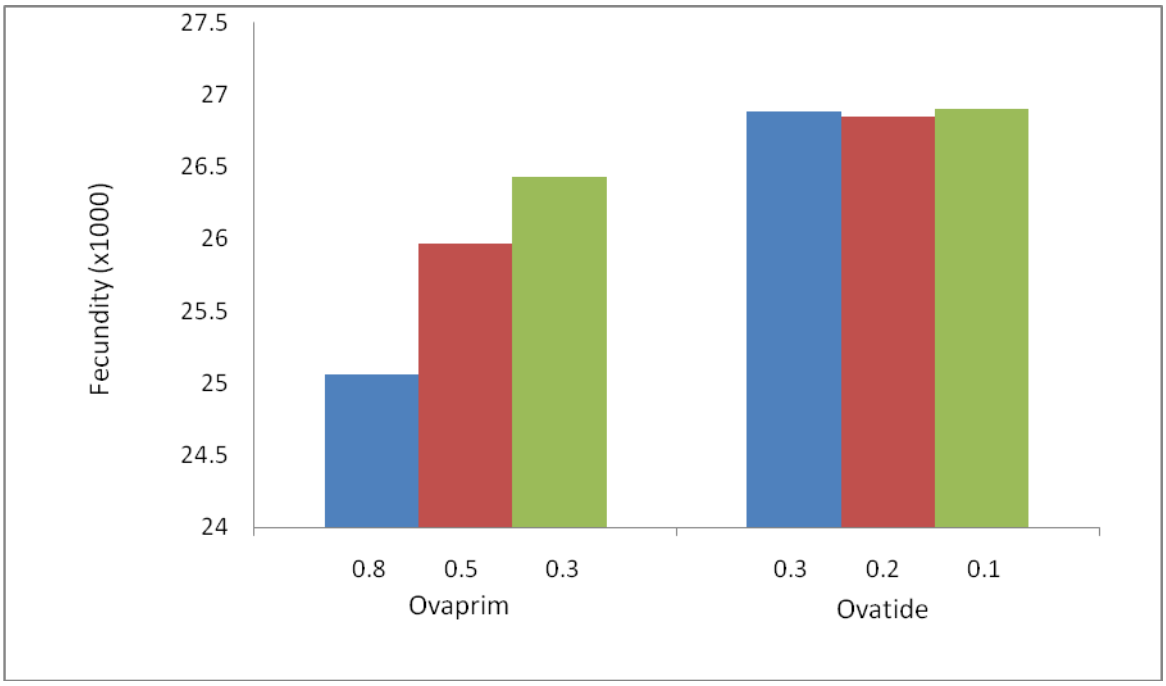

Fig.2: Mean Fecundity of *C. gariepinus* with Ovaprim and Ovatide.

Fertilization Rate of Ovaprim and Ovatide

The highest fertilization rate was observed in the fish that was injected with 0.8ml/kg of ovaprim with a fertilization rate of 84.47%, followed by the one that was injected with 0.5ml/kg with a fertilization rate of 79.30% and the least fertilization rate was recorded in the fish that was injected with 0.3ml/kg with the fertilization rate of 76.43% (Fig. 3). The results showed that there was no significant difference ($p>0.05$) in the three doses of ovaprim in the fertilization rate of the fish (*Clarias gariepinus*). In ovatide, the highest fertilization rate was observed in the fish that was injected with 0.1ml/kg with a fertilization rate of 81.82%, followed by the fish that was injected with 0.3ml/kg with a fertilization rate of

78.62% and the least fertilization rate was recorded in the fish that was injected with 0.2ml/kg with a fertilization rate of 50.05% (Fig. 3). The results showed that there was a significant difference (P<0.05) between TO and TP, TP and TQ but there was no significant difference (P>0.05) in TO and TQ.

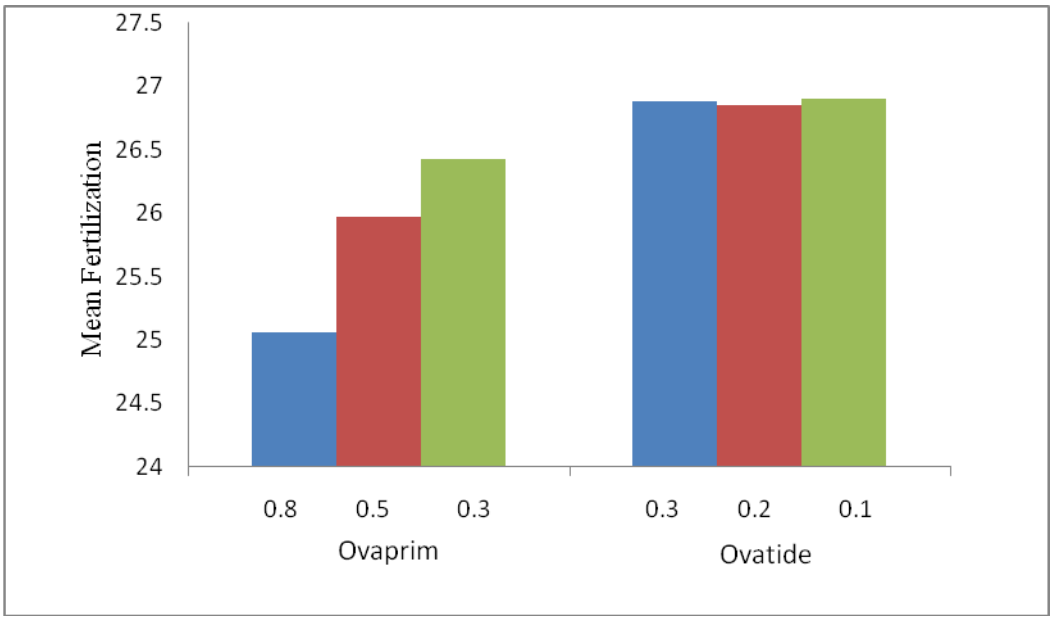

Fig. 3: Mean Fertilization of *C. gariepinus* with Ovaprim and Ovatide.

Hatching Rate in Ovaprim and Ovatide

Hatching rate was observed to be highest (62.46%) in the fish that was injected with 0.8ml/kg of ovaprim, followed by the fish that was injected with 0.5ml/kg with a hatching rate of 62.04%, and the least hatching rate of 54.01% was recorded in the fish that was injected with 0.3ml/kg (Fig. 4). The results showed that there was a significant difference (p<0.05) between TA and TC, TB and TC but there was no significant difference (p>0.05) between TA and TB. In ovatide, hatching rate was recorded to be highest (70.21%) in the fish that was injected with 0.1ml/kg, followed by the fish that was injected with 0.3ml/kg with a hatching rate of 55.57%, and the least hatching rate of 47.93% was recorded in the fish that was injected with 0.2ml/kg (Fig. 4). The results showed that there was a significant difference (p<0.05) between the three treatments.

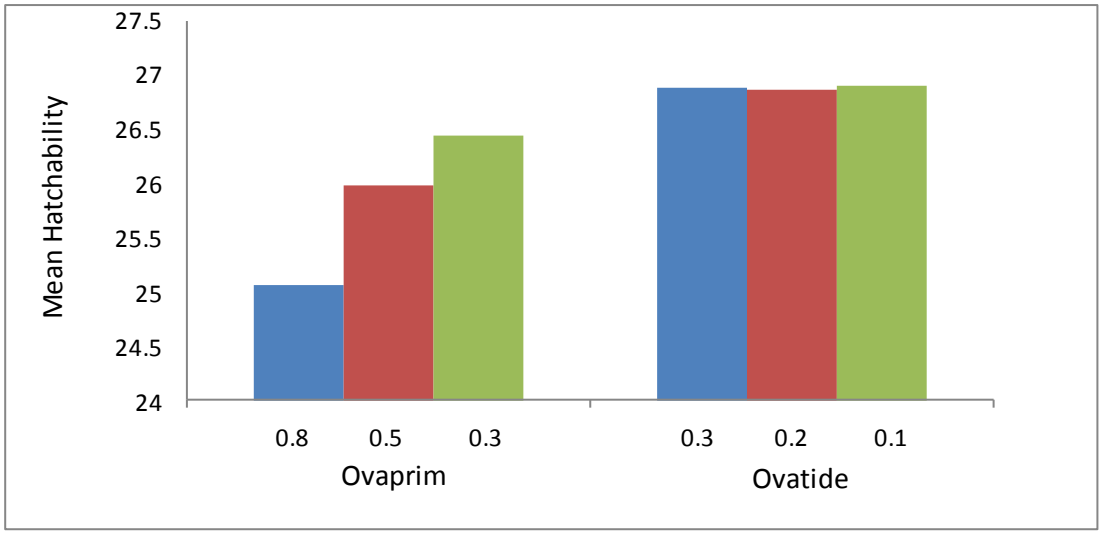

Fig. 4: Mean Hatchability of *C. gariepinus* with Ovaprim and Ovatide.

Discussion

The mean fecundity of 92, 600, 89, 150 and 83, 125 eggs were observed in the fish that were injected with 0.8ml/kg, 0.3ml/kg and 0.5ml/kg of ovaprim respectively. On the other hand, the mean fecundity of 89, 100, 86, 200 and 81, 250 eggs were observed in the fish that were injected with 0.1ml/kg, 0.2ml/kg, and 0.3ml/kg of ovatide respectively (Fig. 2). The results showed that there were significant differences ($p<0.05$) between TA and TB, TB and TC but there was no significant difference ($p>0.05$) between TA and TC. The variation in the mean fecundity using different doses of the hormones (ovaprim and ovatide) could be attributed to the brood stocks maturation, species of the fish used, and effects of the hormones on the brood stocks during latency period, and the genetical constituents of the fish used. These results agreed with the work of Muhammed *et al.*, (2014) which reported that *C. gariepinus* produced more eggs in ovaprim than ovatide. On the other hand, this work is in disagreement with the work of Sharma *et al.*, (2010) which reported the highest egg stripped and net fecundity in the highest dosage of ovatide (1.0ml/kg) used on *C. batrachus*. Achionye and Oborah (2012) recorded the highest fecundity of 300, 000-350, 000 eggs in catfish (*C. gariepinus*) that was injected with the highest dosage of ovaprim (1.5ml/kg). Kasi *et al.*, (2015) reported the highest total egg mass of 300g using the lowest dosage of ovaprim (0.4ml/kg) compared to the manufacturer's recommended dosage. The results of Kasi *et al.*, (2015) disagreed with this study which at higher dosage of ovaprim, fecundity was at its best.

The mean fertilization of 84.47, 76.43 and 81.82 were observed in the fish that were injected with 0.8ml/kg, 0.5ml/kg and 0.3ml/kg of ovaprim respectively. Similarly, the mean fertilization of 81.82, 78.62 and 50.05 were observed in the fish that were injected with 0.1ml/kg, 0.3ml/kg and 0.2ml/kg of ovatide respectively (Fig. 3). The differences observed in the mean fertilization could be attributed to gonadal maturation of the male brood stocks used,

viability and quality of the fecund eggs, quantity and quality of spermatozoa present in the male gonads used. The results showed that there were significant differences ($p<0.05$) between the varying doses of ovatide (TO and TP, TP and TQ) but there was no significant difference ($p>0.05$) between TO and TQ. On the other hand the results showed that there was no significant difference ($p>0.05$) among the fish specimens that were treated with varying doses of ovaprim. The mean fertilization was at its best with the fish specimens injected with 0.8ml/kg of ovaprim and 0.1ml/kg of ovatide. These results disagreed with the work of Gomina (2011) which reported that the fish specimens injected with 0.5ml/kg of ovaprim had the best results. Also, these results are not in agreement with the work of Kasi *et al.,* (2015) which reported that the best fertilization rate of 97.88% was obtained by using the lowest dosage of ovaprim (0.4ml/kg) and the least fertilization rate of 75.66% by using higher dosage of ovaprim (0.6ml/kg). These results were in-line with the work of Raymond *et al.,* (2015) which reported that ovaprim performed better than ovatide in the fertilization of *Clarias gariepinus*.

The mean hatchability of 62.46, 62.04 and 54.01 fry were observed in the fish specimens that were injected with 0.8ml/kg, 0.5ml/kg and 0.3ml/kg of ovaprim respectively. On the other hand the mean hatchability of 70.21, 47.93 and 55.57 fry were obtained in the fish specimens that were injected with 0.1ml/kg, 0.2ml/kg and 0.3ml/kg of ovatide respectively (Fig.4). These results showed that there was a significant difference ($p<0.05$) between TA and TB in the fish specimens that were injected with varying doses of ovaprim. Similarly, there was no significant difference ($p>0.05$) between the fish specimens that were injected with varying doses of ovatide. The mean hatchability differences obtained between TA and TC, TB and TC could be attributed to the viability of the fecund eggs of the fish used, favourable physico-chemical and environmental conditions. On the whole, these results showed that fish that were induced with ovatide had better hatchability than those induced with ovaprim. These results disagreed with the work of Khakesh *et al.,* (2010) who reported that ovaprim had the best hatchability rate of 77.0% than those induced with ovatide (76.0%); Raymond *et al.,* (2015) who induced Pengba (*Osteobrama belangeri*) and the hatchability rate in ovaprim was 84.69% and ovatide 75.01%. These results again disagreed with the work of Muhammed *et al.,* (2014) which induced *Sperata seenghala* with ovaprim and ovatide and had the best hatchability of 55% in ovaprim and had 43% in ovatide. Furthermore, this work is in disagreement with the work of Sharma *et al.,* (2010) which induced *Clarias batrachus* with ovatide and reported that the hatchability was higher by using 1.0ml/kg of the hormone; Kasi *et al.,* (2015) reported that hatchability of 93.66% was obtained using the least dosage of ovaprim (0.4ml/kg) and the hatchability of 83.66% was obtained using a higher dosage of 0.6ml/kg in *Clarias gariepinus*. The differences in these results may be due to the species differences, varying doses of the hormones used, environmental factors as well as quality of the eggs used.

Conclusion

In ovaprim hormone, fecundity and fertility were effective with 0.8ml/kg while in ovatide hormone, fecundity and fertility were effective with 0.1ml/kg. On the other hand, hatchability was effective with a dosage of ovaprim at 0.8ml/kg while in ovatide hormone, hatchability was effective with 0.1ml/kg. Therefore, in the induction of *Clarias gariepinus*, the use of ovaprim at 0.8ml/kg and ovatide at 0.1ml/kg doses are recommended for fish farmers or breeders for inducing spawning in *Clarias gariepinus*, in Makurdi area.

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