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The Effects of Uv-Light on Gametes for Androgens and Gynogens Production in *Clarias Gariepinus*.

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Abstract

The preference to fish consumption has been critical in terms of fish sex where some consumers desire to have either male or female fish in their food. This work aimed at the production of androgens and gynogens from Clarias gariepinus gametes under UV-light irradiation(rays). The research was carried from 2013 to 2015 at the University of Jos, Hydrobiology laboratory. Matured female broodstocks (1.4kg) each was hypophysized with a 0.7ml combination of two synthetic hormones (0.56 Ovaprim and 0.19 ml Ovulin). After hypophysation and stripping, three hundred (300) eggs were counted in three batches and spread on three Petri dishes (10cm in diameter). The eggs were spread in a single layer, and were UV-irradiated using Germicidal UV-lamp of 100W. The irradiation time were varied from 30 to 90 seconds with an interval of 30 sec. for also a varied distance 6, 8 and 10cm each from the lamp. During the irradiation, the samples on the petri dish were kept on a cold water of 4°C and were stirred manually throughout to ensure a uniform irradiation. After irradiation, non-irradiated eggs were immediately mixed with 0.25ml of irradiated sperm suspension for gynogens production, while irradiated eggs were mixed with non-irradiated sperm for androgens productions and were fertilized by adding 10ml of water. The haploid zygotes were divided into three batches of two replicate each and cold shock (exposed on 4°C) administered to induce diploids after which developing embryos were transferred to aquaria for hatching. The eggs and sperms under distance 6cm, 60seconds were non irradiated, which served as controls. The result revealed that fertilization took place in all media used, but hatchings were observed only in ovarian fluid medium with significantly ($P < 0.05$) higher gynogens at effective distance/interval of 8/30 and 8cm/60 sec for androgens, compared to other treatments, while the percentage survival rates of 11.67% and 3.33% were observed in distance/interval of 8cm/60sec for gynogens and androgens respectively. It is recommended that, monosex C. gariepinus can be produced with uv-light apart from chemicals.

Key words. *UV-Light, Irradiation, Gynogens, Androgens, Normal Saline, Ovarian Fluid.*

Introduction : Androgenesis and Gynogenesis are the processes of producing pure males (androgens) and pure females (gynogens) respectively. These processes play significant role in manipulation of broodstock production towards enhancing food security and protein intake in the face of human population explosion. The annual world population is on the increase and the level of protein supply to cater for this phenomenon is lacking because over 70% of our diets in the world have very minimal protein. This also account for the menace of kwashiorkor disease particularly in the less developed and low income countries of the world. Adequate nutrition with the inclusion of fish is essential at all levels from pregnancy and early childhood because it ensures healthy growth, proper organ formation, function, strong immune system, neurological and cognitive development (UNICEF-WHO, 2012). Economic growth and human development require well-nourished population that can learn new skills, think critically and contribute to their communities and national development. Child malnutrition impacts cognitive function and contributes to poverty through impeding individuals' ability to lead productive life. In addition, it is estimated that more than one-third of under-five deaths are attributed to under nutrition (Liu, Johnson, Cousens, Perin, Scott, Lawn, Rudan, Campbell, Cibulskis, Li, Mathers, Black, 2012; Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, Bongers, Nguenga, Eding and Richter, 2008). This problem can conveniently be overcome, given the necessary attention to other methods of fish breeding like hybridization and monosex cultures as sources of proteins supplement in our diets. These

methods can produce hybrids vigor, androgens and gynogens with more adaptive and quality tendencies than the parent's fish. Similarly, Fish can then be easily available throughout the seasons as major source or ingredient of balanced diet. Mono sexes either male or females have the tendency of growing faster without impediment by sexual gametes development, which will allow enough availability of fish to cater for the unprecedented human population increase in Nigeria and the world at large.

In the study of Androgenesis and Gynogenesis in Nigeria, Olufeagba & Yisa (2019) worked on African catfish *Heterobranchus longifilis* to produce mono sex (Androgens and Gynogens) separately. They reported that the process was successfully carried out using Ultraviolet (UV)-light irradiation and cold shock method (Felix, Avwemoya and Abah, 2019) and that the induction of gynogenesis and androgenesis was 50.7 and 6.7% hatchability respectively. They also observed that the percentage survival rate after six days was 97.8% (gynogens) better than 6.25% (Androgens). McElwee, Lewis, Nidiffer, and Buitrago, (2002) reported that gynogenesis involves diploidization of the maternal genome through polar body retention or mitotic interference with the first mitosis of eggs that have been genome neutralized before fertilization. Olufeagba & Yisa (2019) Nyong,& Bassey(2019 and reported that, diploidy can also result from the suppression of the second meiotic division and the retention of the second polar body, similar to the mechanism proposed for the establishment of triploidy in cold shock fish. They also observed that temperature treatment interferes with normal action of the spindle and extrusion of the second polar body, which consequently led to the retention of an extra haploid set of maternal chromosomes. Olufeagba & Yisa (2019) stated that gynogenesis is useful in mono sex production and also sexual studies. UV irradiation is important because it dimerizes or combines similar molecule to form a dimer in the DNA rather than fragmenting it (Bhise & Khan, 2002). Gynogens and androgens can be produced through the activation (fertilization) of irradiated eggs or sperm with the normal sperm or eggs to produce haploid androgens that are unable to survive when left alone. Thus, Bhise & Khan, (2002) reported that a shock was applied following the first cleavage within 34 minutes after fertilization to block the subsequent cell division, which permitted the fusion of the two haploid nuclei to form a stable diploid pure inbred. Olufeagba, Aluko, Omotosho, Raji, and Hassan, (2000) manipulated temperature to induce triploid in *H. longifilis* and the best results from cold shocking of fertilized eggs were obtained at 5°C for 40 minutes, while 39°C for 3 minutes was the minimum for the warm shock and survival percentage of triploid fingerlings was 88.8 percent compared to 51.3 percent for diploid fingerlings.

Khan, Cleveland, and Mollah (2002) used chromosomes for manipulation of fish genomes and showed that the induction of androgenesis using diploid sperm was highly effective in UV-irradiation of eggs. Samonte-padilla, Eizaguirre, Scharsack, Lenz, and Milinski (2011) used UV-light irradiation for the production of Diploid gynogenesis and was successfully performed in three-spined Stickleback and showed that gynogenetic embryo/larva exhibiting abnormalities were haploids and those that developed normally were diploids Nyong *et al* (2023).
Hammed, Fashina-Bombata,; Nyong,& Bassey(2019). and Osinaike, (2010) reported that shock duration of 25min at 0˚C gave the best result of 55% hatch with survival rate of 43.5% at the end of the exposure regime. Lakra (2001) observed that Transgenics fish (products of genetic manipulation) technology has great potentials in aquaculture industry by introducing desirable genetic straits in to Fishes, Mollusks and Crustaceans. Examples of these straits include faster growth rates, improved food conversion efficiency, resistance to some known diseases, tolerance to low oxygen concentration and tolerance to extreme temperatures. Hammed *et al*. (2010) reported that the development to improved fish seeds that can contribute to increased fish production is a potent solution to meeting the future fish protein demands. This work therefore, aimed at genetic alteration through UV irradiation in the mass production of pure sex fish individuals of *Clarias gariepinus* fingerlings to supplement fish seeds.
Materials and Methods: Ovulin and Ovaprim synthetic Hormones were combined (0.516 and 0.019ml respectively) and broodstocks of 1.4kg were hypophysized. The eggs were stripped

after latency period of 15hrs with water temperature of 25ºC. 300 eggs were counted each and were spread on 3 Petri dishes of 10cm in diameter each forming a single layer that were UV-irradiated (Germicidal UV-lamp 100W) for different time periods of 30 to 90secs maintaining a distance of 6, 8 and 10 with intervals of 2cm between the lamp and the sperm or eggs samples. During the irradiation, the eggs in the Petri dishes were kept on ice blocks in a plastic bowls of 42 x 30 x 23.5cm and a temperature of 4ºC was maintained throughout the irradiation period to avoid damage that would have been caused by the heat generated and the eggs samples were manually stirred to ensure uniform irradiation. The milt obtained through dissection was diluted at 1:3 ml with physiological Normal saline (0.9%). After irradiation the eggs and sperm were immediately mixed with the 0.25ml of sperm suspension and 300 eggs respectively and were fertilized by adding 10ml of freshwater. The exact time when the sperm and eggs were mixed to fertilize the irradiated eggs and sperm respectively was considered as zero time. This helped in determining the age of the embryo at the time of cold shock. The excess milt or sperms were washed off and the developing embryos were left at ambient temperature for further development and treatments.

Fertilized eggs were divided in to three batches and cold shock was administered by transferring the eggs to 4˚C cold water. The cold shock parameters, namely, temperature, post insemination time and exposure time were varied to determine the optimum conditions for inducing diploidy. After cold shock, developing embryos were transferred to aquaria filled with clean and aerated water.The fertilized eggs were spread on the nylon net kaka ban in the incubators for hatching under the temperature between 24 - 26.0˚C. The water flow through was maintained for constant oxygen supply in the incubators for hatching of fertilized eggs. It was done by adjusting the open and close ball cock of the knob on the PVC pipe.

Result and Discussion

The result in Table 1 shows the mean control, effect of distance and time on irradiation of sperm (for gynogenesis), fertilization and hatchilings of *C. gariepinus* using 0.9% Normal saline as irradiation fluid (medium). It revealed that the highest fertilized eggs of 290±2.30 was in the control and was significantly (P<0.05) different from all other treatments. This conform with the work of Olufegba and Yisa (2019) and Mei and Gui (2015). This followed by 250±3.10 fertilized eggs in distance 8 cm, 60 s. The next was 240±2.10 fertilized eggs in treatment distance 8 cm, 30 s. This was also followed by 235±1.33 fertilized eggs each in distance 6 cm, 90 s and distance 10 cm, 30 s accordingly.

The next was 231±0.24 fertilized eggs in distance 10 cm, 90 seconds and 230±1.02 fertilized eggs in distance 6 cm, 30 s while the lowest was in distance 10 cm, 60 seconds with 221±23.32 fertilized eggs and were not significantly different from each other. The number of fertilized eggs for androgens were observed on Table 2 and it revealed that the highest (280±5.40 fertilized eggs) was in distance 6cm 60 s the control. This was followed by 240±3.12 fertilized eggs in distance 8cm 60 seconds. The next was 237±0.23 fertilized eggs in distance 8cm 90 s. This was also followed by 233±0.50 fertilized eggs in distance 8cm 30 s, 228±3.31 eggs in 10cm 30 s, 208±2.30 in 6cm 90 s, 203±0.40 fertilized eggs in 10 cm 90 s and the lowest 190±0.21 fertilized was observed in distance 10cm 60s.

Hatching of gynogens fry was observed in the control with 275± fry (96.67%) while all the other treatments of fertilized eggs could not hatch as indicated in the Table 1. By implication, survival rate was also noted only in the control hatchlings with 258±0.60 (94.83±2.21%) fry. This is in line with the work Olufegba and Yisa (2019). Similarly, the result of androgenesis using Normal saline as irradiation medium was presented in Table 2 with the highest fertilized eggs of 280±5.40 (93.33±5.30%) in the control and was also significantly different (P<0.05) from other treatments. This was followed by 240± 3.12(80.00±0.23%) fertilized eggs from distance 8cm, 60s. The next was in distance 8cm, 90s with fertilized eggs of 237±0.23 (79.0±1.24%), distance 8cm, 30s with 233±0.50 (77.67±2.23%), distance 10cm, 30s had 228±3.31(76.00±2.14%), distance 6 cm, 90 seconds with 208±2.30(69.33±3.21%), distance 6 cm, 30 seconds with 205±2.00 (68.33±1.23%), distance 10cm, 90s with

203±0.40 (67.67±0.32%) and the lowest was 190±0.21 (63.33±1.34%) fertilized eggs in distance 10cm, 60s and they were not different from each other significantly. This not in line with work of Olaniyi and Omitogun (2014) but concur with that of Sarker, Das, Hossain, Mian and Iqbal (2022).

Hatching was also observed in the control (6cm 60s) of androgens Table 2 with the highest of 268±4.50 fry (93.33±5.30%) and the survival was 252±5.10 fry (89.33±3.4%), while fertilized eggs from other treatments again could not hatched. Even though the highest fertilized eggs of 240±2.01 in gynogens Table 1 was also in distance 8cm 60s. There were 237 ± 0.23 (79±1.24%) fertilized eggs of androgens in 8cm 90s, 233± 0.50(77.67±2.23%) fertilized androgens eggs in 8cm 30s, 228±3,31 (76.00±2.14%) fertilized androgens eggs in 10cm 30 seconds, 208±2.30 (69.33±3.21) androgen eggs in 6cm 90 seconds, 203±0.40(67.67±0.32%) fertilized androgens eggs in 10cm 90s and the lowest was 190±0.21 (63.33±1.34%) fertilized
anddogens eggs in 10cm 60s all in Table 2 accordingly. The result of hatching and percentage hatchling of androgens in Table 2 was observed only in control with 268±4.5 and 89.33±3.40% respectively. All other treatments could not hatch under this irradiation medium. Survival in
androgens production was only observed in the control with 252± 5.10(94.03±3.50) of the same Table 2.

Table 1
Mean Control (Distance 6cm 60 seconds), Effective Distance, Time of Irradiation on Sperm (Gynogenesis), Fertilization and Hatchlings of *Clarias gariepinus* using 0.9% Normal Saline as Irradiation Fluid

Dist. (Cm)	Time (sec)	Eggs +Ovu25%	Ova75	NFE	H	SF	% FE	% H	% Surv.
6	30	300		230±1.02			76.67±2.03		
	60 (control)	300		290±2.30	275 ± 4.00	258 ± 0.6	96.67±1.01	94.83 ± 2.21	97.73 ± 3.02
	90	300		235±1.33			78.33±3.22		
8	30	300		240±2.01			80.00±5.23		
	60	300		250±3.10			83.33±2.43		
	90	300		235±3.21			78.33±3.15		
10	30	300		225±6.23			75.00±4.23		
	60	300		221±3.32			73.67±2.00		
	90	300		231±0.24			77.00±0.23		
Mean	60	300		234.11±4.32			78.04±5.42		

Note: the control was distance 6cm 60 seconds
Key: Fert = fertilization, Surv = survival, Dist. = distance, Survival Fry = SF, H = hatchlings, NFE = Number of fertilized eggs,

Table 2
Mean control (Distance 6cm 60 seconds), Effective Distance, Time of Irradiation on Eggs (Androgenesis), Fertilization and Hatchlings of *Clarias gariepinus* using 0.9% Normal Saline as Irradiation Fluid

Dist. (Cm)	Time/s	No of eggs	Fertilized eggs	Hatchlings	Survival fry	% Fertilized Eggs	% Hatchlings	% Survival of fry
6	30	300	205			68.33		
	60 Control	300	280±5.40	268±4.5	252±5.1	93.33±5.30	89.33±3.4	94.03±3.5
	90	300	208±2.30			69.33±3.21		
8	30	300	233±0.50			77.67±2.23		
	60	300	240±3.12			80.00±0.23		
	90	300	237±0.23			79.00±1.24		
10	30	300	228±3.31			76.00±2.14		
	60	300	190±0.21			63.33±1.34		
	90	300	203±0.40			67.67±0.32		
Mean	60	300	217.2±3.23			72.40±2.23		

Key: Fert = fertilization.

Mean Survival Rate of Hatchlings of *Clarias gariepinus* from UV-Irradiated Eggs (Androgenesis)

Distance (cm)	Time sec.	Hatchlings survival (Days)								% Survival
		1	2	4	6	8	10	12	14	
6	30	20	20 ± 0.0	10±1.2	5± 0.12	0	0	0	0	0.00
	60 control	20	20±0.0	20±0.0	18±1.2	18±1.2	18±1.2	17±1.0	15±1.2	85.00±0.1
	90	20	8±0.21	4± 0.12	2± 0.12	0	0	0	0	0.00
8	30	20	10±2.3	5± 2.12	3±1.01	1± 0.01	0	0	0	0.00
	60	20	11±1.0	6± 0.12	4± 0.21	3±1.0	3±1.03	3±1.01	3±0.12	15.00±2.12
	90	20	12±2.1	7± 0.20	3±1.32	1±0.12	0	0	0	0.00
10	30	20	0	0	0	0	0	0	0	0.00
	60	20	0	0	0	0	0	0	0	0.00
	90	20	0	0	0	0	0	0	0	0.00
Mean	60	20.0	8.3±2.1	5.3±1.0	2.5±0.0	1.3±0.1	2.1±0.1	2.0±0.0	1.8±0.0	10.0±3.13

Where ± = SE

0.12 (15.00 Table 6

Mean Survival Rate of Hatchlings of *Clarias gariepinus* from UV-Irradiated Eggs (Androgenesis)

Distance (cm)	Time sec.	Hatchlings survival (Days)								% Survival
		1	2	4	6	8	10	12	14	
6	30	20	20 ± 0.0	10±1.2	5± 0.12	0	0	0	0	0.00
	60 control	20	20±0.0	20±0.0	18±1.2	18±1.2	18±1.2	17±1.0	15±1.2	85.00±0.1
	90	20	8±0.21	4± 0.12	2± 0.12	0	0	0	0	0.00
8	30	20	10±2.3	5± 2.12	3±1.01	1± 0.01	0	0	0	0.00
	60	20	11±1.0	6± 0.12	4± 0.21	3±1.0	3±1.03	3±1.01	3±0.12	15.00±2.12
	90	20	12±2.1	7± 0.20	3±1.32	1±0.12	0	0	0	0.00
10	30	20	0	0	0	0	0	0	0	0.00
	60	20	0	0	0	0	0	0	0	0.00
	90	20	0	0	0	0	0	0	0	0.00
Mean	60	20.0	8.3±2.1	5.3±1.0	2.5±0.0	1.3±0.1	2.1±0.1	2.0±0.0	1.8±0.0	10.0±3.13

Where ± = SE

00 Table 6
Mean Survival Rate of Hatchlings of *Clarias gariepinus* from UV-Irradiated Eggs (Androgenesis)

Distance (cm)	Time sec.	Hatchlings survival (Days)								% Survival
		1	2	4	6	8	10	12	14	
6	30	20	20 ± 0.0	10±1.2	5± 0.12	0	0	0	0	0.00
	60 control	20	20±0.0	20±0.0	18±1.2	18±1.2	18±1.2	17±1.0	15±1.2	85.00±0.1
	90	20	8±0.21	4± 0.12	2± 0.12	0	0	0	0	0.00
8	30	20	10±2.3	5± 2.12	3±1.01	1± 0.01	0	0	0	0.00
	60	20	11±1.0	6± 0.12	4± 0.21	3±1.0	3±1.03	3±1.01	3±0.12	15.00±2.12
	90	20	12±2.1	7± 0.20	3±1.32	1±0.12	0	0	0	0.00
10	30	20	0	0	0	0	0	0	0	0.00
	60	20	0	0	0	0	0	0	0	0.00
	90	20	0	0	0	0	0	0	0	0.00
Mean	60	20.0	8.3±2.1	5.3±1.0	2.5±0.0	1.3±0.1	2.1±0.1	2.0±0.0	1.8±0.0	10.0±3.13

Key: Where ± = SE

Table 3
The Mean Control (Distance 6cm 60 seconds), Effective Distance, Time of Irradiation on Sperm (Gynogenesis) and Fertilization of Eggs of *Clarias gariepinus* Using Ovarian Fluid as Irradiation Fluid and was cold shocked.

Distance Cm	Time (sec)	Eggs Ova75 +Ovu25%	No of Fertilized eggs	Hatchlings	(%) no of Fertilized eggs	%Hatchlings
6	30	300	235 ± 3.50	30 ± 3.10	78.33 ± 4.30	12.77 ± 3.2
	60 control	300	250 ± 2.50	45 ± 4.30	83.33 ± 6.10	18.00 ± 6.3
	90	300	240 ± 4.50	61 ± 2.10	80.00 ± 3.80	25.42 ± 1.8
8	30	300	245 ± 3.60	150 ± 2.30	81.67 ± 5.40	61.22 ± 3.4
	60	300	260 ± 5.40	160 ± 3.50	86.67 ± 6.20	61.54 ± 3.2
	90	300	250 ± 4.70	142 ± 4.70	83.33 ± 3.20	56.80 ± 2.5
10	30	300	225 ± 3.60	130 ± 3.50	75.00 ± 4.30	57.78 ± 1.5
	60	300	215 ± 2.50	94 ± 4.30	71.67 ± 2.10	43.72 ± 2.3
	90	300	230 ± 3.20	89 ± 2.30	76.67 ± 3.20	38.70 ± 1.3
Mean	60	300	215 ± 1.20	100 ±1.10	238.89 ± 2.40	41.77 ± 2.1

Key: Fert = Fertilization

Table 4
The Mean Survival Rate of Gynogen Hatchlings of *Clarias Gariepinus* from UV-Irradiated Sperm (Gynogenesis) Fertilized with Unirradiated Eggs Using Ovarian Fluid as Irradiation Fluid and was cold shocked.

Distance (cm)	Time (s)	Hatchlings								% Survival
		Survival in days								
		1	2	4	6	8	10	12	14	
6	30	30	25±7.10	20±2.12	5±0.12	2±0.02	0	0	0	0.00
	60contol	30	30±0.0	30± 0.0	28±1.22	28±1.22	28±0.12	25±3.13	25±4.12	83.33±2.12
	90	30	27±6.70	27±5.12	19±3.32	15±1.24	7±0.12	1±0.02	0	0.00
8	30	30	29±7.20	25±4.32	18±3.41	11±2.31	8±1.30	2±0.12	1±0.01	3.33±0.12
	60	30	30±1.40	26±3.32	26±2.31	23±2.34	23±4.21	12±1.21	7±0.10	23.33±4.32
	90	30	30±1.40	27±5.23	25±2.21	1±1.21	0	0	0	0.00
10	30	30	29±9.70	24±2.12	23±3.41	15±4.12	2±0.12	0	0	0.00
	60	30	26±4.60	26±1.26	15±3.52	5 ± 0.30	1±0.12	0	0	0.00
	90	30	28±8.50	24±3.23	12±1.02	3±0.31	0	0	0	0.00
Mean	60	100	68.1±13	45.33±4.2	14.56±1.31	14.56 ± 1.	4.89 ± 1.2	1.67 ± 0.1	0.78± 0.1	0.49 ± 0.01

(Note; Control is Distance 6cm 60s)
Where ± = SE

The result in Table 3 shows the sperm irradiation for gynogenesis using ovarian fluid as irradiation medium. It revealed that, fertilization and hatching of the eggs were observed in all the treatments. The highest fertilized egg was observed in 8cm 60s with 260±5.4 (86.67±6.20%) followed by 250±2.5 (83.33±6.10%) fertilized eggs in 6cm 60s and 8cm 90s respectively. The next was 245±3.60 (81.67±5.40%) fertilized eggs in 8cm 30s, 235±3.35 (78.33±4.30%) fertilized eggs in 6cm 30s, 230±3.20 (76.67±3.20%) fertilized eggs in 10cm 90s, 225±33.60 (75.0±4.30%) fertilized eggs in 10cm 30s. The lowest was 215±2.50 (71.672.10 fertilized eggs in 10cm 60s.

Similarly, the result of survival rate of gynogens fry was presented in Table 4. The highest being 25±4.12 (83.33±2.12%) in the control. This was followed by followed by 7±0.10 (23.33±4.32%) fry in distance 8 cm, 60 seconds and the lowest of 1±0.01 (3.33±0.12%) fry in distance 8cm, 30seconds while all other treatments had no survivors

The next result of the mean control, effective distance, time of irradiation on eggs (for androgenesis), fertilization and hatching of *C. gariepinus* using ovarian fluid as medium for irradiation are presented in Table 5. It revealed that the highest fertilized egg was 241±12.50 (80.33±12.21%) in 8cm 60s, followed by 213±23.60 (71.00±2.34%) fertilized eggs in 8cm 90s, 201± 23.40(67.00±4.53%) fertilized eggs in 10cm 60s, 200±56.7 (66.67±3.44%) fertilized eggs in 8cm 30s, 190±23.10 (63.33±4.35%) fertilized eggs in 10cm 90s, 180±12.0 (60.26±2.32%) fertilized eggs in 10cm 30s, 150±30.00 (50.00±2.43%) 6cm 90s, 132±34.40 (44.00±2.32%) in 6cm 60s and the lowest was 120±23.10(40.00±5.67%) fertilized eggs in 6cm 30s. They were all significantly (P<0.05) different from each other. On the same Table 5, hatching was observed to have taken place in the other treatments including the control in contrast to the unhatched of other treatments under Normal saline used as irradiation medium. The highest hatchlings (fry) was 160±23.50 (75.12±4.21%) in 8cm 90s, 150±24.50 (62.24±1.34%) in 8cm 60s, 71± 24.30(37.37±4.12%) in 10cm 90s, 50±23.10 (25.00±3.32%) in 8cm 30s, 40±14.60 (30.30±2.34%) in 6cm 60s, 34±43.10 (16.92±3.30%) in 10cm 60s, 30±34.50(16.67±2.43%) in 10cm 30s, 28±13.40 (18.67±13.10%) in 6cm 90s and 23±3.20 (19.70±4.21%) in 6cm 30s in a descending order and were significantly different (P<0.05) from each other. The result of survival rate of androgens (pure males) is presented on Table 6 with 15±1.20 (85±0.10%) fry in 6cm 60s as the highest in the control and the lowest was 3 Table 62.12%) in distance 8cm, 60s with significant different (P<0.05) from each other while all other treatments had no survival fry.

Table 5
Mean Control, Effective Distance, Time of Irradiation on Eggs (Androgenesis) Fertili zation and Hatchlings of *Clarias gariepinus* Using Ovarian Fluid as Irradiation Fluid.

Distance (cm)	Time (sec)	No of eggs	Fertilized eggs.	Hatchling	% Fertilized eggs	% Hatchlings
6	30	300	120±23.10	23±3.20	40.00±5.67	19.70±4.21
	60control	300	132±34.40	40±14.60	44.00±2.32	30.30±2.34
	90	300	150±30.00	28±13.40	50.00±2.43	18.67±13.10
8	30	300	200±56.70	50±23.10	66.67±3.44	25.00±3.23
	60	300	241±12.50	150±24.50	80.33±12.21	62.24±1.34
	90	300	213±23.60	160±23.50	71.00±2.34	75.12±4.21
10	30	300	180±45.30	30±34.50	60.00±5.21	16.67±2.43
	60	300	201±23.40	34±43.10	67.00±4.53	16.92±3.30

	90	300	190±23.10	71±24.30	63.33±4.35	37.37±4.12
Mean	60	300	180.78±12.0	7.11±21.04	60.26±2.32	33.55±2.12

Table 6
Mean Survival Rate of Hatchlings of *Clarias gariepinus* from UV-Irradiated Eggs (Androgenesis)

Distance (cm)	Time sec.	Hatchlings survival (Days)								% Survival
		1	2	4	6	8	10	12	14	
6	30	20	20 ± 0.0	10±1.2	5± 0.12	0	0	0	0	0.00
	60 control	20	20±0.0	20±0.0	18±1.2	18±1.2	18±1.2	17±1.0	15±1.2	85.00±0.1
	90	20	8±0.21	4± 0.12	2± 0.12	0	0	0	0	0.00
8	30	20	10±2.3	5± 2.12	3±1.01	1± 0.01	0	0	0	0.00
	60	20	11±1.0	6± 0.12	4± 0.21	3±1.0	3±1.03	3±1.01	3±0.12	15.00±2.12
	90	20	12±2.1	7± 0.20	3±1.32	1±0.12	0	0	0	0.00
10	30	20	0	0	0	0	0	0	0	0.00
	60	20	0	0	0	0	0	0	0	0.00
	90	20	0	0	0	0	0	0	0	0.00
Mean	60	20.0	8.3±2.1	5.3±1.0	2.5±0.0	1.3±0.1	2.1±0.1	2.0±0.0	1.8±0.0	10.0±3.13

Where ± = SE

Conclusion : The challenge against using higher temperature in fish farming is overcome, by using water flow-through system. The culturing of *Clarias gariepinus* is best at 38°C where the highest weight gain was recorded as against 28 – 32°C. Gynogens and androgens can conveniently be produced only in ovarian fluid media at a distance 8cm 60seconds and the production of gynogens is easier compare to androgens because the fertilized embryo is hosted in the egg after irradiated. The higher the temperature, the faster the growth of the fish and the more, the turn-over in fish farming.

Recommendation(s) : The *Clarias gariepinus* species can now be reared at temperature of 38 °C. Works can be carried out using manipulated temperature from acclimatization of brood stocks to12 weeks old, of the monosex fish produced.
Ovarian fluid is the best irradiation fluid for the production of gynogens and androgens against normal saline and also Monosex *C. gariepinus* production is best at a distance of 8cm and 60seconds duration.

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