

EFFECTS OF DIFFERENT NATURAL EXTENDERS ON SPERM COUNT, MOTILITY AND FERTILITY OF *Clarias gariepinus* (Burchell, 1822) FOR ENHANCEMENT OF FINGERLING PRODUCTION

*Onyia, L.U¹., Diyaware, M.Y²., Etah, S.O.¹& Ochokwu, I.J³.

¹Department of Fisheries, Modibbo Adama University of Technology, Yola.

² Department of Fisheries, University of Maiduguri; Maiduguri.

³Department of Fisheries and Aquacultural Technology, Federal University, Dutsinma.

Email: luconyia@gmail.com.

ABSTRACT

The study assessed the effects of natural sperm extenders on the sperm count, motility and fertility of African mudfish (*Clarias gariepinus*) for artificial induced breeding and cryopreservation purposes. Three natural extenders were tested i.e. Coconut water, sugarcane water and soybean solutions were used. While the saline solution was used as a control. Semen samples (milt) were pooled from mature broodstock males weighing 600 ± 100 g and pre-extension qualities were evaluated for the fresh sperm. Extenders of sugarcane, coconut, soybean and saline water which was used as control were prepared and diluted with sperm to give a sperm extension ratio of 1:20 (1ml of sperm: 20ml of the extender) and 5ml of the prepared solutions were measured in different storage bottles and placed on crushed ice at about 4°C which were used to fertilize ready isolated eggs at 0, 3 and 6 hour intervals of exposure at 4°C to assess the fertility. In general, the fertilization rates decreased with increasing duration. With respect to natural extenders, the saline solution showed the highest fertility of 71%, followed by soybean milk (69%) while coconut water recorded the least fertility. There significant difference ($p < 0.05$) in the percentage fertility of milt among the sperm extenders. The motility of the extended sperms was viewed under microscope at $\times 400$ magnification and calculated. Soybean milk showed the highest motility rate of 65% and sperm count $0.690 \pm 0.050 \times 10^8$ after 6 hours

exposure as compared with other natural extenders. However, sperm count, motility and fertility decreased progressively as the period of storage increased.

Keywords: Coconut Water, Sugarcane Water, Soybean Milk, Spermatozoa, Fertilization, Motility, *Clarias gariepinus*

INTRODUCTION

Development of fish seed production has been identified as a rational way of augmenting the dwindling fish supply from the capture fisheries (Dada and Fagbenro (2008). To provide fish in the required quantities at reasonable prices to Nigerians, there is the need for adequate brood stock management for fish seed production (Francis *et al.*, 2013). Fish produces high viscosity of sperm and in some cases only small volume is produced. Extenders play a vital role in cryopreservation; they are needed for sperm dilution, and generally induce initial motility and increased fertilization of cryopreserved sperm. It is known that spermatozoa can be preserved for a day to years and their motility could be retained under low temperatures (Muchlisin, 2004; Akcay *et al.*, 1995; Bozkurt and Secer, 2005). Ringer and physiology solutions are common practical extenders to dilute the milt, since these solutions are easy to prepare. The objectives of the study are to evaluate sperm motility of *C. gariepinus* from different sperm extenders, determine the sperm count of both extended and fresh milt of *C. gariepinus* and determine the fertility of *C. gariepinus* different sperm extenders.

MATERIAL AND METHODS

The study was carried out in Fisheries Laboratory of Modibbo Adama University of Technology, Adamawa State. Natural extenders used were grind, soaked and sieved for use. The parameters evaluated were:

Motile sperm cell (MC) = Whole sperm cells (WSC) - Immotile sperm cells (ISC)

% Motile sperm cell (MC) = $\frac{\text{Motile sperm cell (MC)}}{\text{Whole sperm cells (WSC)}} \times 100$

Total no of spermatozoa per ml = Average No. of counted spermatozoa $\times 10^4$ of the extended semen

% Fertility = (No. of fertilized eggs / No. of inseminated egg) $\times 100\%$

Statistical Analysis

All measurements were done in duplicate for each sample and the data collected was analyzed using analysis of variance (ANOVA) and Duncan's multiple range tests to evaluate effects of types of extenders.

RESULTS AND DISCUSSION

The study showed that motility (Table 1), progressively decrease as the period of storage increased. Sperm extended with soybean milk showed higher motility significantly different ($p > 0.05$) with other extenders after 6 hours of storage at 4°C . Therefore soybean milk is a good extender for storing sperm for fairly long period of time, although, there was no significant difference ($p > 0.05$) between the control solution and soy milk extender at the same exposure period.

The natural extender that had highest percentage fertility as seen in Table 2, was in the Soybean followed by sugarcane and coconut. Fertility decreased six hours after dilution, indicating that some of the sperms were dying at the time. Coconut water has been found to have higher fertility at the three hours exposure at 4°C of extenders. This result is in agreement with that of Muchlisin and Mohammadar, (2002). The reason for the differences among extenders in fertilization rate can be explained with decrease in spermatozoa motility and sperm count. The higher the sperm count and motility rate, the higher the fertilization.

Table 1: Mean percentage motility rate after 0, 3, and 6 hours exposure at 4°C in different extenders

Duration/h	Control	Sugarcane	Coconut	Soybean
0	84.445±4.445 ^a	76.780±1.780 ^b	75.520±6.290 ^c	82.215±0.395 ^d
3	68.335±1.665 ^a	88.690±2.980 ^b	41.765±3.685 ^c	79.000±1.000 ^d
6	42.220±2.220 ^a	38.095±4.765 ^b	29.715±6.645 ^c	65.000±1.002 ^d

Different superscripts in a row indicate significant differences at $p < 0.05$.

Table 2: Mean percentage fertility rate after 0, 3, and 6 hours exposure at 4°C in different extenders.

Duration/hr	Control	Sugarcane	Coconut	Soybean
0	97.000±1.000 ^a	89.000±1.000 ^b	81.000±1.000 ^c	94.000±2.000 ^d
3	92.000±2.000 ^a	81.000±1.000 ^{bc}	82.000±2.000 ^{bc}	91.000±1000 ^a
6	71.000±1.000 ^b	62.000±2.000 ^c	47.000±3.000 ^{cd}	69.000±1000 ^b

Different superscripts in a row indicate significant differences at $p < 0.05$.

Sperm count in the fresh sperm recording the highest spermatozoa cells 3.68×10^8 and it recorded about 86.96% motility which was the prerequisite which qualifies the sperm for use (Mansour *et al.*, 2002). Among other extenders, soybean milk recorded the highest sperm count which is significantly different ($p > 0.05$) compared with other extenders (Table 3).

Table 3: Overall mean percentage of motility and fertility and mean sperm count of *Clarias gariepinus*.

Treatment	Sperm count ($\times 10^8$)	Motility	Fertility
Control	0.304±0.016 ^a	65.000±7.898 ^a	86.667±5.077 ^a
Sugarcane	0.415±0.035 ^d	67.855±9.978 ^a	77.333±5.103 ^{ad}
Coconut	0.385±0.035 ^a	49.000±9.036 ^{cd}	70.000±7.339 ^d
Soybean	0.690±0.050 ^{cd}	77.486±3.3221 ^d	84.667±5.024 ^a

The mean values in the same column followed by a different superscript indicate significant difference ($p < 0.05$)

CONCLUSION

From the study, it showed that sperm of African catfish (*Clarias gariepinus*) survived more with the highest recorded of sperm count in soybean milk which also recorded the highest motility value, whereas, the control solution had the highest percentage fertility. Although fertility value for soybean solution was also high there was no significant difference with that of the control solution. Therefore, it could be concluded that soybean milk extender can be a good replacement of saline solution which is a conventional solution in artificial breeding exercises.

REFERENCES

- Akcay, E; Tekin, N; Secer, S (1995). Preservation of Fish Semen. Ege University, *Journal of Fisheries and Aquaculture Science*. 12: 367-373.
- Bozkurt Y, Secer S (2005) Effect of Short-Term Preservation of Mirror Carp (*Cyprinus carpio*) Semen on Motility, Fertilization, and Hatching Rates. *Israeli Journal of Aquaculture Bamidgeh*. 57(3):207-212.
- Dada K, Fagbenro D (2008). Catfish fingerlings production in Nigeria. Proceedings of the 4th Annual Conference of School of Agriculture and Agricultural Technology, Federal University of Technology, Akure. pp. 107 -110.
- Francis O.M, Akinlolu A.A and Kehinde O.A (2013). Assessment of bitter leaf (*Vernonia amygdalina*) as fertility enhancer in the giant African Catfish (*Heterobranchus bidorsalis*) broodstock. Pages. 1 - 5.
- Mansour, N, Lahnsteiner, F. and Patzner, R. A. (2002). The spermatozoan of the African Catfish: fine structure, motility, viability and its behaviour in seminal vesicle secretion. *Journal of Fish Biology Vol. 60 No. 3. pp. 545-560.*

- Muchlisin Z.A. (2004). Preliminary study on spermatozoa cryopreservation and evaluation of dietary protein on gonadal development of bagrid catfish (*Mystus nemurus*) female Broodstock. *Thesis*, University Sciences Malaysia, Penang.
- Muchlisin Z.A. and Muhammadar. (2002). Long-term cryopreservation of baung spermatozoa, *Mystus nemurus*: Effect of various cryoprotectants on motility and fertility. *Toran* 12 (4): 204-210.
- Omitogun, G.O., Olaniyan, O., P. Amupitan, Oresanya, T, S. Aladele and W. Odofin (2012). Cryopreservation of the Sperm of the African Catfish for the Thriving Aquaculture Industry in Nigeria, *Current Frontiers in Cryopreservation*, Prof. Igor Katkov (Ed.), ISBN: 978-953- 51-0302-8.

References to this paper should be made as follows: Onyia, L.U. et al (2017), Effects of different Natural Extenders on Sperm Count, Motility and Fertility of *Clarias gariepinus* (Burchell, 1822) for Enhancement of Fingerling Production. *J. of Agriculture and Veterinary Sciences*, Vol. 9, No. 3, Pp. 75-80
