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Effect of Azanza Garckeana (*Goron Tula*) Pulp Powder on Fertility, Hatchability and Fry Survival of *Clarias Gariepinus*

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Abstract

This experiment was conducted to investigate the effect of Azanza garckeana on egg fertilization, hatchability and fry survivability of Clarias gariepinus in culture system, for a period of four weeks. The results show that number of fertile eggs and fertilization rate for week 1 to week 4 differs significantly among all the treatment groups ($p > 0.05$). In the first week, T2 recorded the significantly highest number of fertile eggs (63764.66±7628.54) and fertilization rate (83.00±1.00 %) compared with other treatments ($p < 0.05$). In week 2, T2 also recorded the significantly highest number of eggs (60117.66±5673.12) while fertilization rate was significantly highest in T5, T2, and T3 (83.33±1.52 %, 81.33±1.52 %, and 81.00±1.99 %) respectively. in week 3 show that number of fertile eggs was significantly highest (57006.66±5929.07) in T2 compared with other treatment groups while fertilization rate was significantly highest (83.38±2.50 %) in T5 as compared with other treatment groups ($p < 0.05$). In week 4, both T2 and T4 has the significantly highest number of fertile eggs (62802.66±11735.38 and 55282.00±7329.18) compared with other treatment groups, while T5 has the significantly highest fertilization rate (84.66±1.52 %) compared with other treatment groups ($p < 0.05$). Eggs, hatchability and survival rates differs significantly among all the treatment groups ($p > 0.05$) in all the weeks studies. In the first week, T2 recorded significantly highest number of hatched eggs (47796.33±5494.90) compared with other treatments while hatchability rate was significantly highest (84.33±1.52 %, 82.53±3.55 %, and 80.76±2.24 %) in T5, T4, and T3 respectively compared with T1 and T2 ($p < 0.05$). Furthermore, survival rate was significantly highest (100.00±0.00 %) in T4 and T5 respectively and lowest (80.66±2.30 %) in T1. Week 2, the number of hatched eggs was significantly lowest (26954.66±1523.81) in T2 and highest (37067.33±1362.66) in T4. Also, hatchability rate was significantly highest (77.00±1.00 %) in T5 while survival rate was highest (100.00±0.00 %) in T4 and T5 respectively. Week 3 show hatched eggs was significantly highest (34794.00±3966.94) in T2 compared with other treatment groups while hatchability rate was significantly highest (72.66±1.52 % and 67.66±1.52 %) in T5 and T4 respectively as compared with other treatment groups ($p < 0.05$). Survival rate of week 3 showed similar trend with that of week 1 and 2 respectively. In week 4, both T2 and T4 has significantly highest number of hatched eggs (34417.00±8211.90 and 32159.33±5687.53) respectively compared with other treatment groups, while T5 has the significantly highest hatchability rate (69.38±4.45 %) compared with other treatment groups ($p < 0.05$). Survival rates of T2, T3, T4 and T5 did not differ significantly ($p > 0.05$).

Keywords*: Azanza garckeana, Egg fertilization, Hatchability, survivability, Clarias gariepinus*

INTRODUCTION

As the population in the world increases, the demand for fish in the world is growing. Despite a high preference for fish and fisheries products in Africa, the per capita consumption of fish in this part of the world is still very low (FAO, 2000). C. gariepinus is distinguished by a wide range of tolerance to high salinity levels, resistance to disease attack, ability to withstand stress, high fecundity, and high palatability, which makes it suitable as an aquaculture candidate (Nwadukwe, 2003). Increased production of fry that have the attributes of faster growth rates and better environmental tolerance is needed to be harnessed for sure for fish food security. Fish production can be improved upon through genetic improvement and development of brood stock. However, Megbowon et al. (2013) stated that the African Catfish (C. gariepinus) is widely considered the leading cultured fish in the country. C. gariepinus is accepted and equally reared on most of the fish farms in Nigeria; it is easily crossed among the genus of Clarias (Ochokwu et al., 2015).

There has been an increase in sterility and infertility both in humans and animals due to inherent, environmental, and metabolic factors and unhealthy lifestyles. Several studies have linked declining reproduction, especially male fertility, to environmental toxicants, particularly endocrine-disrupting chemicals (EDCs) such as bisphenol A (BPA) (Lawal et al., 2015), suspecting AG can be used to correct infertility and sterility in humans and animals that are caused by inherent environmental factors and lifestyle.

Medicinal plants have been a source of biologically active substances, employed widely as crude materials or as purified compounds to treat diseases. Plant-based traditional medicine plays a crucial role in the development of novelties in drug discovery (WHO 2018).

One of the medicinally based plants is Azanza garckeana (AG), called ‘goron tula’ (Hausa, Nigeria) or ‘African chewing gum (English) (Umar et al., 2019). In Nigeria, it is abundantly found in Tula, Gombe State; Kankiya, Katsina State; and the Daggish Kali highlands of the Zah district, Adamawa State (Onukogu et al., 2019). AG is widely consumed in Northern Nigeria owing to its fast action in boosting energy for sexual satisfaction. It is very rich in antioxidants, phenols, and flavonoids, which scavenge reactive oxygen species (ROS) that damage cell membranes and DNA (Madaki et al. 2019).

Peña et al. (2022) stated that in Functional Additives and Reproductive Performance in Aquaculture, researchers have realised that not only is it essential to know the percentage of lipids and proteins in diets, but also the levels of functional additives that play a crucial role in maintaining high-quality spawning. In this context, functional additives are defined as substances that exert a benefit for a certain biological function. The provision of functional additives in conventional broodstock diets is intended to improve progeny quality, among other benefits. The quality of larvae and eggs is a very important parameter in the aquaculture industry, because a large quantity of eggs of optimum quality is necessary to allow further development of the cultured organism (Peña et al. 2022).

MATERIALS AND METHODS

Study Site

The study was conducted at the Research Farm of the Department of Aquaculture and Fisheries Management, Nasarawa State University, Keffi, Shabu-Lafia Campus, Lafia, Nasarawa State.

The site location

Lafia is located at latitude 8° 35’N, longitude 8° 32’E, and 181.53 m above sea level with a mean temperature of 34°C, relative humidity of 40-86%, and average daylight of 9-12 h (NIMET, 2024).

Collection of Azanza garckeana fruit and identification

The fruits (Azanza garckeana) were sourced from Lafia market, Nasarawa State, Nigeria. The fruit samples were authenticated and identified for use by a plant manual from the Department of Forestry and Wildlife, Federal University of Lafia, in Nasarawa State.

3.4. Experimental fish

The brood stocks, both male and female, were collected from a reputable fish farm in Nasarawa State, Nigeria. The fish were transported in plastic troughs (50 cm diameter×30 cm deep) to the research fish farm of the Department of Aquaculture and Fisheries Management, Faculty of Agriculture, Nasarawa State University of Keffi, Shabu campus, Lafia. The broodstock were acclimatised to it.

3.5 Experimental diet

The experimental diets were formulated with 40% crude protein using the FeedWincomputer software. Fish meal, soybean, wheat bran, vitamin premix, vitamin C, lysine, methionine, and cassava starch (binder) were procured from Lafia market. Soybean meal was collected

from a one-man village near Abuja. All the feed ingredients were weighed with a Satter top-loading scale, and the ingredients that are needed in small quantities were measured with a sensitive scale. The weighed ingredients were ground separately using a hammer mill. The ground feed ingredients were thoroughly dry, mixed manually, and pelleted.
The feed was formulated as shown on table 1 below.

Table 1: Gross composition of the formulated diet

Composition AGM in g/kg					
Ingredients	**AG1**	**AG2**	**AG3**	**AG4**	**AG**
Maize	8	8	8	8	8
Rice bran	8	8	8	8	8
GNC	32	32	32	32	32
Fish meal	14	14	14	14	14
SBC	32	32	32	32	32
Casava	4.5	4.5	4.5	4.5	4.5
Bone meal	0.25	0.25	0.25	0.25	0.25
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
fish oil	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Azanza (goron tula)	0	10g/kg	15g/kg	20g/kg	25g/kg
Total	100	100	100	100	100

AG1= 0% *Azanza garckeana*. **AG2=**10% *Azanza garckeana*. **AG3=**15% *Azanza garckeana*. **AG4=**20% *Azanza garckeana*. **AG5=**25% *Azanza garckeana*.

Collection, processing, and preparation of *A. garckeana* meal

The fruit of A. garckeana was purchased from the Lafia Local Government area, Nasarawa State, Nigeria. The seeds were removed from the pulp, and the pulp was sun-dried. The dried pulp was pounded into powdered form using a pestle and mortar. The pounded pulp was sieved using 0.8 mm mesh, packed, and kept under room temperature in a black polythene bag until required.

Experimental design

Various concentrations of AGPM at 0 g, 10 g, 15 g, 20 g, and 25 g/kg of the feed as AG1 (control), AG2, AG3, AG4, and AG5, respectively, were mixed with Clarias gariepinus broodstock feed.
A total of 120 gravid C. gariepinus broodstock were used for the experiment.
The broodstock were divided into five equal experimental groups and replicated into three.

Fifteen experimental ponds were used; each pond was stocked with eight broodfish. Each replicate per pond contained four male broodstock and four female broodfish.

Experimental procedure

The AGPM base diets were allotted to the broodstock per treatment in a concrete pond (3x2x2). The broodstock was fed with the experimental diet for the period of 28 days ad libitum twice daily, morning and afternoon.

The experimental fish were weighed weekly to track the progress of the total biomass and to notice their improvement in growth, and the growth parameters were determined. Water quality parameters were checked weekly.

The experiment was conducted on a weekly basis; at the end of every week, one each of the female and male broodstock was randomly collected from each treatment group and used for evaluating the fecundity, fertilisation, hatchability, and survival rates of the hatchlings.

Fertilisation rate was determined by inducement with Ovatide hormone at 0.5 mL/kg of fish. After a 10-hourlatency period, each female was stripped of its eggs into a dry receptacle, and milt was mixed for fertilisation to take effect; then data was subsequently collected.

A milk sack of each male was collected after sacrifice. The milt sack was cut into two, and the spermatozoa were squeezed onto the stripped eggs. Saline solution was added to the mixture of the eggs and the milt after 1 min

of stirring.

Seven thousand estimated eggs were used for fertilisation from each of the treatments collected and placed on a spawning tray in a bowl containing well-aerated water in replicates. The number of fertilised eggs was recorded 7 hours post fertilisation, while the number of hatchlings was recorded after 24-28 hours post fertilisation depending on the temperature of the day.

One hundred fry were collected each from the hatched eggs and stocked in a transparent bowl for observation of survivability; survival of the hatchlings was recorded at the fourth day post hatching after absorption of their egg yolk.

The percentage of fertilisation, hatching, and survival for each treatment were estimated as follows:

Fertility = Number of fertilised eggs/Total number of eggs counted × 100

Egg Hatchability = Number of hatched eggs / Total number of fertilised eggs × 100

Survival rate = Number of fry surviving at the end of yolk stage/Number of fry stocked × 100

RESULT

Effect of Dried *Azanza garckeana* Pulp Powder on the Fertilization Rate of *Clarias gariepinus* Eggs

The weekly effect of dried Azanza garckeana pulp powder on the fertilisation rate of Clarias gariepinus eggs is presented in Table 1. The results show that the number of fertile eggs and fertilisation rate for week 1 to week 4 differ significantly among all the treatment groups ($p > 0.05$). In the first week (week 1), T2 recorded the significantly highest number of fertile eggs (63764.66±7628.54) and fertilisation rate (83.00±1.00%) compared with other treatments ($p < 0.05$). In the second week, T2 also recorded the significantly highest number of eggs (60117.66±5673.12), while fertilisation rate was significantly highest in T5, T2, and T3 (83.33±1.52%, 81.33±1.52%, and 81.00±1.99%, respectively). The results of week 3 show that the number of fertile eggs was significantly highest (57006.66±5929.07) in T2 compared with other treatment groups, while the fertilisation rate was significantly highest (83.38±2.50%) in T5 as compared with other treatment groups ($p < 0.05$). In the fourth week, both T2 and T4 have the significantly highest number of fertile eggs (62802.66±11735.38 and 55282.00±7329.18) compared with other treatment groups, while T5 has the significantly highest fertilisation rate (84.66±1.52%) compared with other treatment groups ($p < 0.05$).

Table 1: Weekly Effect of Dried *Azanza garckeana* Pulp Powder on the Fertilization Rate of *Clarias gariepinus* Eggs

Week	Parameters	Treatments T1	T2	T3	T4	T5	*P* value
1	Total egg no.	53453.83±2823.43^{a}	76903.66±10060.04^{b}	54578.33±3707.37^{a}	64345.66±1323.34^{a}	52663.00±9029.06^{a}	0.004
	No. of fertile eggs	37932.66±1798.84^{a}	63764.66±7628.54^{c}	46727.66±2581.41^{ab}	55761.00±791.40^{bc}	46996.66±9734.45^{ab}	0.002
	Fertilization rate (%)	70.98±1.71^{a}	83.00±1.00^{b}	85.66±1.15b^{c}	86.66±0.57^{bc}	89.00±5.29^{a}	0.000
2	Total egg no.	55380.00±3679.87^{b}	73848.66±5660.38^{c}	58367.83±5993.62^{b}	62898.33±857.21^{b}	44005.00±5762.27^{a}	0.000
	No. of fertile eggs	42847.33±3508.71^{ab}	60117.66±5673.12^{c}	47257.33±4672.53^{b}	50535.33±802.66^{b}	36639.00±4423.01^{a}	0.001
	Fertilization rate (%)	77.33±2.08^{a}	81.33±1.52^{b}	81.00±1.99^{b}	80.35±1.52^{ab}	83.33±1.52^{b}	0.023
3	Total egg no.	55813.33±5026.23^{b}	84077.50±11351.71^{c}	52572.00±954.57^{b}	50866.83±1851.00^{b}	37307.83±1181.14^{a}	0.000
	No. of fertile eggs	36140.33±4280.67^{ab}	57006.66±5929.07^{c}	39244.33±105.76^{b}	39331.33±1411.36^{b}	31087.66±71.29^{a}	0.000
	Fertilization rate (%)	64.66±2.51^{a}	68.00±2.99^{a}	74.66±1.52^{b}	77.33±1.52^{b}	83.38±2.50^{c}	0.000
4	Total egg no.	56103.66±3245.35^{c}	84610.50±12755.55^{e}	39996.66±4399.88^{b}	69675.66±8437.99^{d}	22214.83±2102.02^{a}	0.000
	No. of fertile eggs	40586.00±2665.48^{b}	62802.66±11735.38^{c}	30912.33±2070.65^{b}	55282.00±7329.18^{c}	18817.00±1958.13^{a}	0.000
	Fertilization rate (%)	72.32±1.52^{a}	73.99±4.35^{ab}	77.53±3.32^{ab}	79.33±4.04^{bc}	84.66±1.52^{c}	0.006

Values are mean±SD (n=3). ^{ab} Rows with different superscript are significantly different ($p < 0.05$).

Effect of Dried Azanza garckeana Pulp Powder on the Hatchability and Survival Rates of Clarias gariepinus Fry

The weekly effect of dried Azanza garckeana pulp powder on the hatchability and survival rate of Clarias gariepinus fry is presented in Table 2. The results show that the number of hatched eggs, hatchability, and survival rates differ significantly among all the treatment groups ($p > 0.05$) in all the weeks studied. In the first week (week 1), T2 recorded the significantly highest number of hatched eggs (47796.33±5494.90) compared with other treatments, while the hatchability rate was significantly highest (84.33±1.52%, 82.53±3.55%, and 80.76±2.24%) in T5, T4, and T3, respectively, compared with T1 and T2 ($p < 0.05$). Furthermore, survival rate was significantly highest (100.00±0.00%) in T4 and T5, respectively, and lowest (80.66±2.30%) in T1. In the second week, the number of hatched eggs was significantly lowest (26954.66±1523.81) in T2 and highest (37067.33±1362.66) in T4. Also, hatchability rate was significantly highest (77.00±1.00%) in T5, while survival rate was highest (100.00±0.00%) in T4 and T5, respectively. The results of week 3 show that the number of hatched eggs was significantly highest (34794.00±3966.94) in T2 compared with other treatment groups, while the hatchability rate was significantly highest (72.66±1.52% and 67.66±1.52%) in T5 and T4, respectively, as compared with other treatment groups ($p < 0.05$). The survival rate of week 3 showed a similar trend to that of weeks 1 and 2, respectively.

In the fourth week, both T2 and T4 have significantly higher numbers of hatched eggs (34417.00±8211.90 and 32159.33±5687.53, respectively) compared with other treatment groups, while T5 has the significantly highest hatchability rate (69.38±4.45%) compared with other treatment groups ($p < 0.05$). Survival rates of T2, T3, T4, and T5 did not differ significantly ($p > 0.05$).

Table 2: Weekly Effect of Dried *Azanza garckeana* Pulp Powder on the Hatchability and Survival Rate of *Clarias gariepinus* Fry

		Treatments					
Week	**Parameters**	**T1**	**T2**	**T3**	**T4**	**T5**	***P* value**
1	No. of fertile eggs	37932.66±1798.84^{a}	63764.66±7628.54^{c}	46727.66±2581.41^{ab}	55761.00±791.40^{bc}	46996.66±9734.45^{ab}	0.002
	No. of hatched eggs	26918.66±1092.26^{a}	47796.33±5494.90^{c}	37699.00±1064.42^{b}	46020.33±2084.28^{ab}	39610.66±8056.18^{ab}	0.002
	Hatchability rate (%)	70.98±1.99^{a}	74.99±2.00^{a}	80.76±2.24^{b}	82.53±3.55^{b}	84.33±1.52^{b}	0.000
	Survival rate (%)	80.66±2.30^{a}	89.66±0.57^{b}	93.33±1.53^{c}	100.00±0.00^{d}	100.00±0.00^{d}	0.000
2	No. of fertile eggs	42847.33±3508.71^{ab}	60117.66±5673.12^{c}	47257.33±4672.53^{b}	50535.33±802.66^{b}	36639.00±4423.01^{a}	0.001
	No. of hatched eggs	26954.66±1523.81^{a}	39699.33±4085.45^{d}	32899.66±2798.16^{bc}	37067.33±1362.66^{cd}	28183.00±3035.71^{ab}	0.001
	Fertilization rate (%)	63.00±1.99^{a}	66.00±0.99^{b}	69.69±1.53^{c}	73.33±1.52^{d}	77.00±1.00^{e}	0.000
	Survival rate (%)	84.66±2.51^{a}	89.33±2.51^{b}	97.00±2.64^{c}	100.00±0.00^{c}	100.00±0.00^{c}	0.000
3	No. of fertile eggs	36140.33±4280.67^{ab}	57006.66±5929.07^{c}	39244.33±105.76^{b}	39331.33±1411.36^{b}	31087.66±71.29^{a}	0.000
	No. of hatched eggs	19328.00±1419.37^{a}	34794.00±3966.94^{c}	23415.33±2010.57^{ab}	26627.33±1512.14^{b}	22589.66±430.35^{ab}	0.000
	Fertilization rate (%)	53.66±2.51^{a}	61.00±1.00^{b}	59.66±5.13^{b}	67.66±1.52^{c}	72.66±1.52^{c}	0.000
	Survival rate (%)	94.66±1.52^{a}	96.00±1.00^{a}	97.00±3.00^{a}	97.00±1.00^{a}	98.00±2.00^{a}	0.310
4	No. of fertile eggs	40586.00±2665.48^{b}	62802.66±11735.38^{c}	30912.33±2070.65^{b}	55282.00±7329.18^{c}	18817.00±1958.13^{a}	0.000
	No. of hatched eggs	19736.33±1423.20^{a}	34417.00±8211.90^{b}	19057.00±782.33^{a}	32159.33±5687.53^{b}	13088.66±1929.02^{a}	0.001
	Fertilization rate (%)	48.69±3.34^{a}	54.45±2.86^{ab}	61.83±4.89^{b}	58.03±4.21^{b}	69.38±4.45^{c}	0.001
	Survival rate (%)	91.66±2.51^{a}	96.00±1.00^{b}	96.33±1.52^{b}	97.33±1.15^{b}	98.00±1.00^{b}	0.004

Values are mean±SD (n=3). ab Rows with different superscript are significantly different ($p < 0.05$).

DISCUSSION

Effect of Dried Azanza garckeana Pulp Powder on the Fertilisation Rate of Clarias gariepinus Eggs

After contact with water, eggs acquire the ability to be fertilised for a certain period of time (Coward et al. 2002; Minin and Ozerova 2008). Fertilisation success is strictly related to the quality of the gametes (Bobe and Labbe 2010), the sperm-to-egg ratio (Linhart et al. 2006), the time of contact of active sperm with active eggs (Liley et al. 2002), and the activating solution used (e.g., Kucharczyk et al. 2010; Żarski et al. 2012a). Many studies have aimed at investigating different activating media on fertilisation rate (e.g., Diyaware et al., 2012; Dada, 2012; Barde et al., 2023; Oniya et al., 2015). However, there is very little information on the effect of Azanza garckeana pulp powder on fertilisation effectiveness. The results obtained in the present study indicate that higher fertilisation rates were observed with increasing dietary dried Azanza garckeana pulp powder, with the highest fertilisation rates (89.00%, 83.33%, 83.38%, and 84.66%) recorded in Clarias gariepinus broodstock fed 40 mg/kg of the dietary inclusion in weeks 1, 2, 3, and 4, respectively. This indicated that Azanza garckeana pulp powder has a significant influence on fish egg fertilisation. However, the fertilisation rate obtained in this study is lower compared to the 94–100% observed by Oniya et al. (2015) in a similar study on Clarias gariepinus broodstock. The variation in the fertilisation rate could be due to the differences in concentration of the plant used.

Similar to the findings of this study, Diyaware et al. (2012) observed a 68-71% fertilisation rate after fertilising female C. gariepinus with milt obtained from male C. gariepinus treated with Garcinia kola meal. Adeparusi et al. (2010) reported a 90.88% fertilisation rate for C. gariepinus broodstock treated with various dosages of Kigelia africana seed powder. Dada (2012) also reported a 43.58-78.49% fertilisation rate in Clarias gariepinus broodstock with varying levels of Garcinia kola seed meal in their diet. However, the fertilisation rates recorded in this study were higher than the 48.04-51.71% reported by Dada and Ogunduyile (2011) for broodstock of C. gariepinus treated with different dosages of velvet bean (Mucuna pruirens) dietary seed meal and the 35.71-53.52% reported by Barde et al. (2023) for broodstock of C. gariepinus treated with different levels of tiger nut (Cyperus esculentus). The variation observed from the results of this study could be due to

variation in the plant and dosages used.

Effect of Dried Azanza garckeana Pulp Powder on the Hatchability and Survival Rate of Clarias gariepinus Fry

Hatching, or leaving the egg envelopes (chorion), is the most important environmental change fish experience during their lives. This moment is usually regarded as the dividing line between the embryonic and larval periods (Korwin-Kossakowski, 2012). According to Fuiman (2002), hatching occurs when the embryo reaches a size at which its energy requirements for oxygen exceed the diffusion capabilities of this gas through the egg envelopes and perivitelline fluid. Nearly all environmental factors have an effect on hatching, with temperature exerting possibly the greatest effect on fish development (Kamiński et al., 2006; Korwin-Kossakowski, 2008). This factor also influences the activity of the hatching gland cells, metabolism, and oxygen requirements (Kamler 1992, 2002; Kamler et al., 1998). Water pH, oxygen saturation, chemical composition, and salinity can all accelerate or delay, as well as prolong hatching (Griem and Martin, 2000; Jezierska and Witeska, 2001; Pyle et al., 2002; Bonisławska, 2010).

The hatching rate in this study ranged from 80.66% to 100.00% in the first week, 84.66% to 100.00% in the second week, 94.66% to 98.00% in the third week, and 91.66% to 98.00% in the fourth week, the control having the lowest hatchability rate while the T5 (40 mg/kg) diet had the highest hatchability in all the weeks. Meaning Hatching rate increased with increased levels of Azanza garckeana pulp meal. The hatching rates in this study are higher compared to the 42.78–58.55% reported by Diyaware et al. (2012) for broodstock of Clarias gariepinus fed varying levels of bitter cola (Garcinia kola). Dada (2012) reported a hatchability rate of 48.99–70.63% when Clarias gariepinus broodstock were fed Garcinia kola seed meal. Diyaware et al. (2010) reported a hatching rate of 63-88.27% in C. anguillaris females fertilised with milt collected from C. anguillaris through male ablation. Dada and Ogunduyile also reported hatching rates (61-91-37%) for broodstock of C. gariepinus treated with different dosages of velvet bean (Mucuna pruriens) dietary seed meal. The variation in hatchability rates in this study with previous authors may be due to species variation of the medicinal plants, which may contain different levels of pro-fertility agents.

Survival rates in this study increased significantly with increased dietary Azanza garckeana pulp meal, indicating the plant helps to improve the survival of the fish as compared with the control. This could be as a result of the phytochemical contents of the plant, which do not only help in improving reproductive performance in farmed fish species by stimulating the onset of sexual maturation in fish but also provide antioxidant, antimicrobial, cytotoxic, anti-inflammatory, anti-cancerous, anti-allergic, and haematopoietic actions (Itodo et al., 2022), thereby protecting the biological systems of fish against the damaging effects of oxidative processes on the body's macromolecules (Atmani et al., 2009). The result of this study is in line with the findings of Ochokwu et al. (2020), who reported no mortality in Clarias gariepinus fingerlings fed Telfairia occidentalis leaf meal when compared with the control. Oniya et al. (2015) also reported higher survival rates when Clarias gariepinus were fed different levels of Azanza garckeana pulp. Dada (2012) also reported similar results for Clarias gariepinus fed varying levels of Garcinia kola seed meal.

CONCLUSION AND RECOMMENDATION

Azanza garckeana pulp significantly influences the hatchability of fish eggs and the survivability of fry. From the results, it is therefore recommended that Azanza garckeana can be used in the hatchery for breeding purposes.

REFERENCE

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