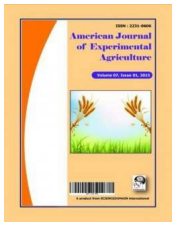

American Journal of Experimental Agriculture
12(4): 1-6, 2016, Article no.AJEA.24687
ISSN: 2231-0606

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Study on the Effect of Dettol as a Disinfectant and Anti-Sticking Agent on African Catfish (*Clarias gariepinus*) Eggs, Survival and Growth Performance of the Hatchlings

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJEA/2016/24687
Editor(s):
(1) Renata Guimarães Moreira-Whitton, Departamento de Fisiologia - Instituto de Biociências-USP, Cidade Universitária, Brazil.
Reviewers:
(1) Anonymous, Istanbul University, Turkey.
(2) Carlos Andres Satizabal, The University of Tokyo, Japan.
(3) Michael E. Barnes, McNenny State Fish Hatchery, USA.
Complete Peer review History: http://sciencedomain.org/review-history/14558

Original Research Article

Received 29th January 2016
Accepted 2nd April 2016
Published 10th May 2016

ABSTRACT

Eggs of matured *Clarias gariepinus* size ranging from 500-600 g total body weight (TBW) were treated with dettol concentrations 0.00 ml, 0.10 ml, 0.20 ml and 0.30 ml (T1, T2, T3 and T4) respectively for 60 seconds to determine their effect on hatching, survival and growth performance of fry. Each treatment was replicated three times. The experiment was conducted at the indoor hatchery unit Fish Farm, Federal University of Technology, (FUT), Bosso Campus, Minna, Nigeria. Percentage fertilization did not differed significantly in all treatments except for T2 (0.10 ml) and T3 (0.20 ml) that had significant difference ($p>0.05$) (75.79^{c} and 78.54^{b}) respectively. Percentage hatching differed significantly ($p>0.05$) among treatments control (0.00 ml), 0.10 ml, 0.20 ml and 0.30 ml (50.00^{d}, 51.60^{c}, 52.57^{b} and 54.10^{a}) respectively. The bred hatchlings were maintained for 8 weeks and total percentage mortality and survival showed that T1 (control) (0.00 ml) had the highest mortality (64.00) and T2 (0.10 ml) had the highest survival (426.00). There was no significant difference ($P<0.05$) in all fish body parameters measured among treatments except the

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mean total body weight (TBW) gain that differed significantly (P>0.05) T3 (0.20 ml) (0.18^{a}) as compared to other treatments T1, T2 and T4 (0.12^{b}, 0.12^{b} and 0.11^{b}) respectively. It is concluded that *Clarias gariepinus* eggs disinfected with dettol at 0.20 ml and 0.30 ml concentration for 60 seconds was most effective and should be applied before incubation for optimal fertilization, hatching, growth and survival.

Keywords: Artificial propagation; fish egg; disinfection; hatchlings and survival.

1. INTRODUCTION

In seed production of African catfish (*Clarias gariepinus)*, egg mortality during fertilization and hatching is one of the factors which decrease the number of production. The continuous growth of aquaculture is hinged on the production of fish seeds with high percentage fertilization and survival rates, high feed conversion efficiency, and high growth rate among other factors [1]. One of the limiting factors in fish production is microbial infection of fish eggs in the hatchery during breeding. Bacteria and fungi infection are the primary threat to C*larias gariepinus* eggs which hinders successful fertilization and hatching. Bacterial infection most often occur in hatchery operation when there is poor hygienic condition and hatching trough is overcrowded [2]. The external surface of fish eggs is easily colonized by bacteria, such as *Flavobacterium sp., Psuedomonas sp., Aeromonas sp. and Vibrio sp.* [3,4]. Fungus is more prevalent at lower temperature usually 26ºC and below as it rapidly affects infertile and dead eggs. Fungal infection on eggs cause disease problem which resulted into egg mortality, reduces hatching of fertilized eggs and survival of larvae [5].

Regular disinfection of eggs with approved chemical disinfectants is not a common practice by most fish breeders and hatchery operators. Although it has been reported that some disinfectants such as iodophor, formalin, methylated spirit and izal has been used to disinfect fish eggs, it is not widely practice by fish breeders and hatchery operators. This has resulted into massive egg mortality, poor fertilization and hatching. Dettol is a unique non bleach formula disinfectant proven to kill 99.9% of bacteria on surfaces. It contains 4.8% chloroxylenol B.pc, 8.38% oleum piniaromatism, 9.43% isopropyl, 5.60% sapovegetails, saccharum usltum and water [6]. Dettol has long been used for treatment of tanks and sterilizing equipment but the use of dettol for treating fish eggs before incubation has not been a common practice by fish breeders. Egg disinfection is an important management practice among hatchery operators [6].

Disinfecting eggs will prevent the transfer of pathogens from brood stock to larvae and thus helps to prevent the risk of infection thus enhance hatching efficiency and production. The efficiency of various disinfection methods has been studied using different species of fish eggs [7,8] and [9].

In Nigeria, African catfish is widely cultured by many fish farmers and is of high preference by consumers. This is due to its hardness, fast growth, air breathing ability and high protein content. The objective of this study therefore was to determine the effect of dettol on fertilization and hatching of *Clarias gariepinus* eggs and on growth and survival of hatchlings.

2. MATERIALS AND METHODS

2.1 Experimental Fish

Four (4) fish samples, (2 males and 2 females) of matured *Clarias gariepinus* brood stock size ranging from 500-600g total body weight were procured from Agaie/Lapai reservoir dam, Niger State. They were transported in a perforated plastic jerry-can to the indoor hatchery of Federal University of Technology, (F.U.T.), Bosso Campus Minna where they were acclimatized for 5 days in holding indoor concrete tanks of 725.76 L water holding capacity.

2.2 Brood Stock Maintenance and Gonadal Examination

The brood stocks were maintained separately under optimum temperature, fed with 40% crude protein commercial diet (coppens) under good water quality management before being used for breeding. The males were examined for rigid and reddish infusion of the genital papilla and for females, swollen of belly and release of eggs when gentle pressure was applied on the abdomen.

2.3 Experimental Procedure

Dettol solution was prepared by diluting 0.10 ml, 0.20 ml and 0.30 ml of dettol with 99.90 ml, 99.80 ml and 99.70 ml distilled water respectively. Matured female brood stocks were weighed and treated with a single dose of hormone (Ovaprim) according to their body weight at 0.5ml/kg body weight. One female brooder was hand stripped for eggs after a minimum latency period of twelve (12) hours at water temperature ranging between 26ºC-29ºC. Total weight of eggs stripped was 7.5 g and this was divided into four equal portions. Each portion contains about 1,500 eggs and first portion was not treated with dettol solution (control) (0.00 ml). The second, third and fourth portions were treated with varying diluted concentrations of dettol solution post fertilization to exposure time of 60 seconds before incubation (T1 (control) (0.00 ml), T2 (0.10 ml), T3 (0.20 ml) and T4 (0.30 ml) for all treatments. This gave a total of four treatments replicated three times as 4 x 1 x 3 experimental design. Distilled water was added to the solution to measure up to the required level. Milt was obtained by sacrificing the male and testis was removed, cleaned with cotton wool to remove all the stained blood and then kept in a clean Petri dish and thereafter macerated to squeeze out milt to fertilize eggs. Milt and eggs were mixed together gently with a plastic spoon for 2-3 minutes. Small quantity of saline solution was then pour onto the eggs to avoid been sticking together and ensure even fertilization. Incubator made of net hapa, placed inside plastic aquaria tanks measuring 60 cm x 40 cm x 20 cm (length x breadth x depth) respectively filled with clean water was used. The hapa was constructed from a coated nylon net with 1.5 mm mesh size. Fertilized eggs were spread in a monolayer on the net hapa in the incubator. Aeration was maintained by AC powered aerator. When hatching was completed, the hapa with un- hatched eggs and shells was lifted out of the incubation tank and washed. Water quality parameters such as dissolved oxygen (DO), pH, carbon (IV) oxide and conductivity were monitored and measured during incubation and rearing of the hatchlings.

Percentage fertilization and hatching were determined according to a method described by [10] using the formulae:

> Percentage Fertility = (Number of fertilized eggs / Number of eggs stripped) x 100
>
> Percentage Hatching = (Number of fry / Number of fertilized eggs) x 100

2.4 Fry Rearing

After 3 days of yolk absorption, the hatchlings were fed with artemia for 3 weeks and thereafter with imported feed (coppens). 150 fries were stocked per plastic aquarium tank and reared for 8 weeks. The morphometric measurement of hatchlings was done weekly using sensitive electronic weighing balance (P.E. mx Rady) for weight and transparent ruler for length. Water was exchanged on daily basis up to 3 weeks.

Percentage mortality and survival rates were determined using the following formulae:

> Percentage Mortality = (Cumulative Mortality / Total number stocked) x 100

and

> Percentage Survival = (Cumulative Survival / Total number stocked) x 100

[11] as adopted by [12].

2.5 Data Analysis

The statistical tool used for the analysis was One way Analysis of Variance (ANOVA). Data obtained were pooled from the replicate and mean values was calculated per treatment. Also Duncan Multiple range Test was used for mean separation. All differences in mean values of parameters were determined at P = 0.05 level of significance.

Correlation statistical methods was also used to determine correlation between effects of water quality parameters on treatments at P= 0.05 and 0.01 level of significance.

3. RESULTS

The result in Table 1 shows that percentage fertilization and hatching differed significantly ($p<0.05$) among treatments. Table 2 shows the percentage mortality and survival of fry hatched from *Clarias gariepinus* eggs treated with varying concentration of dettol 0.00 ml (T1), 0.10 ml (T2), 0.20 ml (T3) and 0.30 ml (T4). The result in the table shows that T1 had the highest mortality of (64), followed by T3 (55), T4 (43) and T2 (24) respectively. The result in Table 3 shows that water quality parameters such as pH, dissolved oxygen, and conductivity did not differed significantly ($p>0.05$) as compared to carbon (iv) oxide that differs significantly ($p<0.05$) among treatments.

Meanwhile the result in Table 4 shows that standard length, total length and total weekly mortality did not differed significantly (p>0.05) among the treatments. However, the result in the table shows that total body weight differed significantly (p<0.05) among treatments, T3 (0.20 ml) had highest total body weight (0.18^a). The result in Table 5 shows that the correlation between the treatment levels and weeks, pH, dissolved oxygen, conductivity, total body weight was positive but not significant. Standard length, total length and total weekly mortality shows negative correlation and not significant. However, there is positive and strong correlation between treatment levels and $C0_2$ and was significant at (p>0.01) level. This implies that as the treatment increases, the $C0_2$ concentration also increases. The correlation between week and pH and total weekly mortality was negative and significant at (p>0.01) level. Meanwhile, the correlation between week and dissolved oxygen, conductivity, standard length, total length and total body weight were positive, strong and significant at (p>0.01) level. This implies that as the week increases, dissolved oxygen increases and pH decreases. However, it has no significant relationship with CO_2. The correlation between pH and total weekly mortality was positive, strong and significant at (p>0.01) level. Also, conductivity shows positive, strong and significant correlation at (p>0.01) level with standard length, total length and total body weight. However, CO_2 has no significant relationship with the parameters except in total body weight in which it correlate positively, strongly and significantly at (p>0.01) level, Positive and negative correlations were observed in other parameters measured, some were significant at (p>0.01) while correlation between total length and total weekly mortality was negative and significant at (p>0.05).

Table 1. Mean fecundity, percentage fertilization and hatching of *Clarias gariepinus* for induced breeding treated with Dettol at varying concentrations

Parameters	Control	0.1 ml	0.2 ml	0.3 ml	±S.E.
% fertilization	80.00a	75.79^c	78.54b	80.63a	0.57517
% hatching	50.00d	51.61^c	52.57b	54.10a	0.44870

Values carrying different superscript on the same row differed significantly (p<0.05) from each other treatments

Table 2. Percentage mortality and survival of fry hatched from *Clarias gariepinus* eggs treated with varying concentration of disinfectant (Dettol)

Treatment	Initial stock	Mortality	% mortality	Survival	Survival
T1 (0.00 ml)	450	64	14.22	386	85.77
T2 (0.10 ml)	450	24	5.3	426	94.66
T3 (0.20 ml)	450	55	12.22	395	87.77
T4 (0.30 ml)	450	43	9.56	407	90.44

Table 3. Mean of some physico-chemical parameters measured on reared *Clarias gariepinus* in plastic aquaria tank for 8 weeks

Parameters	T1 (0.00 ml)	T2 (0.10 ml)	T3 (0.20 ml)	T4 (0.30 ml)
pH	7.04a	7.03a	7.04a	6.94a
Dissolved oxygen (mg/l)	5.46a	5.62a	5.45a	5.60a
Carbon (iv) oxide (mg/l)	14.24b	14.08b	15.40a	15.75a
Conductivity (µ/cm)	394.88a	393.17a	402.8a	401.67a

Values carrying different superscript on the same column differed significantly (P<0.05) from each other

Table 4. Mean morphometric measurements of *Clarias gariepinus* fry reared in plastic aquaria tanks for 8 weeks

Parameters	T1 (0.00 ml)	T2 (0.10 ml)	T3 (0.20 ml)	T4 (0.30 ml)
Mean standard length (cm)	2.25a	2.13a	2.38a	2.16a
Mean total length (cm)	2.40a	2.25a	2.53a	2.28a
Mean total body weight (g)	0.12b	0.12b	0.18a	0.11b
Mean total weekly mortality	2.63a	1.00a	2.29a	1.79a

Values carrying different superscript on the same column differed significantly (p<0.05) from each other

Table 5. Correlation matrix of some water quality parameters and morphometric measurements of *Clarias gariepinus* fry reared in plastic aquaria tanks for 8 weeks

	TTL	WEEK	pH	D.O (mg/l)	COND (µΩ/cm)	CO2 (mg/l)	SL (cm)	TL (cm)	TBW (g)	TWM
TTL	0.000									
WEEK	0.039	-808**								
pH	0.035	0.889**	-0.753**							
D.O (mg/l)	0.110	0.717**	-0.656**	0.690**						
COND (µΩ/cm)	0.327**	0.153	-0.155	0.128	0.126					
SL (cm)	-0.004	0.944**	-0.773**	0.795**	0.681**	0.180				
TL (cm)	-0.012	0.949**	-0.780**	0.802**	0.690**	0.180	0.998**			
TBW (g)	0.031	0.680**	-0.542**	0.630**	0.472**	0291**	0.733**	0.733**		
TWM	-0.410	-0.396**	0.302**	-0.271**	-0.271**	-0.48	-0.450**	-0.450*	-0.359**	

*** Correlation is significant at the 0.01 level (2- tailed) and * correlation is significant at the 0.05 level (2- tailed)*
Keys: TTL= Treatment Level, DO= Dissolved Oxygen, COND= Conductivity, CO_2= Carbon (iv) Oxide, SL= Standard Length, TL= Total Length, TBW=Total Body Weight and TWM= Total Weekly Mortality

4. DISCUSSION

The highest values (80.63^a and 54.10^a) percentage fertilization and hatching respectively obtained in treatment 4 (0.30 ml) might be attributed to effect of dettol to act as anti sticking agent on fish eggs thereby promoting its fertilization and hatching. This assertion was corroborated by [13] in their study effect of chemical disinfectant (Izal) on hatching of eggs of African catfish (*Clarias gariepinus)*, survival and growth performance of fry. The result obtained indicates 64.85^a as percentage fertility for 1 ml of izal and 53.80^a as percentage hatching for 0.5 ml applied as compared to 80.63^a for percentage fertility and 54.10^a for percentage hatching respectively in 0.3 ml of dettol applied in this study. Similarly, a study conducted on effect of Methylated Spirit (MS) as a disinfectant and anti sticking agent on hatchability of *Clarias gariepinus* eggs and survival of the hatchlings at various concentrations. This revealed that MS at 0.40% concentration removed stickiness of fish eggs most effectively at both 5 and 10 seconds exposure time. The result obtained showed that 62.31% and 61.92% hatching for 5 and 10 seconds respectively at 0.40% concentration.

The highest percentage mortality recorded in T1 (control) (0.00 ml) was due to weak hatchlings emanated from untreated fertilized eggs as similarly reported by [14] in their study effect of formalin on the hatching rate of eggs and survival of larvae of the African catfish where highest mortality was recorded in untreated eggs. All the physico-chemical parameters measured fall within the tolerance range to culture warm water fishes except for CO_2 which varies among treatments. According to [15] tropical fishes can tolerate CO_2 levels over 100 mg L-1 but the ideal level of CO_2 in fish ponds is less than 10 mg L-1.

The highest value of mean total body weight (0.18_a) recorded in T3 (0.20 ml) was attributed to vigour hatchlings resulted from treated viable eggs and quality milt. Fungi infection was reduced on the eggs resulting in good hatching and subsequently active hatchlings that grows very fast.

5. CONCLUSION

Results of the experiment showed that *Clarias gariepinus* eggs treated with 0.01 ml concentration of dettol had the highest percentage survival of hatchlings while 0.00 ml was the least. Eggs treated with 0.20 ml and 0.30 ml diluted dettol concentration post-fertilization for 60 seconds before incubation were most effective in terms of fertilization and hatching.

6. RECOMMENDATION

Based on the conclusion of this study, the following are recommended:

Clarias gariepinus eggs should be treated with 0.20 ml and 0.30 ml diluted dettol before incubation to enhance fingerling production.

Further research should be carried out on whether dettol application on *Clarias gariepinus* eggs has residual effect on the consumers of the bred fish.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/14558