INCIDENCE OF DISEASES IN FISH HATCHERIES AND CONTROL MEASURES ADOPTED BY FISH FARMERS IN IJEBU-ODE REGION, OGUN STATE, NIGERIA

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Abstract: The study was carried out to assess the incidence of diseases and control measures adopted by farmers in fish hatcheries in Ijebu-Ode Region, Ogun State. Thirty-six fish hatcheries were randomly surveyed using a questionnaire to gather information on farm description, culture techniques/practices, frequency of disease occurrence; types of diseases encountered and control measure. The result revealed that a majority (55.56%) of the farms were basically for hatchery purposes while others were for hatchery and grow-out production and have been in operation between the past year and 14 years. *Clarias gariepinus* is the only species farmed in the hatcheries and brood stock are obtained from farms and the wild or self-raised by the farmers. A Majority (77.78%) of the farmers have experienced one form of disease outbreak, at least once since the establishment of the hatcheries. Diseases encountered include bacterial (32.14%), environmental (10.71%), fungal (3.57%) and 42.86% encountered both bacterial and fungal; however, 10.71% of the farmers were not sure of the type of disease encountered. Control measures adopted include administered drugs, herbs and chemicals used singly or in combination. The purposes of application include water treatment, brood stock disinfection, anti-stress and disease treatment.

Keywords: Adoption, brood stock, hatchery, fish diseases, control measures

Introduction

Aquaculture is the fastest growing food production industry in the world. It has been estimated that fisheries and aquaculture supplied the World with about 110 million metric tons of food fish per year (FAO, 2010), providing a per capita supply of 16.7 kg (live weight equivalent). Of this supply, 47% is derived from aquaculture production. However, this production is hampered by unpredictable mortalities that may be due to negative interactions between fish and pathogens.

The growing problem with diseases has led to the intensive use of antimicrobials for treatments (Romero *et al*., 2012). They are commonly used in large quantity in fish industry; especially in developing countries where their uses are not regulated (Soltani *et al*., 2014). A survey revealed that by year 2030, antimicrobial usage will increase by 67% (Laxminarayan *et al.*, 2015) while in developing countries like Indonesia, Nigeria, Vietnam and Peru, a projected increase of 202, 163, 157 and 160% will be observed, respectively (Anthony *et al.*, 2016). About 70 - 80% of drugs used in aquaculture end up in the environment and can be transferred to human beings through food or contact with the fish or water. Some of these antimicrobials are often non-biodegradable and persist in the aquatic environment as residues. In addition, when antimicrobials are mixed with fish feeds, residues may be deposited in the flesh, hence, there is global concern about the consumption of low levels of antimicrobials residues in aquatic foods and public health risks to the consumers. The potential hazards associated with the presence of antimicrobials residues in edible tissues of products from aquaculture include: allergies, increased toxicity, cancer risks, changed nutrient levels and colonization patterns of human gut flora and acquisition of drugs resistance in pathogens in human body. Furthermore, indiscriminate use may degenerate into the development of antibiotic resistance of pathogenic bacteria, thus making antibiotics ineffective in treating specific microbial disease in fish, other animals and even humans (Bengtsson and Greko, 2014).

Fish culture today is hardly possible without the artificial propagation of fish seeds of preferred cultivable fish species. In Nigeria, most hatchery operators have experienced low outputs in the number of fingerlings produced from hatcheries due to high mortality of young fish larvae within one week of hatching. As a result, there have been complaints from farmers who have not been able to procure the quantity of fingerlings they need for their table fish production business. This poor survival of hatchlings has also led to frustration of hatchery owners/operators who seem to be frantically looking for solutions to solve the problem and revive their businesses both to earn income and satisfy their customers, the fish farmers (Soltani *et al*., 2014).

Hence, this study was carried out to assess the incidence of diseases in fish hatcheries and the control measures adopted by farmers in Ijebu-Ode Region, Ogun State, Nigeria.

Materials and Methods

Description of study area

The study was carried out in Ijebu-Ode Local Government Area of Ogun State. The city is located in South Western Nigeria, with estimated population of 218,600 (The World Gazetter, 2018). The city is located 110 km by road, North East of Lagos; it is within 1000 km of the Atlantic Ocean in the eastern part of Ogun State and possesses a warm tropical climate. Its coordinates are 6º49'15"N 3º55'15"E. People living in Ijebu-Ode include farmers, civil servants, medical personnel, artisanal workers amongst other professions.

Questionnaire survey and data analysis

A total of 52 fish hatcheries were identified (from a preliminary study), of which 70% (36 hatcheries) were randomly selected for the study. The questionnaires were used to gather information on:

i. Farm description,
ii. Management practises adopted and
iii. Incidence of disease and control measures.

The study period was between April and August, 2019. Frequency and percentages were used in analysing the data.

Results and Discussion

Farm description

Table 1 and Fig. 1 showed the description of the fish hatcheries. 72.22% of the hatcheries were rented; 55.56% of the hatcheries were solely for hatchery purpose while 44.44% were used for both hatchery and grow-out production; 88.89% of the hatcheries used tanks for hatchery production; and the hatcheries have been in operation between the past year (14%) and past 14 years (44%). Integration with other agricultural practises were reported by 41.67% of the farmers while 52.78% of the farms were not integrated.

Table 1: Farm description

Farm Ownership	No. of Respondent	%
Self-owned	8	22.22
Rented	26	72.22
No response	2	5.56
Total	**36**	**100**
Purpose of farm		
Hatchery	20	55.56
Hatchery + Grow-out	16	44.44
Research	-	-
Total	**36**	**100**
Culture facilities		
Tanks	32	88.89
Earthen ponds	-	-
Tanks + Earthen ponds	4	11.11
Total	**36**	**100**
Integration with other agricultural practises		
Yes	15	41.67
No	19	52.78
Void	2	5.56
Total	**36**	**100**

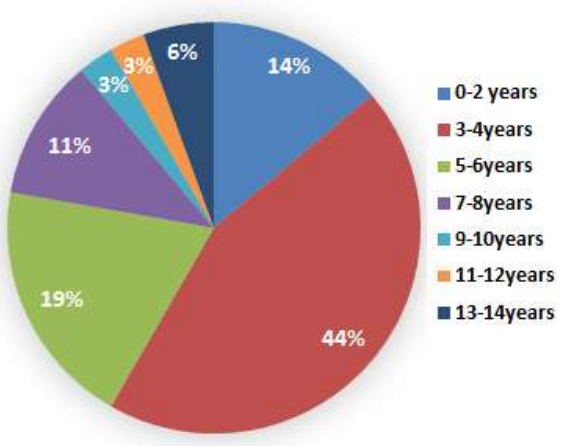

Fig. 1: Age of hatchery

Culture techniques and practices

Broodstock procurement and production cycle

Table 2 showed the results on broodstock procurement by farmers and production cycle. All the farmers (100%) farmed *Clarias gariepinus*. The broodstock were obtained from the wild, farms or self-raised. Majority of the farmers (55.56%) had more than four (4) production cycles per annum with the culture period lasting for of 8 weeks.

Sanitation and environmental management

In any live animal production facility, there is always the risk of introducing pathogens that can cause disease. Diseases can come from many sources, such as new broodstock, contaminated equipment, birds and other animals. They can even find their way into a hatchery during routine operational activities. Sanitation is a common-sense method of prevention to avoid contact between animals and pathogens. It involves the establishment and implementation of a system or procedures to prevent the introduction of pathogens into a fish hatchery from outside the facility or into a section of the hatchery from another section in the same hatchery (Mohamed Din and Subasinghe, 2017). In Table 3, water treatment was practised by 33.33% of the farmers while majority (63.89%) did not treat the water used in the hatcheries. Of the farmers that treated water, 66.67% treated water before use while 33.33% treated water both before and after use. All the farmers (100%) observed sanitation before and after spawning operations. Used water in the hatcheries was re-used for other purposes on the farm by 5.56% of the farmers while 86.11% discharged used water in water bodies and 8.33% discharged on the roads close to the hatcheries.

Table 2: Brood stock procurement and production cycle

Culture Species	No. of Respondents	%
Tilapia	-	-
Catfish	36	100
Carp	-	-
Total	**36**	**100**
Sources of Brood stock		
Wild	-	-
Farms	10	27.78
Self-raised	7	19.44
Wild & Self-raised	6	16.67
Farm and Self-raised	13	36.11
Total	**36**	**100**
Production cycle per annum		
1	-	-
2	2	5.56
3	1	2.78
4	12	33.33
>4	20	55.56
No response	1	2.78
Total	36	100
Length of single Production		
8 weeks	35	97.22
10 weeks	-	-
12 weeks	-	-
No response	1	2.78
Total	**36**	**100**

Table 3: Sanitation and environmental management

Water Treatment	No. of Respondent	%
Yes	12	33.33
No	23	63.89
No response	1	2.78
Total	**36**	**100**
Treatment Time		
Before use	8	66.67
After use	-	-
Before and After	4	33.33
Total	**12**	**100**
Used water disposal		
Re-use	2	5.56
River/water course	31	86.11
Nearby environment	3	8.33
Total	**36**	**100**
Sanitation before spawning		
Yes	36	100
No	-	-
Total	**36**	**100**
Sanitation after spawning		
Yes	36	100
No	-	-
Total	**36**	**100**

Table 4: Incidence of diseases and control measures

Experienced Disease outbreak	No. of Respondent	%
Yes	28	77.78
No	8	22.22
Total	**36**	**100**
Diseases encountered		
Bacterial	9	32.14
Environmental	3	10.71
Fungal	1	3.57
Viral	-	-
Nutritional	-	-
Bacterial and Fungal	12	42.86
Not sure	3	10.71
Total	**28**	**100**
Disease Treatment		
Chemical	-	-
Drugs	12	42.86
Herbs	13	46.43
Drugs/Herbs	-	-
Drugs /Chemical	2	7.14
Drugs/Chemical/Herbs	1	3.57
Nothing	-	-
Total	**28**	**100**
Stock lost during outbreak		
1/4	14	50.00
1/2	10	35.71
All	3	10.71
Void	1	3.57
Total	**28**	**100**
Complaint lodgement		
Government	-	-
Cooperative society	4	14.29
Nobody	21	75.00
No response	3	10.71
Total	**28**	**100**

Incidence of diseases and control measures

Diseases in fish do not usually occur and are often associated with high stocking densities and poor water quality (Osungbemiro *et al*., 2014). The incidence of diseases may be that farmers are not maintaining proper water hygiene, using appropriate stocking densities and using quality feeds.

This study also revealed that fish hatchery farmers used different varieties of antimicrobial agents including oxytetracycline and chloramphenicol which explained reason for the presence of these substances in water samples from Ijebu-Ode Region in a study by Olaitan *et al*. (2014). Antimicrobials are widely used in aquaculture to treat infections caused by a variety of bacterial pathogens of fish and also used prophylactically. Formalin is used primarily as an external parasiticide on fish and fish eggs. Sodium chloride (NaCl) is an old treatment used for fungal and parasitic diseases of fish in Bangladesh (Alderman, 1992). Potassium permanganate is good for treating external protozoa and external bacterial infections (Plumb, 1992). All these substances were reported to have been applied by the fish hatchery farmers in the study area, Ijebu-Ode Region, the most popular of these were oxytetracycline, streptomycin, formalin and chloramphenicol. This is in agreement with several studies (Mukti *et al.*, 2011; Rohana *et al.*, 2000) which reported that chloramphenicols, erythromycin, formalin and oxytetracycline were the predominant antimicrobials used in fish hatcheries surveyed.

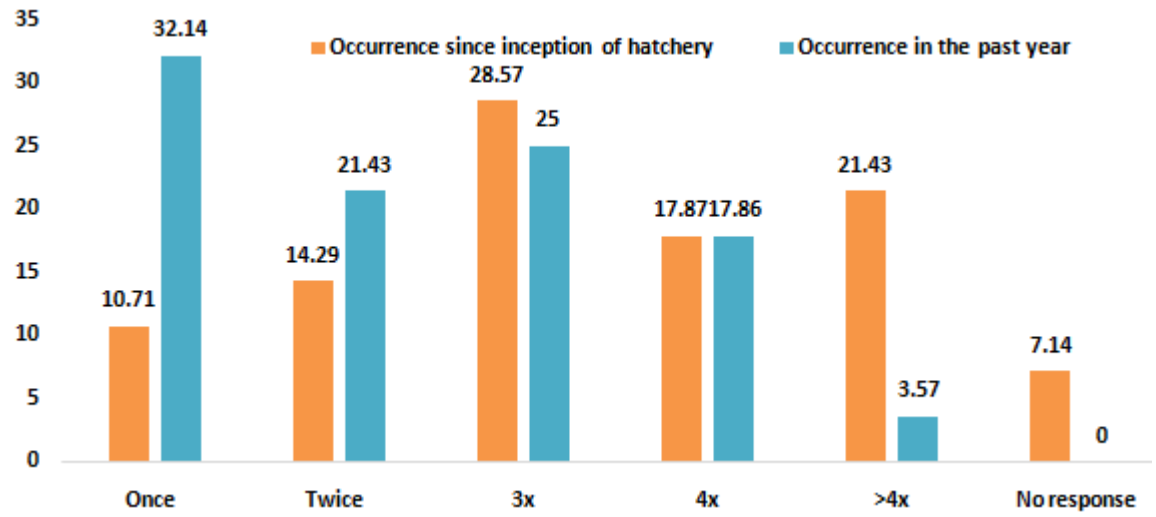

Fig. 2: Frequency of diseaese occurrence

Table 5: Antimicrobials used in fish hatcheries

Name of Antimicrobial	Purpose
Fish biotic®, Oxyveto-505®, Iodasteryl Polyvalent®, Potassium permanganate, Formalin, Table salt	Broodstock disinfection
Streptomycin®, Oxy-tetracycline, Procaine®, Furasolidone®, Vitamin C	Anti-stress
Iodasteryl®, Sodium bicarbonate, Table salt, Soda ash, Agricultural lime	Water treatment
Furasol®, Florenor®, Oxyveto®, Potassium permanganate, Tetracycline®, Chloramphenicol®, Procaine®, Furasolidone®, Streptomycin®, Pawpaw leaves, Bitter leaves, Ash, Vitamin C, Agricultural lime	Disease treatment

Table 4 and Fig. 2 show the incidence of diseases and the control measures adopted. Twenty-eight (77.78%) of the hatcheries have experienced at least an episode of disease outbreak which include bacterial, environmental and fungal diseases. Drugs, chemicals and herbs were the substances indicated by the farmers for disease treatment. Fifty percent (50%) of the farmers lost a quarter of their stock; 35.71% lost a half of their stock and 10.71% lost all their stock during disease outbreak. Seventy-five percent of the farmers did not report the incidence while some farmers (10.71%) reported to cooperative societies. Since the inception of the hatchery, 10.71 and 32.14% of the farmers respectively, experienced at least an incidence of disease outbreak. Table 5 shows the names of antimicrobial agents used and the purpose of application.

Conclusion

The study was able to ascertain that antimicrobials were actively used by fish hatchery farmers in Ijebu-Ode Region. The study also identified the antimicrobials being applied by the hatchery farmers and the purposes of application. To prevent the problems of antibiotic resistance and residual levels of antimicrobials in fish, proper regulations and enforcements should be put in place.

Conflict of Interest

Authors declare that there is no conflict of interest related to this study.

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