



Obtainable Drugs for Fish Hatchery Operation and Grow-out Ponds in Bangladesh

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Authors' contributions

This work was carried out in collaboration between all authors. Author MAI managed the literature searches, wrote the protocol and wrote the first draft of the manuscript. Authors MNH, YM, MSR and SS managed the analyses of the study. Author MSM managed the literature searches. Author MK designed the study and managed the analyses of the study.

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ABSTRACT

This study was carried out to evaluate the obtainable drugs, chemicals and antibiotics used in aquaculture activities in Bangladesh for increasing aquaculture production. This study was carried out using data collection method through questionnaire interview and personal contact. The study was carried out in Mymensingh Sadar upazila and Trishal upazila of Mymensingh, Bangladesh from July, 2011 to November, 2011. Data were collected through questionnaire interview, personal contact with hatchery and nursery owner as well as market survey with fish and shrimp farmers, retailers of animal medicine and representatives of pharmaceutical companies. About 46 questionnaires (16 pharmaceuticals companies, 14 drug traders/sellers, 10 fish farmers and 6 fish hatchery owners) were used to collect information. The study identified a number of commercial products with various trade names available in the market namely JV zeolite, geotox, green zeolite, orgavit aqua, fish vitaplus, AQ grow-G, oxyflow, oxy max and O₂-

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marine which were most widely used. The survey discovered that 14 drug traders and 16 pharmaceuticals companies are actively involved in importing and marketing of the aqua drugs. Though Oxytetracycline and a potential sulfonamide are approved for the use of disease treatment but some off-labeled chemicals which had only trade name but no information about the active ingredient of these chemicals was discovered. The farmers of Bangladesh have little knowledge regarding the use of chemicals, their appropriate dose and method of application. For this perceptive the survey were taken so that the obtainable aqua drugs may be known as well as their appropriate dose and application method may be determined for safe aquaculture practices in Bangladesh.

Keywords: Aqua drugs; questionnaire interview; pharmaceuticals; hatchery etc.

1. INTRODUCTION

Fish and fisheries play a significant role in the economy of Bangladesh in terms of animal protein supply, foreign currency earning, employment and poverty alleviation. In 2012 this sector contributes 4.43% to gross domestic product (GDP), 2.73% of export earning and 60% of the total protein supply in the diet of the people of Bangladesh [1]. A massive intensification occurred in Bangladesh aquaculture, where stocking density and the rate of application of aqua-drugs have been hugely accelerated. In aquaculture, one of the inputs required for successful fish production is chemical. These are essential components in pond construction, health management, soil and water management, enhancement of natural aquatic productivity, transportation of live organism, feed formulation, manipulation and enhancement of reproduction, growth promotion and processing value enhancement of final product [2,3]. With the expansion of aquaculture in Bangladesh, there has been increasing trend in using chemicals and aqua drugs in aquatic animal health management. Fish health management and disease treatment are the major areas where farmers use such compounds. Other uses included growth promotion, improving water quality and as probiotics. Commonly found traditional chemicals in health management included lime, salt, potassium permanganate, sumithion, melathion, formalin, bleaching powder, malachite green and methylene blue. Some previous studies also revealed the similar reports about the use of chemicals used in aquaculture of Bangladesh [4,5]. For the success of aquaculture, chemicals and aqua drugs must be judiciously and responsibly used. Fish disease is an alarming factor for which production of aquaculture is hampered. Aqua - medicines are indeed essential ingredients for successful aquaculture, which has been used in various forms for centuries [6]. Disinfectants are widely used in both hatchery and grow-out facilities mainly for equipment preparation, to maintain hygiene and in some cases to treat disease Use of aqua-medicine in aquaculture system for various purposes is widely recognized. Present study on status of the most abundantly available drugs used for fish hatchery operation and grow-out ponds were conducted to know the availabilities of growth promoters, aqua-medicines, antibiotics and the awareness of these use.

2. METHODOLOGY

2.1 Study Area

The study was carried out in Mymensingh Sadar upazila and Trishal upazila of Mymensingh, Bangladesh (Fig. 1) from July, 2011 to November, 2011.



Fig. 1. Sampling locations for survey on abundantly available aquaculture related drugs and chemicals used for hatchery operation and grow out ponds in Mymensingh

2.2 Preparation of Questionnaire

Two questionnaires: one for collection of data from farmers and another for data collection from retailers. The key points incorporated in the farmer form were: i) awareness about aqua drugs/chemicals, ii) use of drugs and chemicals, iii) advice or instructions received for their use, iv) their knowledge about banned chemicals or medicine, v) source of purchased drugs/chemicals, vi) prevention of diseases, vii) effect of chemicals, viii) training received on use of chemicals/drugs, ix) buying information (e.g. local store, import etc.). The points included in the questionnaire of traders/suppliers were i) type of medicine, ii) source of drugs (information on import, local or self-manufacture), iii) function of drugs, iv) advising farmers on use of drugs, v) storage facilities of drugs/chemicals, vi) knowledge on banned drugs/chemicals, vii) Action taken regarding expired drugs/chemicals, viii) training on use of drugs, ix) inspecting authority of the drug store, x) support received from different organizations/manufacturing company.

2.3 Data Collection Method

Data was collected through questionnaire interview, personal contact and market survey. The questionnaire was composed of both closed and open form of question. A set of preliminary questionnaire was prepared. This was field tested with a few target people of each representative group.

About 46 questionnaires were used to collect information from 16 pharmaceuticals companies, 14 drug traders/sellers, 10 fish farmers and 6 fish hatchery owners. In this survey much attention was given to any new information, which was not designed to ask but was important and informative towards the objectives. Thus necessary modifications were made based on the feedback and the final questionnaire was prepared on the basis of survey. Separate set of questionnaire was prepared for each group. For the interview, simple random sampling method was followed.

3. RESULTS

3.1 Chemicals Used for Pond and Water Quality Management

For improving water quality of the fish ponds, the list of such chemicals with their active ingredients, company and source and approximate dose are shown in Table 1. Some compounds also available in the chemical shops used mainly for controlling predatory fish and increasing primary productivity in fish pond. Chemicals like Rotenone were used for controlling unwanted fishes as well as other harmful aquatic animal. Fertilizer uses to increase primary productivity.

3.2 Chemicals Used as Disinfectant

The disinfectants available in the market were EDTA, Bleaching Powder, Timsen, Emsen, Water clear, Omicide, Microdine-Iodine 20%, Formalin, BKC Efinol etc. shown in Table 2. The major sources of the chemicals are Rals Agro Ltd., Eon Animal health Products Ltd., Organic Pharmaceuticals Ltd., Chemical seller etc. According to the information inserted on leaflet provided by the pharmaceutical company, Timsen and Emsen are very effective in prevention of some bacterial and fungal infection as well as they destroys viruses. Formalin is used in controlling protozoan disease. BKC is used for controlling bacterial disease and Efinol is used as stress resistance substance.

3.3 Chemicals Used for Oxygen Supply

To supply oxygen during oxygen depletion in the water of fish ponds, the list of such chemicals with their active ingredients, source and approximate dose are shown in Table 3.

3.4 Chemicals Used as Growth Promoter

Several chemicals available in markets/shops were reported to be used as growth promoter for increasing fish production. Aqua boost contains beta-glucan, immunostimulant, which enhance non-specific immunity in fish. A list of growth promoters is shown in Table 4. The trade names of those chemicals are Aqua Boost, Aqu savor Nutricell Aqua, Hepaprotect aqua etc. The major suppliers are Eon Animal health Products Ltd., Organic Pharmaceuticals Ltd. Novartis Pharmaceuticals Ltd. Reneta, Fish tech etc.

3.5 Antibiotics and Other Chemicals for Disease Treatment

Major diseases reported by the farmers were EUS, tail and fin rot, dropsy, anal protrusion, fungal disease, nutritional disease; red and white spot disease etc. In the present investigation about 8 branded antibiotics with different trade names as shown in Table 5. which are used by the fish farmers.

Table 1. Chemicals used for pond and water quality management

Trade Name	Active ingredients	Dose	Name of the company
Pontox plus	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O	For 3-6 feet deep water body 15 kg/100 dec. After stocking 10-20 kg in same water body about 30-40 days.	Rals Agro Ltd.
JV Zeolite	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O, K ₂ O, Mn, P	During pond preparation 7 kg/33dec. During culture 3.5Kg/33 dec. every 15 days	Eon Animal health Products Ltd.
Green Zeolite	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O, K ₂ O, TiO ₂	During pond preparation 20-25 Kg/100 dec. During culture 10-15 kg/100dec. Every 40 days	Organic Pharmaceuticals Ltd.
Geotox	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O	For 3-6 feet deep water body 20-25Kg /100 dec. After stocking 10-20 kg/100 dec. about 30-40 days.	Novartis Pharmaceuticals Ltd.
Zeolite	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O	20-30 kg/acre	National Agricare Imp. Exp Ltd
Zeocare	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O	20-30 kg/acre	Nature Care
Aquazet	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO, MgO, Na ₂ O	20-30 kg /acre	Lion Overseas Trading Company
Alpha Zeolite	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO, MgO, Na ₂ O	20-30 kg /acre	Biswas Agrovet Ltd
Zeolite Plus	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO, MgO, Na ₂ O	20-30Kg/acre	Penta Agrovet Ltd.

Table 2. Chemicals used as disinfectant

Trade Name	Active ingredients	Dose	Source
EDTA	Sodium thio sulfate	0.1-1 ppm	Chemical seller
Bleaching	Chlorine	60 ppm	Chemical seller
Timsen	n-alkyl dimethyl benzyl ammonium chloride+ stabilized urea	20 g/33dec. (For prevention) 80 g/33dec. (For Treatment)	Eon Animal Health Products Ltd.
Emsen	n-alkyl dimethyl benzyl ammonium chloride+stabilize stabilized urea	80 g/33 dec.	SK+F Eskayef Bangladesh Ltd.
Water clear	Sodium Thiosulphate	In case of 5-6 feet deep water body 2-3 L/100 dec.	Organic Pharmaceuticals Ltd.
Omicide	Benzyl ammonium chloride+ urea	200 ml/33dec. After 24 hours 150 ml	Lion Overseas Trading Company
Microdine-Iodine 20%	Nonyl alkyl ohenoxy poly ethane oxide iodine complex	2-2.5 L/acre	Rals Agro Ltd.
Formalin	38% formaldehyde	1-3 ppm	Chemical seller
BKC	Benzal Konium chloride	Spread with water, 0.5 ppm	Chemical seller
Efinol	Efinol	5-8 g/1000 Liter water	Eon Animal health Products Ltd.

Table 3. Chemicals used for oxygen supply

Trade Name	Active ingredients	Dose	Source
Oxyflow	H ₂ O ₂ 10%	General dose 250-350 g/acre, In case of high deficiency 500 gm/acre in same water body.	Novartis Pharmaceuticals Ltd.
Oxymax	H ₂ O ₂ 10%	250-500gm/acre (1 m deep water body)	Eon Animal health Products Ltd.
O ₂ -Marine	H ₂ O ₂ 10%	33-40 Tab./33dec. (Generally), 66-90 Tab/33dec (In case of emergency)	Organic Pharmaceuticals Ltd.
Pure Oxy	Sodium per carbonate	250-500gm/acre	Al Madina
Bio- Ox	Sodium carbonat, H ₂ O ₂	General dose 2.5-5.0 g/acre, In case of high deficiency 5-8 g/acre in same water body.	ACI Animal Health
Oxy plus	Na ₂ O ₂ + Al(OH) ₃ Na ₂ O ₂ -90%	500 g/acre	Navana Animal Health
Gasonex (+)	Pseudomonas, Bacillus subtilis, Nitrococcus	General dose 250-500 g/acre; In case of high deficiency 750-1000 gm/acre	Fish Tech.
Oxymore	Sodium carbonat peroxyhydrate	General dose 250-500 g/acre; In case of high deficiency 750-1000 gm/acre	SK+F Bangladesh Ltd.

Table 4. Chemicals used as growth promoter

Trade Name	Active ingredients	Dose	Source
Aqua Boost	Organic acid, β-Glucan	500 g/MT feed	Novartis Pharmaceuticals Ltd.
Nutricell Aqua	Mannans 3 Beta-glucan	100 g/100 kg feed	Organic Pharmaceuticals Ltd
Aqua Savor	Amino acid premix	2-3 kg /Ton feed	Eon Animal health Products Ltd.
Hepaprotect-Aqua	Beta Glucan, Mannon Polymer and Essential oil	100-200 g/100 Kg of fish feed.	Renata.
Rapid Grow	Selected organic acid and their salt, beta-glucan, mannan oligosacharide, essential oil	50 g/100 kg of finished feed	Fish Tech.

Table 5. Antibiotics for disease treatment

Trade name	Active ingredients	Dose	Source
Oxysentin 20%	Oxytetracline HCl BP	100-200 g/100 kg feed,5-7 days	Novartis Pharmaceuticals Ltd.
Chlorsteclin	Chlortetracycline	200-300 g/100 Kg feed (5-7days)	Novartis Pharmaceuticals Ltd.
Ranamox	Amoxicillin Trihydrate	28-40 g/100 bd of fish, 10 days continuously.	Renata Pharmaceuticals Ltd
Renamycin	Oxytetracycline	28-42 g/100 kg feed, 10days.	Renata Pharmaceuticals Ltd.
Oxy-D Vet	Oxytetracycline 20% and Doxycycline 10%	1 g/4 Kg fish feed daily	Eon Animal health Products Ltd
Orgamycin 15 %	Oxytetracycline HCl BP (WSP)	In case of prevention 60 gm/100 kg feed 10 days	Organic Pharmaceuticals Ltd.
Orgacycline-15%	Chloro tetracycline	200-300 g/10 kg feed (5-7days)	Organic Pharmaceuticals Ltd
Bactitab	Oxytetracyclin 20%	50 g/kg body weight,5-7 days	ACI Animal Health

The literature available in the label of those products suggests that most of these antibiotics are effective against bacterial disease. Some antibiotics like Oxytetracycline 20%, Orgamycin 15%, Orgacycline 15% are also effective against EUS. Chlorsteclin and Fish cure play vital role in growth promotion as well as effective against some disease like dropsy, tail and fin rot, gill rot of fish etc.

Apart from those antibiotics only a handful of chemicals were available in the markets/shops for treating fish disease as presented in Table 6. Farmers used these chemicals for treating a variety of fish diseases with different doses.

In above chemicals, Eco-solutions have been reported by the farmers as effective for preventing viral diseases. Formalin, Sumithion and Lime were also reported to be useful for eradication of external parasite as well as fungal diseases. Lime is also used for common fish diseases. Spa is effective for both disease treatment and as growth promoter. Timsen is used for treatment of diseases and as a disinfectant.

Table 6. Chemicals used for disease treatment

Trade Name	Active ingredients	Source
Eco- solution	No information	Chemical seller
Lime	CaO, Ca(OH) ₂	Chemical seller
Formaline	40 % HCHO	Chemical seller
Spa	Protein, chloesteren, Ca, Vitamin-D, Carotinaid	Syngenta
Timsen	N-alkyl dimethyl benzyl ammonium chloride+ stabilized urea	Eon Animal Health Products Ltd.
Sumithion	Fanitrothion	Chemical seller

4. DISCUSSION

The present study identified a wide range of aqua chemicals and antibiotics marketed by different companies for using in various activities of aquaculture. The present study also identified a number of commercially available products with various trade names in the market which included Zeolite, Geotox, Mega geo, aqua boost, Oxyflow, Bio-tuff, Quick-oxygen, Orgavit aqua, Aqua-gold, Timsen, Efinol etc and various antibiotics and probiotics. The local animal feed and chemical shop owners are the main suppliers of such compounds to the farmers. All of these are related for better health management of aquatic animal. However, fish disease treatment was one of the most important areas where most of the chemicals were used.

A number of authors also reported similar disease conditions in aquaculture of Bangladesh [7,8,9]. The use of chemicals is also influenced by the culture system. In the extensive systems, this is limited to fertilizers, while in more complex semi-intensive and intensive systems a wide range of natural and synthetic compounds are used. It was also found from the present survey that farmers were using some chemicals indiscriminately.

There are some regulations (FIQC rules 2008) on the use of chemicals in aquaculture in Bangladesh but it has not yet been implemented.

In US, there are only six drugs approved for use in aquaculture: one anesthetic, one parasiticide, one spawning agent, and three antibiotics. All drugs must be used according to label instructions. Oxytetracycline and a potentiated sulfonamide are antibiotics approved for

use to treat disease but only in certain types of aquatic animal and only to treat certain diseases [10]. In the present investigation, some chemicals were found with only trade names.

The use of antibiotic substances is the cause of much controversy. Bacterial diseases of fish can be successfully treated with antibiotics.

However, to ensure the correct antibiotic, the causative agent of the disease needs identification via a sensitivity test at a diagnostic laboratory. All traders (14 traders) who sell antibiotics in the markets for fish disease treatment were identified from our investigation. Most of the farmers use antibiotics indiscriminately without knowing the exact causes of disease. It is learned that most of the farmers do not have training about the use of chemicals in ponds. It is widely recognized that continuous use of antibiotics contributes the development of resistant strains of bacteria [11].

5. CONCLUSION

In our investigation 16 pharmaceuticals companies are seen in market with their aqua chemicals which provided attractive information in leaflet or in the label to promote their products to the farmers. Detailed information is available about the dosages, duration and method of application of chemicals in the leaflet. However, farmers had different opinion about the use and efficacy of many of the products. Thus, farmers come under considerable pressure from commercial companies to use a variety of products in their farms. There are new products being made available continually and often there is very little information available about their efficacy.

There is no doubt that some products were very useful, however, may not perform as claimed and farmers must evaluate the cost and benefits of treatment before investing any products.

Further research on the impacts of this aquaculture drugs on the aquatic flora and fauna are recommended in the research area.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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