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PRESENT STATUS OF USING AQUA MEDICINES AND CHEMICALS ON FISH HEALTH MANAGEMENT IN BOGURA DISTRICT, BANGLADESH

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In order to understand the existing status of aqua-medicines and chemicals in aquaculture activities present investigation was conducted from January to June 2017 in four upazilas of Bogura district namely, Bogura Sadar, Sherpur, Kahaloo and Shibganj. Questionnaire and focus group discussion were used for data collection. Among the latest aqua-chemicals, geotox, jv zeolite, mega plus, aquastar pond, acme's zeolite, zeo-fresh, aqua green, biomin pond life, aquakleen, megagio gold, and aqua boost were extensively used. Probiotics like profs, aqua photo, aqua gold, super biotic and pond care were used. The selected farmers used growth promoter such as saltose, panvit aqua, spa gelly, aqua boost and bio-pond, bio-grow, aqua pure, gasstrap, metrix, geo-rich bio-aqua 50 and aqua magic were used as toxic gas reducer. Approximately 11 trade names of antibiotics were marketed in the selected area. Their main active ingredients were chlortetracycline, oxytetracycline, amoxicillin, co-trimoxazole, azithromycin and sulphadiazine. The survey identified some problems connected with the practice of such chemicals such as shortage of fish farmer's knowledge about the usage of chemicals, proper dosage and their maintenance.

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INTRODUCTION

Aquaculture drugs and chemicals plays a pivotal role not only in fish health management but also pond construction, soil and water management, enhancement of natural aquatic productivity, feed formulation, manipulation of reproduction, growth promotion and processing and value addition of the final product (Subasinghe et al., 1996). Several traditional chemicals and drugs such as sodium chloride, formalin, malachite green, methylene blue, potassium permanganate, glutaraldehyde and trifluralin (Hasan and Ahmed, 2002) were used in aquaculture for health management. Different types of antibiotics were also used to control harmful microbes and fish diseases from the aquatic environment. Pharmaceuticals companies and chemical sellers play a significant role of introducing those aqua chemicals to the fish farmers. However, most of the fish farmers were unaware of using these aqua-medicines efficiently. This is due to lack of knowledge, information regarding the present status and consequences of aqua-medicines using in aqua-health management. Considering the above facts, the present study was designed to know the diverse group of aqua drugs and chemicals, their active ingredients and recommended doses, purpose of using them for aquatic health management in some selected areas of Bogura district of Bangladesh.

MATERIALS AND METHODS

Study area and study periods

Four upazilas of Bogura district such as, Bogura Sadar, Sherpur, Kahaloo and Shibganj were selected for the present study. The study was carried out for a period of 6 months from January to June 2017.

Target groups

Data were collected from 80 fish farmers and 12 technical people of different aqua-medicine producing companies during the study period.

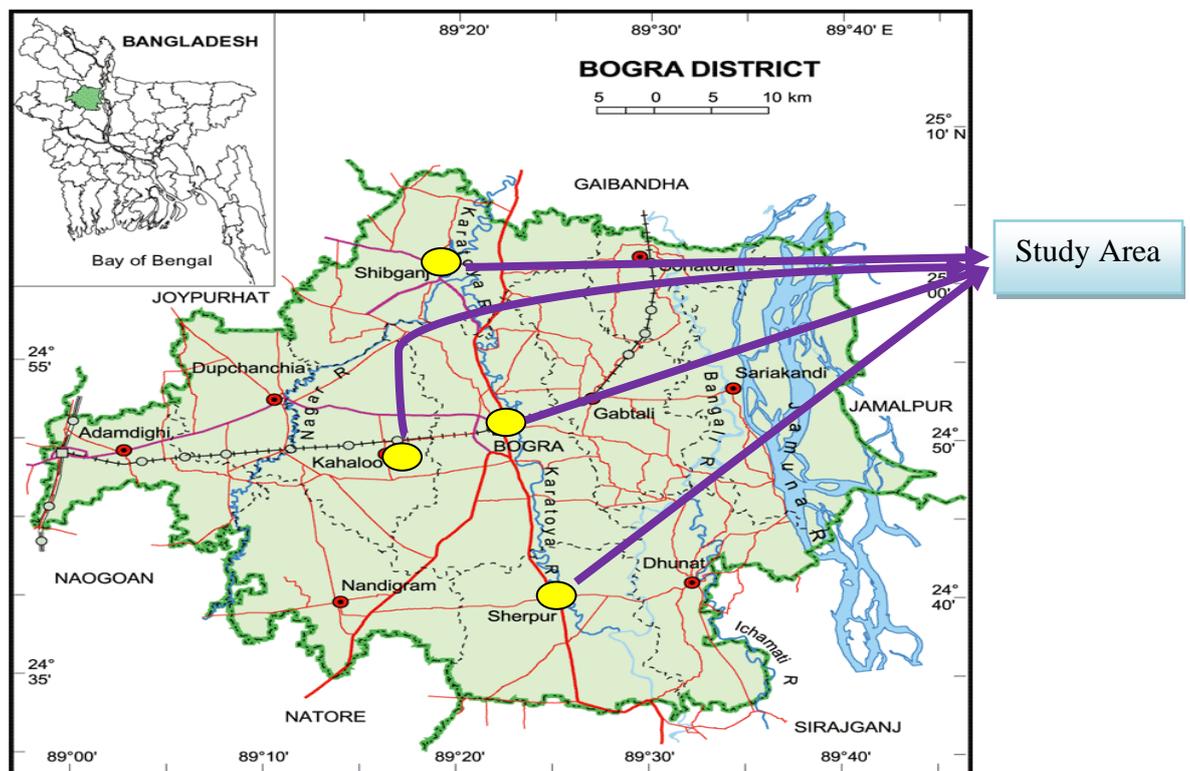


Figure 1. Map showing the study area

Questionnaire survey

The data was collected through questionnaire interview. A set of initial questionnaire was organized for pre-test through as field visit and then the questionnaire was finalized including the information of chemicals, active ingredients, persistence of use, techniques of application and doses extent, possessions on environment, effect on healthiness etc.

Data collection

Primary data collection

Primary data were collected from different target groups to have a brief outline of the present status of aqua-medicines through questionnaire interview, Focus Group Discussion (FGD) and Participatory Rural Appraisal (PRA).

Secondary data collection

Secondary data were collected from various technical and resource persons of government and non-government organizations such as; Districts Fisheries Officer (DFO), Upazila Fisheries Officer (UFO), Assistant Fisheries Officer (AFO), representatives of aqua medicine Company and Non Governmental Organization (NGO) workers as well as Journals, Books etc.

Data analysis

The data were analyzed using tabular and descriptive statistical techniques using MS Excel 2012 as well as the summary tables were prepared in accordance to the objective of the study.

RESULTS

Aqua medicines and chemicals used for oxygen supply

Around 10 aqua chemicals typically used for oxygen supply were recorded from aqua-medicine companies. Oxidizing agent and sodium per carbonate is the major active ingredients of such chemicals are shown in (Table 1).

Table 1. Aqua medicines and chemicals used for the supply of oxygen

Trade name	Active ingredients	Recommended dose	Company name
Oxyrich	Sustained release O ₂ 13.5%	10g/dec.	Opsonin
Oxyrich Tab	Sustained release O ₂ 12%	12-14 tab/dec.	Opsonin
Oxymore	Sustained release useful O ₂ 13.5%	200-250g/acre	SK+F
Oxylife	Sodium per carbonate	500-1kg/acre	Square Pharmaceuticals LTD.
Oxy-max	Sodium per carbonate	250-300g/acre	Eon animal Health
Oxy-A	Sustained release useful O ₂ 13.5%	6-8 kg/33dec.	ACME
Oxy-ren	Sodium carbonate per oxy hydrate	2-3g/dec.	Renata
Bio-ox	2Na ₂ CO ₃ 3H ₂ O ₂	300-400g/dec.	ACI animal Health
Oxy gold	Sodium per-carbonate	250 g/acre	Fish tech Ltd.
Quick oxygen	Sodium per-carbonate + free oxygen	500 g/acre	Organic Pharmaceuticals Ltd.

Antibiotics used for disease treatment

The active ingredients, recommended dose and trade name of available antibiotics are used by the fish farmers in the study zone are shown in (Table 2).

Table 2. Antibiotics used for disease treatment

Trade name	Active ingredients	Recommended dose	Company name
Renamox	Amoxicillin trihydrate	28-40g/100kg fish	Renata
Renamycin	Oxytetracycline	28-42g/100kg fish	Renata
Povin vet	Povin iodine U.S.P. 1.0%	2-3 ml/liter	Opsonin
Bactiab	Oxytetracycline 20%	50g/kg body weight,5-7 days	ACI animal health
Cotrim vet bolus	Co-trimoxa zole	Mixed with feed:1 bolus/10-12kg/body weight	Square Pharmaceuticals Ltd.
Otetra vet power 50	Oxytetracycline	Mixed with feed:11-16g/100 kg body weight	Square Pharmaceuticals Ltd.
Cotrim vet	Sulphamethoxole +Trimethoprie	0.50mg/ kg body weight	Square Pharmaceuticals Ltd.
Oxin WS	Oxytetracycline 20%	50mg/ kg body weight	Navana
Fish cure	Chlortetracycline HCL	500/1000 kg feed (3–5 days)	Rals agro Ltd.
Chlorsteclin	Chlortetracycline	200–300 gm./100 kg feed (5–7 days)	Elanco Pharmaceuticals Ltd.
Orgacycline 15%	Chlortetracycline	200–300 gm./100 kg feed (5–7 days)	Organic Pharmaceuticals Ltd.

Aqua medicines and chemicals used as disinfectants

The selected fish farmers used various types of aqua medicine as a disinfectant in order to keep pond free from any pollutant or pathogen. The following disinfectants listed in (Table 3).

Table 3. Aqua medicines and chemicals used as disinfectant

Trade name	Active ingredients	Recommended dose	Company name
Safeguard	Vitamin, enzyme and Probiotics	1-2g/Kg feed	SK+F
Timsen	N-Alcohol, Di-ethyl benzyl ammonium chloride	20g/33dec.	Eon Pharmaceuticals Ltd.
Albeas	vitamins, minerals and antimicrobial agent	150-200 g/dec.	Eon Pharmaceuticals Ltd.
Argulex	Tri-chlorofone 40%	12-13 ml/dec.	Eon Pharmaceuticals
Virex	Potassium peroxy mono sulphate 50%	200g/33dec	ACI Animal Health
Polgard plus	3-methyl and 4 methyl two chain brominated compound	500ml/acre	Fish tech Ltd.
Ascalina	Organic sperulina 100%	5-10g/Kg feed	SK+F
Formalin	38% formaldehyde	1-3 ppm	Chemical seller
BKC	Benzal Konium Chloride	Spread with water, 0.5 ppm	Chemical seller
Polgard plus	3-methyl and 4-methyl two chain brominated compound	500 ml/acre	Fish tech Ltd.
Microdine iodine 20%	Nony alk ohenoxypoly ethaneixide iodine complex	2 –2.5 L/acre	Rals Agro Ltd.

Aqua-medicine used for removal of harmful gasses

To eradicate organic and inorganic wastes producing gas in ponds, fish farmers were seen to use gas removal agent to their culture pond. About 14 toxic gas removals with different trade name were found to different companies. Their trade name, dose and manufacture are given in (Table 4).

Table 4. Aqua-medicine used for removal of harmful gasses

Trade name	Active ingredients	Recommended dose	Company name
Geo-rich	Natural geolite 100%	100-200g/dec.	Opsonin
Yucca	Yucca cidigera extract	2-3ml/dec.	Opsonin
Geo-prime	Natural green geolite 100%	200-250g/dec.	SK+F
Gasonil	Probiotic and yucca (30%)	150-200g/acre	SK+F
Geopel	Natural pellet geolite 100%	200-250g/dec.	SK+F
Bio-pond	Geo-lite and probiotic	200-250g/dec.	SK+F
Bio-grow	Vitamin, mineral and probiotics	150-200g/dec.	SK+F
Aqua pure	Natural sodium aluminum silicate	10-16kg/acre/3-6 ft. water	Square Pharmaceuticals Ltd.
Gasstrap	Enzyme and probiotics	200 g / acre/3-6 ft. water	Square Pharmaceuticals Ltd.
Metrix	Al ₂ O ₃ , CaO, SiO ₂ , Feroso ferric oxide	6-10 kg/acre	Eon Pharmaceuticals Ltd.
Bio-aqua 50	Extract of euka cidijera	3-4ml/3-4ft water	Eon Pharmaceuticals LTD.
Geo-ren	Aluminum sodium silicate	20-25kg/acre	Renata Animal Health
Megagio plus	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO	200g/dec.	ACI Animal Health
Ammonil	Yucca plant extract, <i>Bacillus subtilis</i> , <i>Candida utilis</i>	100-200 g/acre	Elanco Pharmaceuticals Ltd.
Gas stop	<i>Bacillus subtilis</i> Al ₂ O ₃ SiO ₂	500 mg/acre, 3 weeks	Organic Pharmaceuticals Ltd.
Aqua Magic	<i>Azotabactor chorococcum</i> , <i>Bacillus subtilis</i> , <i>Candida utilis</i>	400g/acre	Fish tech Ltd.

Aqua medicines and chemicals used for pond preparation and water quality management

Different types of aqua chemicals used by the fish farmers for pond preparation and improving water quality management of fish pond in the study area. The list of such chemicals with their active ingredients, dose, and manufacture are shown in (Table 5).

Table 5. Aqua medicines and chemicals used for pond preparation and water quality management

Trade name	Active ingredients	Recommended dose	Company name
Megagio plus	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO	200g/dec.	ACI Animal Health
Megagio gold	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO	100-150g/dec.	ACI Animal Health
Aquastar pond	Probiotics	6g/dec./3-4 ft. water	Renata
JV zeolite	Natural zeolite	6-8 kg/33dec.	Eon Pharmaceuticals Ltd.
Zeo-fresh	Standard zeolite	25-30 kg /acre/3-6 ft. water	Square Pharmaceuticals Ltd.
Aqua green	Seaweed extract and organic micro-nutrient	4-5kg/3ft water	Square Pharmaceuticals Ltd.
Aqua pure	Natural sodium alluminium silicate	10-16kg/acre/3-6 ft. water	Square Pharmaceuticals Ltd.
Biomax	Aluminum sodium silicate	3-4 kg/3 ft. water	Square Pharmaceuticals Ltd.
Pond care	Probiotic	50-75g/acre	SK+F
Acme zeolite	Aluminum sodium silicate	20-30 kg/acre	ACME
Zeopel	Zeolite 100%	20-30 kg/acre	SK+F
Green Zeolite	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO, MgO, Na ₂ O, K ₂ O, TiO ₂	20-25 kg/acre	Organic Pharmaceuticals Ltd.
Pontox plus	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO, MgO, Na ₂ O	15 kg/acr. After stocking 10-20 kg/acr.	Rals Agro Ltd.

Probiotics used in fish culture

In the present study, diverse types of probiotics are used by fish farmer to control vibriosis and other luminescent bacteria, improving water and soil quality and control pH shown in (Table 6).

Table 6. Probiotics used in fish culture

Trade name	Active ingredients	Purpose of use	Recommend dose	Company name
Profs	<i>Bacillus sp.</i> and <i>Padiococcus sp.</i>	Control vibriosis, luminescent bacteria	50-70 gm./33 Dec.	Eon Pharmaceuticals Ltd.
Aqua photo	<i>Bacillus subtilis</i> and <i>Rhodoseudomonas</i>	Control unwanted gas, and increase growth of plankton	50 –70 ml/100 dec.	ACI Animal Health
pH fixer	<i>Bacillus sp.</i>	Improve water quality and control pH	1–2 kg/acre	CP Aquaculture
Eco marine	<i>Bacillus subtilis</i> , <i>B. pumilis</i> , <i>B. myolichenifacions</i> , <i>B. megaterium</i> .	Control vibriosis and luminescent bacteria.	3–4 tablet/acre	Organic Pharmaceuticals Ltd.
Aqua gold	<i>Rhodopseudomonas sp.</i>	Increase growth rate and disease preventive power	2 ml/100 dec.	Organic Pharmaceuticals Ltd.
Procon-PS	<i>Bacillus sp.</i> , <i>Rhodococcus</i> , and <i>Rhodobacter</i>	Control unwanted gas, sediment and arrests the pathogens	5 L/hac (1 m depth)	Rals Agro Ltd.
Super biotic	<i>Bacillus sp.</i>	Reduce pathogenic bacteria in water	1–2 kg/ acre	CP Aquaculture
Super PS	<i>Rodobacter sp.</i> , <i>Rodococcus sp.</i>	Improve soil quality and reduce toxic gas from bottom	4–6 L/acre	CP Aquaculture
Pond care	<i>S. faecalis</i> and other bacteria	Inhibit pathogenic bacteria	50g/ acre	SK + F

Aqua medicines used for growth promoter

Diverse group of aqua-medicines were found to be used as growth promoter as well as to increase fish production such as saltose, panvit aqua, square aquamix, spa gelly, vitamix- F aqua premium, charger gel, aqua boost, megavit aqua etc. The list of such aqua medicines with their active ingredients, dose and sources are shown in (Table 7).

Table 7. Aqua medicines used for growth promoter

Trade name	Active ingredients	Recommended dose	Pharmaceutical company
Saltose	Probiotic and enzyme mixed	1-2g/Kg feed	Opsonin
Panvit aqua	Liquid multi-vitamin	0.5-1L/ton water	Square Pharmaceuticals Ltd.
Spa gelly	Omega-3 fatty acid	10-15g/kg feed	Eon Pharmaceuticals Ltd.
Vitamix- F aqua premium	Vitamin, minerals, amino acid	2.5Kg/ton feed	ACME
Charger gel	1-3 D glucan, olysaccharides, btain, beta glucan	6-8/kg feed	Fish tech Ltd.
Aqua boost	Organic acid, β-glucan	500 g/mt feed	Elanco Pharmaceuticals Ltd
Megavit aqua	Vitamin, mineral and amino acid supplement	100 g/100 kg feed	Elanco Pharmaceuticals Ltd.
Orgavit aqua	Vitamin, mineral and amino acid supplement	100 g/100 kg feed	Organic Pharmaceuticals Ltd.

Aqua medicines producing pharmaceutical companies

In the present study, about 40 companies were found which either produce or market aqua products. Among them 70% of the products are produced by top 12 companies which are shown in (Table 8).

Experiences of farmers in fish culture

The survey revealed that each of the selected fish farmers (100%) has fish farming experience. More than fifty percent of the fish farmers (52.5 %) had 6-10 years fish farming experience, while 47.5 % fish farmers had 1-5 years.

Table 8. Number of different products by pharmaceutical companies

Company Name	Number of products (N=150)	Products (%)
ACI	15	10.00
Square	13	8.67
Eon	11	7.33
Acme	11	7.33
SK+F	10	6.67
Opsonine	9	6.00
Fish tech	7	4.67
Organic	7	4.67
Reneta	6	4.00
Rals	6	4.00
CP	5	3.33
Elanco	4	2.67
Other companies	46	30.67

Water quality problems faced by the fish farmers in the study area

Water quality testing is an important part of environmental monitoring. When water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well. The common water quality problems faced by the farmer are shown in Table 9.

Table 9. Water quality problems faced by the fish farmers in the study area

Water quality problem	Prevalence (%)	Death (%)	Number of farmers (n = 80)	% of farmer
DO deficiency	30-40	10-30	80	100
pH	20-30	10-20	64	80
Ammonia	20-40	10-20	40	50
Turbidity	30-40	5-20	24	30
Poor phytoplankton	20-30	5-10	8	10

Disease of fish

Various types of fish diseases were reported in the study area. Disease outbreak mainly occurred during winter season. Fishes were affected by different types of fish diseases such as Epizootic Ulcerative Syndrome (EUS), tail rot and fin rot, dropsy, argulus etc. But proper preventive measures were reported to be adopted by the fish farmers to protect their fishes from various diseases shown in (Table 10).

Table 10. Disease problems faced by the fish farmers in the study area

Disease	Prevalence (%)	Death (%)	Number of farmers (n = 80)	% of farmer
EUS	20-50	3-20	80	100
Tail rot and fin rot	20-40	2-20	56	70
Dropsy	15-40	2-15	32	40
Argulus	20-40	5-10	28	35
Exophthalmia	20-30	5-10	18	22.50
Gill rot	20-30	5-30	18	22.50
Fin rot	15-30	3-10	6	7.50

Training experience on fish culture

From the present study, it was observed that only 12.5% of the fish farmers were received simple training from some GOs and NGOs for short duration on fish culture, while majority of the farmers (87.5%) did not get any institutional training.

Problems of fish culture in the study area

Different types of problems of fish culture were recorded in the investigation area including lack of technical knowledge, diseases, problem of taking lease pond, lack of chemicals and fertilizers, insufficient water in dry season, lack of marketing facility, lack of finance, theft of fish, poisoning in pond enmity, flood etc. are shown in (Table 11).

Table 11. Problems of fish culture in the study area

Problems	Number of farmers (n = 80)	% of fish farmer
Lack of technical knowledge	80	100
Diseases	74	92.50
Problem of taking lease pond	64	80
Flood	60	75
Insufficient water in dry season	52	65
Theft of fish	38	47.50
Poisoning in pond enmity	26	32.50
Lack of finance	12	15
Lack of chemicals and fertilizers	2	2.5
Lack of marketing facility	2	2.50

Problems of using aqua medicines and chemicals in fish culture

In the existing study, problems of using chemicals or aqua-medicine were identified from the selected fish farmers which are, lack of knowledge about use of aqua chemicals, lack of knowledge of application procedure of aqua chemicals and antibiotics, lack of support from GO and NGOs, lack of awareness about the safety issues in using hazardous chemicals, lack of information on possible hazardous chemicals, lack of diagnostic facilities for proper disease diagnosis, lack of knowledge about residual effect and expiry date and lack of trained manpower to recommend fish medicine.

DISCUSSION

Different types of aqua drugs were recorded in the study area for the improvement of water quality of fish ponds such as megagio plus, megagio gold, aquastar pond, jv zeolite, zeo-fresh, aqua green, aqua pure, biomax, pond care, acme zeolite, zeopel, green zeolite, and pontox plus. Faruk et al., (2008) reported drugs like geotox, jv zeolite, lime, mega zeo, bio aqua and acmes zeolite used for improving water quality. Rahman, (2011) was identified various types of chemicals like bio care, geotox, pontox plus, green zeolite, benzo, zeo-care, bio tuff, acmes zeolite, supper zeolite, aqua zel, fish grow and biolite plus used for the improvement of water quality parameters in fish ponds. Diverse types of fish diseases such as EUS, tail rot, fin rot, gill rot, argulous, exophthalmia and dropsy were observed. Similar conditions were also reported by Faruk et al., (2004) and Hossain et al., (2014). A Majority of the farmers in the selected areas were also used different types of aqua drugs and chemicals in order to control these types of fish diseases. It meant that disease problem was the major constraint in aquaculture production of the selected areas.

In the study area, fish farmers were used several types of aqua medicine such as safegard, timsen, albeas, argulex, virex, polgard plus, ascalina, polgard plus, microdine iodine 20% etc. as disinfectant in order to keep ponds free from pollution and pathogens. According to Chowdhury et al., (2015), timsen has great influence on the prevention of bacterial and fungal infection, while formalin is effective to control protozoan fish disease. Benzal Konium Chloride (BKC) is chemical which is very useful to control bacterial disease. Apud (1984) investigated that farmers used formalin as disinfectant and to control protozoan diseases. Rahman (2011) found various chemicals such as polgard plus, bactisal, virex, biogaurd, lenocide, timsen, emsen, aqua cleaner plus, formalin and bleaching powder were used as disinfectants. Monsur (2012) reported that various aqua drugs and chemicals such as geotox, mega zeo, lime, bio aqua, timsen, efinol, polagard plus, oxyflow, oxy-a, potash, salt, capter, megavit aqua, ac-mix super fish and aqua boost were used by the selected fish farmers against fish diseases and health problems of cultured fishes.

In the present study, various aqua chemicals such as oxyrich, oxyrich tab, oxymore, oxylife, oxy-max, oxy-a, oxy-ren, bio-ox, oxy gold, and quick oxygen were mainly used for supplying oxygen in the fish pond. Ali, (2008) mentioned that oxy max and oxy flow were used to control excess removal of hardness and poisonous gases. Similarly Rahman, (2011) reported aqua drugs like oxy-gold, oxy life, bio care, oxy plus, pure oxy, oxy max, and oxy flow were effective the supply of oxygen. Faruk et al., (2008) found that ac-mix super fish and aqua boost has disease preventing ability in fishes. Islam, (2013) reported that farmers used a wide range of aqua-medicines for growth promoter such as acimix super fish, spa, megavit aqua, charger gel, rapid grow and nutrimix. Ashraful et al., (2014) were also reported that various types aqua chemicals such as megavit aqua, charger gel, acimix super-fish, vitax-c and rena fish were used for the rapid increase of fish growth which is similar to the findings of the present study. Various types of antibiotics such as renamox, renamycin, povin vet, bactiab, cotrim vet bolus, otetra vet power 50, etc. were found in the present study. Sarker, (2000) observed in an experiment to test drug sensitivity of five isolates of *A. sobria* and found that most of the isolates were sensitive to oxytetracycline, oxolinic acid and chloramphenicol but resistance to erythromycin and sulphamethoxazole. Chowdhury et al., (2003) was found that antibiotic like renamycin (oxytetracycline) had positive effect against bacterial infection at a dose of 50 mg/kg body wt. /day applying for days and 80-90% fish were recovered under laboratory condition. Rashid et al., (2014) reported that oxysentin 20%, acimox and oxy-d vet were used in separate nine aquaria at lower, recommended and higher dose respectively. Ali et al., (2014) conducted an experiment on *Aeromonas hydrophila* infected silver carp which treated by antibiotics such as Oxysentin 20%, acirnox and oxy-d vet were used at lower, recommended and higher doses respectively. The antibiotic trial was conducted for 10 days. Among the three antibiotics, oxycentin 20% and acimox at higher dose showed good results where 100% fish were recovered.

Probiotics were used by different fish farmers to control vibriosis and other luminescent bacteria, improving water and soil quality and control pH. In study area found different types of probiotics such as profs, aqua photo, mutagen, pH fixer, aqua gold, procon-ps, super biotic, super-ps and pond care. The probiotic contains mainly different concentration of beneficial bacteria which include *Bacillus* sp., *Rodobacter* sp., *Rodococcus* sp., *Streptococcus faecalis* etc. Islam, (2013) observed that farmers used a wide range of aqua-medicines as probiotic such as navio plus, biozyme, pro marine and aqua boost. Ashraful et al., (2014) observed that various types of probiotics such as megazeo pro, biomin pond life and aqua photo.

CONCLUSION

A number of traditional and advanced aqua drugs and chemicals were used by the fish farmers in Bogura district. Lack of knowledge about the use of aqua chemicals, lack of awareness about the safety issues in using hazardous chemicals and facilities for proper disease diagnosis were identified as major problems. Therefore, both the government and non-government organizations should take initiative for better understanding of chemical uses in aquatic animal health management.

CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

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