

Use of Aqua-Medicines and Chemicals in Aquaculture in Shatkhira District, Bangladesh

¹M. Ashraful Alam and ²M. Mammur Rashid

Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh

Abstract: A six months' study was carried out to understand the present status of use of aqua-medicines and chemicals in aquatic animal health management of Shatkhira district of Bangladesh. Thirty small fish farms, fifteen commercial fish farms, twelve fish hatcheries and eight aqua-medicine companies were investigated out. Seven categories of aqua-medicines and chemicals were identified in the study areas that were used by small fish farmers, commercial fish farmers and hatchery owners produced by Square Pharmaceuticals Ltd., Novartis Animal Health, ACI Animal Health, SK + F Bangladesh Ltd., Acme Laboratories, Reneta and Eon Animal Health. In the investigated area various types of diseases such as bacterial infection, EUS (epizootic ulcerative syndrome), ichthyophthiriasis, argulosis, swollen abdomen, and white spot diseases were found to affect tilapia (*Oreochromis nilotica*), sharputi (*Puntius sarana*), rui (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus cirrhosus*), bagda (*Penaeus monodon*), golda (*Macrobrachium rosenbergii*) and silver carp (*Hypophthalmichthys molitrix*). Geotox, JV Zeolite, Mega Zeo Plus and Zeolite Gold were found to be used for water quality management; Oxyflow, Oxymore, Bio-Ox and Oxy-Gold to improve dissolved oxygen level; Megavit Aqua, Charger Gel, Acimix Super-fish, Vitax-C and Rena Fish as growth promoter; Oxy-sentin 20%, Captor, Oxy-D Vet and Aquamycine as antibiotics; Timsen, Emsen and Polgard Plus as disinfectant; Megazeo Pro, Biomin Pond Life and Aqua Photo as probiotics and lime, salt, formalin, methylene blue, potash and malachite green were found to be used against different fish diseases. Susceptible months of disease outbreak in the study area were August, September, October, May and June. Some problems were identified in study area in case of using aqua-medicines and chemicals. The present study pointed out the lack of technical knowledge of fish farmers about use of aqua-medicines and chemicals in Shatkhira district as well as future environmental hazards caused by the massive use of huge numbers of aqua-medicines. So, it was suggested that the Department of Fisheries, Government of the Peoples Republic of Bangladesh might give license to a few pharmaceutical companies to produce a limited number of aqua-medicines and ban other products.

I. Introduction

With the expansion of aquaculture in Bangladesh, there has been an increasing trend in using aqua-medicines and chemicals in aquatic animal health management. In fish health management and disease treatment farmers use different compounds as growth promoter, antibiotics, disinfectants, probiotics and to improve water quality and dissolved oxygen. Chemicals used in aquaculture included sodium chloride, formalin, potassium permanganate, copper compounds, malachite green and methylene blue (Li et al., 1996).

Commonly used chemicals in Bangladesh aquaculture were lime, rotenone, various forms of inorganic and organic fertilizer, salt, dipterex, antimicrobials, potassium permanganate, copper sulphate and formalin (Faruk et al. 2005). Sodium chloride was normally used for parasitic and fungal disease of fish (Phillips, 1996). Potassium permanganate (KMnO₄) was good for protozoan infestations on skin, gills and fins (Floyd, 1993). For the success of aquaculture, chemicals and aqua-medicine must be used responsibly. Fish disease is an alarming factor for which production of aquaculture is hampered. Aqua-medicines are indeed essential ingredients for successful aquaculture. Use of aqua-medicine in aquaculture system for various purposes is widely recognized. In Bangladesh near about 100 pharmaceuticals companies are now producing about 400 different aqua-medicines. Excessive use of such a huge number of aqua-medicines and chemicals might create environmental degradation. Moreover, most of the farmers do not know the appropriate dosages and method of their application. Thus present status of use of aqua-medicines and chemicals in aquaculture sector especially in aquatic animal health management needs to be investigated. The present work reports the use of aqua-medicines and chemicals in aquaculture in Shatkhira district of Bangladesh.

II. Materials and Methods

The present study was carried out in Shatkhira district. Thirty small fish farms, twelve fish hatcheries, fifteen commercial fish farms and eight aqua-medicine companies were investigated. The survey was carried out for 6 month from November 2013 to April 2014. Data were collected from commercial fish farmers, small fish farmers, hatchery owners, aqua-medicine representatives and chemical sellers about the use of chemicals, active

ingredients of aqua-medicines, purpose of use, method of application, dose, dosage, effectiveness, duration, price, effect on environment and impact on health.

III. Result and Discussion

Many aqua-medicine companies were found in Satkhira district such as Square animal health, Novartis animal health, ACI animal health, Fishtech, Reneta, Eon animal health, Acme laboratories and SK + F Bangladesh Ltd. Various types of aqua medicines were produced by those companies which were used in aquaculture activities for water quality management, disinfection, improvement of dissolved oxygen, antibiotics and chemicals for disease treatment, as probiotics and as growth promoter (Table 1-7).

Following four zeolites were found to be used for water quality management in Shatkhira district (Table1). Faruk et al. (2008) found drugs like Geotox, JV Zeolite, Mega Zeo, and Bio Aqua used for improving water quality.

Table 1. Zeolites used for water quality management

Trade Name	Active ingredients	Dose	Source	Price (Taka)
Geotox	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O	20-25 Kg/dec./month (3-4 ft depth)	Novartis Animal Health Ltd.	55/Kg
JV Zeolite	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O, K ₂ O, Mn, P	6-7 Kg/33 dec./month	Eon Animal Health Ltd.	350/10 Kg
Mega Zeo Plus	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O K ₂ O and Mn	200 g/dec./month	ACI Animal Health Ltd.	340/10 Kg
Zeolite Gold	SiO ₃ , MgO, CaO ₂ etc.	200-250 g/dec./month	Fishtech	410/10 Kg

Aqua-medicines used as disinfectant

Farmers used aqua-medicines as a disinfectant to keep their pond free from pollution or pathogen. Polgard Plus, Timsen, Virex, and Emsen and were used as disinfectant. Rahman (2011) observed that disinfectans were Polgard Plus, Virex, Biogaurd, Lenocide, Timsen, Emsen, Aqua Cleaner Plus, formalin and bleaching powder. Their active ingredients, prescribed dosage, sources and approximate price are shown in Table 2.

Table 2. Aqua-medicines used as disinfectant

Trade Name	Active ingredients	Dose	Source	Price (Taka)
Polgard Plus	3-Methyl and 4-Methyl two chain brominated compound	500 ml/acre	Fishtech	460/200 ml
Timsen	n-Alkyldimethylbenzyl ammonium chloride and Stabilized urea	20 g/33 dec. (For prevention) 80 g/33 dec. (For Treatment)	Eon Animal Health Ltd.	260/50 g
Virex	Potassium Peroxymono sulphate 50%	200 g/33 dec.	ACI Animal Health Ltd.	100/100 g
Emsen	n-Alkyl dimethyl benzyl ammonium chloride stabilized urea	80 g/33 dec.	SK + F Bangladesh Ltd.	250/50g

Aqua-medicines used to increase dissolved oxygen

To increase dissolved oxygen Oxyflow, Oxymax, Bio-Ox, and Oxy-Gold were used. The list of such aqua-medicines with their active ingredients, prescribed dosage, sources and approximate price are shown in Table 3. Monsur (2012) observed that Oxyflow, Oxymax, Bio-Ox, Oxy-A and Oxy-Gold were used to increase dissolved oxygen in aquaculture ponds.

Table 3. Aqua-medicines used to increase dissolved oxygen

Trade Name	Active ingredients	Dose	Source	Price (Taka)
Oxyflow	H ₂ O ₂ 10%	250-350 g/acre. In case of high deficiency 500 g/acre	Novartis Animal Health Ltd.	800/Kg
Oxymax	Calcium peroxide	250-300 g/acre for 3-4 ft	Eon Animal Health Ltd.	360/500 g
Bio-Ox	Sodium percarbonate	10 g/dec.	ACI Animal Health Ltd.	475/Kg
Oxy-Gold	Sodium percarbonate 90%	250-500 g/acre In case of high deficiency 750-1000 g/acre	Fishtech	670/Kg

Antibiotics used for fish disease treatment

Most farmers used Aquamycine, Captor, Oxysentin 20%, Renamycin Soluble Powder and Oxy-D Vet for disease treatment. The list of such aqua medicines with their active ingredients, prescribed dosage, sources

and approximate price are shown in Table 4. Monsur (2012) found Oxyseptin 20%, Aquamycine, Captor and Acimox powder as antibiotics. Islam (2013) found Oxy-Dox-F, Renamox, Ciprovet and CT-Dox. Faruk et al., (2005) observed that Aquamycine, Oxy-Dox-F 100, Captor, Oxyseptin 20%, Doxy-A Vet WSP, Tetravet WSP, Moxilin Vet WSP, Renamycin Soluble Powder and Oxy-D Vet were used as antibiotics to cure different bacterial diseases of cultured aquaculture species in Bangladesh.

Table 4. Antibiotics used for fish disease treatment

Trade Name	Active ingredients	Dose and dosage	Source	Price (Taka)
Aquamycine	Oxytetracycline HCL 25%	1-2 g/Kg feed for 5-7 days	ACI Animal Health Ltd.	70/100 g
Captor	Chlorotetracycline HCL 45%	50-70 g/100 Kg feed for 5-7 days	Novartis Animal Health Ltd.	405/100 g
Oxyseptin 20%	Oxytetracycline HCL 200 mg	100-200 g/100 Kg feed for 5-7 days	Novartis Animal Health Ltd.	840/1Kg
Renamycin Soluble Powder	Oxytetracycline 200 mg	50 mg/Kg body wt. for 5-7 days	Reneta Ltd.	72/100 g
Oxy-D Vet	Oxytetracycline 20% Doxycycline 10%	5-10 g/Kg body wt. for 5-7 days	Eon Animal Health Ltd.	172/100 g

Chemicals used for disease treatment

Potash, lime, formalin, methylene blue, benzalkonium chloride, salt and malachite green, were found to be used for disease treatment. The list of such chemicals with their active ingredients, dose, purpose of use, sources and approximate price are shown in Table 5. Ali (2008) observed that methylene blue, melathion, salt, lime, sumithion and protadice were used to treat various disease problems of fishes of Bangladesh.

Table 5. Chemicals used for disease treatment

Trade Name	Active ingredients	Dose	Purpose of use	Sources	Price (Taka)
Potash	KMnO ₄	2-3 ppm	EUS	Chemical seller	195/Kg
Lime	CaO, Ca(OH) ₂	1 kg/dec.	Pond preparation	Chemical seller	15/Kg
Formalin	40 % Formaldehyde	15-25 ppm	Protozoan fish disease	Chemical seller	80/Kg
Bleaching	Chlorine	60 ppm	Water treatment	Chemical seller	60/Kg
Malachite Green	C ₂ H ₂ O ₄	1 ppm; 1min; dip	EUS	Chemical seller	600/25 g
BKC	Benzalkonium chloride	0.5 ppm	Bacterial disease	Chemical seller	2000/Kg
Methylene Blue	C ₁₆ H ₁₄ N ₃ SCI	0.15 ppm	Antifungal disease	Chemical seller	70/100 ml
Salt	NaCl	1 kg/dec.	Pond preparation	Chemical seller	8/Kg

Probiotics used in shrimp farms in Shatkhira district

Shrimp farmers were found to use probiotic products of different aqua-medicine companies such as Pond Plus, Biomin Pond Life, Aqua Photo, Megazeo Pro and Biozime. The probiotics contained different beneficial bacteria including *Bacillus subtilis*, *B. Pumilis* and *Saccharomyces cerevisiae* (Table 6). Islam (2013) found the use of Navio Plus, Biozime, Aqua Bost and Pro Marine to increase disease resistance in shrimps.

Table 6. Probiotics used in shrimp farms in Shatkhira district

Trade Name	Active ingredients	Dose	Source	Price (Taka)
Pond Plus	<i>Bacillus subtilis</i> ,	300-400 g/acre	Fishtech	615/500 g
Biozime	<i>Saccharomyces cerevisiae</i>	25-50 g/100 Kg feed	Fishtech	150/100 g
Aqua Photo	<i>Bacillus subtilis</i>	50 ml/dec.	ACI Animal Health Ltd.	300/L
Megazeo Pro	<i>Bacillus subtilis</i>	10-15 Kg/acre	ACI Animal Health Ltd.	360/10 Kg
Biozime	<i>Bacillus subtilis</i> <i>Saccharomyces cerevisiae</i>	25-50 g/100 Kg feed	Fishtech	150/100 g

Growth promoters used in fish farms in Shatkhira district

Several aqua-medicines were found to be used as growth promoter as well as to increase fish production. Megavit Aqua, Acimix Super-fish, Square Aquamix, Rena Fish, Vitax-C and Charger Gel were used. The list of such aqua medicines with their active ingredients, prescribed dose, sources and approximate price are shown in Table 7. Islam (2010) observed that Resistol, Charger Gel, Ossi-C and Cevit Aqua were used as growth promoter.

Table 7. Growth promoters used in fish farms in Shatkhira district

Trade Name	Active ingredients	Dose	Source	Price (Taka)
Acimix Super-fish	Vitamin, Mineral and Amino acid.	2.5 g/Kg feed	ACI Animal Health Ltd.	325/2.5 Kg
Megavit-Aqua	Vitamin A, Ca, P, Na etc.	100 g/100 Kg feed	Novartis Animal Health Ltd.	360/Kg
Square Aquamix	Vitamin, Amino acid, Mineral, Probiotic, Anti oxydent etc.	1 g/Kg feed	Square Pharmaceuticals Ltd.	295/Kg
Rena Fish	Vit A, B, C, D ₃ , E, K, Cu, Mn, Fe, Co etc.	1 Kg/ton feed	Reneta Ltd.	260/Kg
Vitax-C	Vit C BP 100 mg/g powder	1-2 g/2-3 Kg feed	Eon Animal Health Ltd.	200/100 g
Charger Gel	1-3 D-Glucan, Polysaccharides Btain, Beta Glucan	6-8 g/Kg feed	Fishtech	1060Tk/Kg

Impact of aqua-medicines on fish health

In Shatkhira fish farmers reported that susceptible months of disease outbreak in the study area were August, September, October, June and July. Rui, Catla, and Mrigal were found to be susceptible with tail rot and fin rot having 10% prevalence. Tail rot and fin rot affected rui, catla and mrigal were treated by farmers with Aquamycin having 95% recovery. Tilapia was found to be susceptible with bacterial infection having 15% prevalence. Farmers used Aquamycine against bacterial infection having 100% recovery. Bagda and Golda were found to be susceptible with WSSV having 80% prevalence. Farmers used zeolite, dolomite and bleaching powder against WSSV having 10% recovery. Carp fishes were found to be susceptible with EUS having 70% prevalence. Farmers used Malachite Green and Oxytetracycline against EUS having 95% recovery. Tilapia was found to be susceptible with dropsy having 30% prevalence. Farmers used Oxytetracycline and KMnO₄ with dip bath against dropsy having 85% recovery. Bagda, Golda, Rui, Catla and Mrigal were found to be susceptible with exophthalmia having 90% prevalence. Farmers used dolomite and malachite green against exophthalmia having 100% recovery (Table 8).

Table 8. Impact of aqua-medicines on fish health

Disease	Clinical sign	Species	Treatment	Prevalence (%)	Season	Recovery (%)
Tail rot and fin rot	Reddish color and rotten on base	Rui, Catla, Mrigal	Aquamycin (Oxytetracycline HCL) 1-2 g/Kg feed	10	Aug.-Sept.-Oct.	95
Bacterial infection	Infection in skin, fin lesion on gill	Tilapia	Aquamycine (Oxytetracycline HCL) 1-2 g/Kg feed	15	Sept.-Oct.	100
WSSV	White spot in carapace and body	Bagda, Golda	Zeolite 200-250 g/dec. Bleaching powder 2-3 ppm Dolomite 150 g/dec.	80	All over the year	10
EUS	Red spot and infection	Carp fishes	Oxytetracycline 1-2 g/Kg feed	70	All over the year	95
Dropsy	Swollen abdomen	Tilapia	KMnO ₄ Dip bath 2 ppm	30	Sept.-Oct.	85
Exophthalmia	Eye swollen	Bagda, Golda, Rui, Catla, Mrigal	Dolomite 150g/dec. and Malachite Green	90	June-July	100

A number of new aqua-medicines were recorded in the market for water quality management such as JV Zeolite, Bio Aqua-50, Mega Zeo plus, Zeolite Gold, Polgard+, Geotox, and Ammonil. Islam (2013) also found drugs like Geotox, JV Zeolite, Mega Zeo plus, Bio Aqua-50 and Ammonil used for improving water quality.

The chemicals widely used as disinfectants in aquaculture in Shatkhira district included formalin, lime, bleaching powder, timsen, polgard plus, virex, methylene blue, malachite green and emsen. Monsur (2012) observed that polgard plus, methylene blue, malachite green, formalin, bleaching powder, and timsen were used as disinfectants. The present study point out the lack of technical knowledge of fish farmers about use of aqua-medicines and chemicals in Shatkhira district. Rajib et al., (2014) found indiscriminate use of drugs and chemicals in the coastal region of Bangladesh. A lot of chemicals used in aquaculture have detrimental after effect by their precipitations in water and sediment (Samuelsen 1994; Barnes et al., 1995; Malvisi et al., 1997;

GESAMP 1997; Douet et al., 2009). As aquaculture in Bangladesh is developing very rapidly and as intensive aquaculture is causing health hazards of fish, aquaculturists are being bound to use aqua-medicines for treatment. In this opportunity, a lot of pharmaceutical companies are presenting their products. Massive use of all these aqua-medicines may cause a great harm to the aquaculture environment of Bangladesh within a short period (Spanggaard et al., 1993; Anderson and Levin, 1999; Tendencia and De La Pena, 2001). So, Department of Fisheries should certify a few aqua-medicines for each disease problem to save Bangladesh waters for intensive aquaculture.

References

- [1]. Ali MM 2008: Study on the chemicals and antibiotics used in aquatic animal health management, MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh.
- [2]. Andersson DI and BR Levin 1999: The biological cost of antibiotic resistance. *Current Opinion in Microbiology*. **2** 489-493.
- [3]. Barnes AC, Hastings TS and Amyes GB 1995: Aquaculture antibacterials are antagonized by seawater cations. *Journal of Fish Disease*. **18** 463-465.
- [4]. Douet DG, Le Bris H and Giraud E 2009: Environmental aspects of drug and chemical use in aquaculture: an overview. In: Rogers C. (ed.), Basurco B. (Editors). *The use of veterinary drugs and vaccines in Mediterranean aquaculture*. Zaragoza 105-126. pp. (Options Méditerranéennes :Série A. Séminaires Méditerranéens; n. 86)
- [5]. Floyd RF 1993: *The Veterinary Approach to Game Fish*. Pergamon Press. 395-408. pp.
- [6]. Faruk MAR, Alam MJ, Sarker MMR and Kabir MB 2004: Status of fish disease and health management practices in rural freshwater aquaculture of Bangladesh. *Pakistan Journal of Biological Science* **7** (12) 2092-2098.
- [7]. Faruk MAR, Sultana N and Kabir MB 2005: Use of chemicals in aquaculture activities in Mymensingh area, Bangladesh. *Bangladesh Journal of Fisheries* **29** (2) 1 -10.
- [9]. Faruk MAR, Ali MM and Patwary ZP 2008: Evaluation of the status of use of chemicals and antibiotics in freshwater aquaculture activities with special emphasis to fish health management. *Journal of Bangladesh Agricultural University* **6** (2) 381-390.
- [10]. GESAMP 1997: Joint Group of Experts on the Scientific Aspects of Marine Pollution. Towards safe and effective use of chemicals in coastal aquaculture. *Rep. Stud. GESAMP* **65** 37.
- [11]. Islam MT 2010: Present status of aqua-medicines used in aqua health management. MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh.
- [12]. Islam A 2013: Investigation into the commercial aqua medicines in Bangladesh aquaculture. MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh.
- [13]. Li MH, Wise DJ and Rohinson EH 1996: Chemical prevention and treatment of winter saprolegniosis ("winter kill") in channel catfish, *Ictalurus punctatus*. *Journal of World Aquaculture* **27**(1) 1-6.
- [14]. Malvisi J, Della Rocca G, Anfossi P and Giorgetti G 1997: Tissue distribution and depletion of flumequine after in-feed administration in sea-bream (*Sparus aurata*). *Aquaculture* **157** 197-204.
- [15]. Phillips M 1996: The use of chemicals in carp and shrimp aquaculture in Bangladesh, Cambodia, Lao PDR, Nepal, Pakistan, Sri Lanka and Viet Nam. In: *Use of Chemicals in Aquaculture in Asia*. Arthur JR, Lavilla-Pitogo CR, Subasinghe RP (Editors). Southeast Asian Fisheries Development Center, Aquaculture Department Tigbauan, Iloilo, Philippines. 75-84. pp.
- [16]. Rajib MS, Sumi KR, Alam MJ, Rahman MM, Ferdous Z, Ali MM and Chaklader MR 2014: Drugs and chemicals used in aquaculture activities for fish health management in the coastal region of Bangladesh. *International Journal of Life Sciences Biotechnology and Pharma Research* **3** (4) 51-58.
- [17]. Rahman MM 2011: Status and impact of commercial aqua drugs and chemicals on fish health at farmer level. MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh.
- [18]. Spanggaard B, F Jorgensen, L Gram and HH Huss 1993: Antibiotic resistance in bacteria isolated from three freshwater fish farms and an unpolluted stream in Denmark. *Aquaculture*, **115** 195-207.
- [19]. Samuelsen OB 1994: Environmental impacts of antibacterial agents in Norwegian aquaculture. In: *Proceedings of the Canada-Norway Workshop on Environmental Impacts of Aquaculture*. Fiskerihavet NR 13, Institute of Marine Research, 107-113. pp.
- [20]. Tendencia EA and LD De La Pena 2001: Antibiotic resistance of bacteria from shrimp ponds. *Aquaculture*, **195** 193-204.