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Article

Impact of aqua drugs and chemicals on the recoveries of fish diseases and total fish production in Sherpur region of Bangladesh

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Abstract: The present study was conducted to investigate the impact of aqua-drugs and chemicals on fish health and total fish production in Sherpur region, Bangladesh from July 2014 to June 2015. Forty nine different types of aqua-drugs and chemicals were recorded in the study area; among those sixteen types mainly ADDIC drugs and chemicals were widely used by the farmers for treatment of different fish diseases. It was recorded that GR Plus, Active Blue with Copper sulphate, ID Plus, Aqua c vit and H. vit plus were used for the treatment of EUS in Pangus, Shing and Thai koi which had an average recovery of 80-90%. For the treatment of Edwardsiellosis in Pangus and Thai koi, farmers used GR Plus, ID Plus, OTC power, Aqua c vit, H.vit plus and potassium permanganate which had an average recovery of 75-80%, and for the treatment of dropsy in Thai koi and Shing GR Plus, ID Plus, OTC power, Aqua c vit, H.vit plus and potassium permanganate were used which had an average recovery of 75-85%. Histopathology of liver and kidney of fishes were almost normal in control ponds, whereas, in fish organs from drug treated ponds had pathological changes like necrosis, pyknotic cells, hemorrhage, fat droplet, ilets of langerhens, degeneration of kidney tubules and vacuums. Total production of Thai koi, Shing and Pangus was 10,000 kg/acre, 10,000 kg/acre, and 13,000 kg/acre in drugs treated ponds; whereas, such value was 5,000 kg/acre, 4,500 kg/acre and 6,500 kg/acre in non-treaded ponds, respectively in the study areas. In control ponds, mortality rate was comparatively high and production was also low than drugs treated ponds. End of the experiment, it was observed that efficacy of drugs of Aqua Drug and Disease Information Centre (ADDIC) was excellent.

Keywords: aqua drugs; chemicals; fish diseases; total fish production

1. Introduction

Over the last decade the rapid expansion of fish culture has been drawn an outstanding development in Bangladesh fisheries sector and it contributes 4.43% to the Gross Domestic Product (DoF, 2014). Aquaculture expands through the practice of improved extensive and semi intensive fish culture systems. For the successful aquaculture, technology is most needed (Subasinghe *et al*., 1996) as well as the application of different aqua-drugs and chemicals which enhance the production and disease resistance capacity. There is a long history behind the using of drugs and chemicals in aquaculture. A variety of aqua-drugs and chemicals are used in both inland and coastal aquaculture. The purposes of using chemicals and antibiotics are to improve health condition of aquatic animal, growth promotion (Ahmed *et al.*, 2014), feed formulation, manipulation of production, transportation of live fish, pond construction, and overall the management of natural pond environment and water quality (GESAMP, 1997; Faruk *et al*., 2004 and Khan *et al*., 2011). In past farmers used only some traditional chemicals like lime, salt, potassium permanganate, copper sulphate, formalin and bleaching powder (Hasan and Ahmed, 2002 and Plumb, 1992) but in recent years several pharmaceutical companies play a vital role to produce various types of commercial aqua-drugs and chemicals (Faruk *et al.*, 2008). For health

management of fish several types of antibiotics are used by farmers. The antibiotics have been applied in aquaculture for over fifty years for treating bacterial infections in fish (Shamsuzzaman and Biswas, 2012). The common ingredients of antibiotics are oxytetracycline, chlorotetracycline, amoxicilin, co-trimoxazoie, sulphadiazine and sulphamethoxozole (Plumb, 1992). Some common chemicals are used for health management including sodium chloride, formalin, malachite green, methyl blue, potassium permanganate and hydrogen per-oxide (Plumb, 1992). Potassium permanganate is the most widely used chemical for treating external protozoa and external bacterial infection. For treating fungal infection, external parasite on fish and fish eggs as flush, prolonged or indefinite treatment or fungal control sodium chloride and formalin is an old treatment used by the farmers (Plumb, 1992). Thus, present study was carried out to evaluate impact of aqua drugs and chemicals of Aqua Drug and Disease Information Centre (ADDIC) on the recoveries of fish diseases and total fish production in Sherpur region of Bangladesh

2. Materials and Methods

The present study was carried out in Sherpur sadar and Nalitabari upazillas in Sherpur district from July 2014 to June 2015. Data were collected through questionnaire interview, personal contact, participatory rural appraisal (PRA) and focus group discussion (FGD) with fish farmers association, medicine representative, market survey and retailers of aqua medicine and chemicals. The sample size varied from different target groups such as 12 to 15 farmers, 3 to 4 drug sellers or drug shops and 1 to 2 farmers association from each sampling stations. ADDIC drugs were GR Plus, Active Blue, ID Plus, Aqua c vit, H. vit Plus, Aqua Ox, OTC Power, Para Con, Haspoka killer and Converter. The impact of ADDIC aqua drugs and chemicals on fish health and production was measured through the farmer's and retailer's opinions. Fish production was compared between culture systems using aqua Drugs and chemicals and without chemicals.

The samples were collected from the field level for health check through clinical and histological observations. Fish samples were collected from gill and liver. Sampling was done by a sharp scalpel and forceps and fixed in 10% neutral buffer formalin and kept in transparent plastic vials. Fish samples were processed in an automatic tissue processor (SHANDON, CITADEL 1000), embedded, sectioned using a microtome (LECIA JUNG RM 2035), stained with Haematoxyline and Eosin, mounted with Canada Balsam and the slides were examined under a compound microscope (OLYMPUS, Model CHS, Japan). Then photomicrographs were taken by a photographic camera in Fish Disease Laboratory at BAU, Mymensingh.

3. Results and Discussion

During the present investigation, five categories and 28 pharmaceutical companies were recorded in the Sherpur region. From the research findings of Faruk *et al.* (2008) 33 pharmaceutical companies were found either producing or marketing aqua-drugs in Mymensingh district. Farmers used drugs which were categorized as pond preparatory and water quality maintenance, oxygen supplementary, gas removal, growth promoters, disinfectants, antibiotics and disease treatment. According to Faruk *et al.* (2008) farmers of Mymensingh regions used different types of aqua drugs and chemicals for various purposes like pond preparation, growth promotion, increasing oxygen concentration, disinfection, probiotics and disease treatment. In present study, 49 different types of aqua drugs and chemicals were recorded in the study area. Among those, 16 types of drugs were widely used by the farmers for treatment of different fish diseases such as GR Plus, Active Blue, ID Plus, Geolite, H. vit plus, Aqua c vit, Ossi-c, OTC Power, Captor, Renamycine, Para con, Argulax, Timsen, Haspoka killer, Converter and Rano gard. Ahmed *et al.* (2014) found that farmers in Mymensingh district used 50 different types of aqua-drugs and chemicals on various purposes and among those, 15 types of antibiotics and drugs have been found to be used in this study by the farmers for the treatment of different fish diseases.

3.1. Impact on fish health and disease

In case of inland aquaculture of Sherpur region various types of fish diseases such as EUS, Edwardsiellosis, Dropsy, White spots and Fins and tail rot diseases were detected in Thai koi, Pangus and Shing. From the research findings of Ahmed *et al.* (2014) in Mymensingh region EUS, Dropsy and Edwardsiellosis were observed in Pangus, Koi and Tilapia. From the present study in Sherpur sadar upazilla farmers used GR Plus, Active Blue, ID Plus, Aqua C- Vit and H.vit Plus for the treatment of EUS in Pangus, which had an average of 80- 90% recoveries (Table 1). However, in Nalitabari upazilla farmers used GR Plus, ID Plus, Active Blue with Copper sulphet, H.vit Plus and Aqua C- Vit for the treatment of EUS in Pangus, which had an

average of 85-90% recoveries. According to Rahman (2012) in case of EUS, farmers of Jamalpur used Oxysentin 20%, Aquamycin and Acimox powder and achieved 90% recovery with Tilapia, Rui, Catla and Pangus. In EUS affected Shing and Koi, farmers of both regions used GR Plus, Active Blue with Copper sulphet, H.vit Plus, Aqua C- Vit, and Para Con which had an average recovery of 80-90%. According to Ahmed *et al.* (2014) to treat EUS affected Tilapia farmers of Fulpur upazilla used Renamycin, Polgard Plus and Ossi-c with a result of 80-95% recovery. Rahman (2011) mentioned that EUS affected Tilapia were treated with Renamycin, Polgard plus and Ossi-c and achieved 95% recovery. In the present study, farmers of Sherpur sadar upazilla used GR Plus, Active Blue, OTC Power, Aqua C-Vit and H. vit Plus for the treatment of Edwardsiellosis in Pangus and Koi with a result of 75-80% and 80-85% recoveries, respectively (Table 1). From the research findings of Ahmed *et al.* (2014) in Edwardsiellosis affected Pangus, farmers used Renamycin, Active Blue, Timsen and Ossi-c having 80% recoveries. Whereas, in Nalitabari upazilla, for the treatment of Edwardsiellosis affected Pangus and Koi farmers used GR Plus, ID plus, OTC Power, Aqua C- Vit and H. Vit Plus which had an average 75-80% recoveries. Rahman (2011) mentioned that Edwardsiellosis affected Pangus were treated with Renamycin, Timsen, Polgard Plus and Ossi-c having 80% recovery. For the treatment of Tail and Fin rot, White spot and Dropsy farmers of both upazillas used GR Plus, ID plus, Active Blue with Copper sulphet, OTC Power, Aqua c vit , H. Vit Plus and Para Con which had an average 75-85% recoveries (Table 1). According to Ahmed *et al*. (2014) in Dropsy affected Tilapia farmers of Fulpur upazilla used Aquamycin and Ossi-c with a result of 95% recoveries. In the present study it was observed that various spots on skin pungas and shing and scale dropped in some parts of Koi, farmers of both upazillas used GR Plus, ID plus, Active Blue with Copper sulphet, Lime, Salt, and Para con with a result of 70-80% recoveries (Table 1). From the research findings of Ahmed *et al.* (2014) in spots on pungas skin and Shing and scale dropped in some parts of Koi, farmers used Renamycin, Active Blue, Timsen and Ossi-c having 80% recoveries.

3.2. Histological observations

Photomicrograph of normal liver except showing vacuums (V) necrosis (N) and pyknosis of Thai koi and mild affected liver of Shing having vacuums (V), Ilets of langerhens (IL), tricodinia parasite (Tr) and necrosis (N) found from both upazilas in control ponds (Figures 1A and 1C). Cross section of affected liver of Thai koi having vacuum (V), necrosis (N), pyknotic cell (P) and keryorhexis (Kh) found from both upazilas in treated ponds (Figures 1B and 1D). According to Rahman (2012) liver of fishes were almost normal in control ponds. From the research findings of Ahmed *et al.* (2014) in control ponds section of fish liver were almost normal except some vacuums. Ahmed *et al.* (2014) reported that some important pathological changes such as hemorrhage, necrotic hepatocytes, pyknotic cells and vacuums were recorded in the liver of chemical treated fishes. According to Rahman (2012) liver of chemical treated fish had some important pathological changes such as hemorrhage, necrosis, pyknotic cell and vacuums. Cross section of normal kidney except showing hemorrhage (H) and vacuums (V) of pangus from control pond and normal kidney of Thai koi having hemorrhage (H), vacuums (V) and fat droplets (FD) of both upazilas from control ponds (Figures 2A and 2C). Section of severely affected kidney having hemorrhage (H), vacuum (V), necrosis (N), degenerated kidney tubules (DT) and with bacterial colony (BC) of pangus and affected kidney of Thai koi having hemorrhage (H), necrosis (N), vacuums (V), degenerated kidney tubule (DT) and monogenetic trematods (MT) of both upazilas from treated ponds (Figures 2B and 2D). Ahmed *et al.* (2012) observed that kidney pathology almost normal structure except vacuums in control pond. Khatun (2011) mentioned that kidney pathology of Thai pungas almost normal structure except some vacuums and hemorrhage in control pond. Mondal (2012) reported that *Anabas testudineus* had tubular degeneration, necrosis, hemorrhage, pyknosis and vacuums from fishes of Swopon Fish Farm and in Fishes of BAU Fish Farm, had tubular degeneration, necrosis, hemorrhage and vacuums in treated ponds. Ahmed *et al.* (2009) also observed necrosis, vacuums, hemorrhage and blood cells in kidney tubule of *Anabas testudineus* in treated ponds.

Table 1. Impact of ADDIC aqua drugs and chemicals on fish health and diseases control in both Sherpur sadar and Nalitabari upazila.

Study areas	Species	Diseases	Drugs/chemicals with dose	Recovery (%)
Sherpur Sadar Upazila and Nalitabari Upazila	Thai Koi	EUS	GR Plus 20ml/dec, Active Blue 15ml/dec, ID Plus10ml/dec, Aqua C-Vit 3g/kg feed, H.vit Plus 5ml/kg feed, Para Con 1ml/dec	80-90
		Edwardsiellosis	OTC power 3g/kg feed, GR Plus 20ml/dec, Active Blue15ml/dec, Aqua C-Vit 3g/kg feed, H.vit Plus5ml/kg feed	75-80
		Tail and Fin rot	OTC power 3g/kg feed, GR Plus 20ml/dec, Active Blue Aqua C-Vit 3g/kg feed, ID Plus10ml/dec, Lime 0.5-1 kg/dec, salt 0.5-1 kg/dec	75-80
	Pangus	EUS	GR Plus 20ml/dec, Active Blue 15ml/dec, ID Plus10ml/dec, Aqua C-Vit 3g/kg feed, H.vit Plus 5ml/kg feed, Para Con	85-90
		Dropsy	OTC power 3g/kg feed, GR Plus 20ml/dec, ID Plus10ml/dec, Aqua C-Vit 3g/kg feed, H.vit Plus 5ml/kg feed	80-85
		Edwardsiellosis	OTC power 3g/kg feed, GR Plus 20ml/dec, Active Blue Aqua C-Vit 3g/kg feed, ID Plus10ml/dec, Para Con 1ml/dec, lime 0.5-1 kg/dec, salt 0.5-1 kg/dec.	80-85
	Shing	EUS	GR Plus 20ml/dec, Active Blue 15ml/dec, ID Plus10ml/dec, Aqua C-Vit 3g/kg feed, H.vit Plus 5ml/kg feed, Para Con 1ml/dec Lime 0.5-1 kg/dec, salt 0.5-1 kg/dec	80-85
		White spot	GR Plus 20ml/dec, ID Plus15ml/dec, Para Con 1ml/dec, Active Blue 15ml/dec, Aqua C-Vit 3g/kg feed, H.Vit plus 5ml/kg feed, lime 0.5-1kg/dec, salt 0.5-1kg/dec,	70-75
		Dropsy	OTC power 3g/kg feed, GR Plus 20ml/dec, Active Blue 15ml/dec, Aqua C-Vit 3g/kg feed, H.vit Plus 5ml/kg feed	70-80

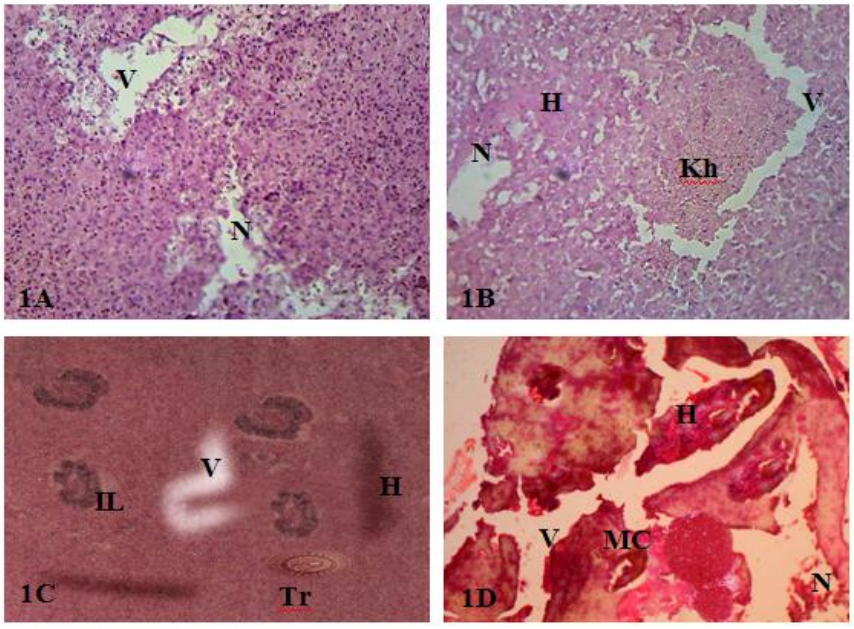

Figure 1. Photomicrograph of normal liver of Thai koi (1A) from a control pond of Sherpur sadar upazila except showing vacuums (V) necrosis (N) and pyknosis (H & E x 125). Cross section of affected liver of Thai koi (1B) from a treated pond of Sherpur sadar upazila having vacuum (V), necrosis (N), pyknotic cell (P) and, keryorhexis (Kh) (H & E x 125). Section of mild affected liver of Shing (1C) from a control pond of Nalitabari having except showing vacuums (V), Ilets of langerhens (IL), Tricodinia parasite (Tr) and necrosis (N) (H & E x 125). Photomicrograph of affected liver of Shing (1D) from a treated pond of Nalitabari upazila having vacuums (V), pyknosis (P) microbial cyst (MC) and necrosis (N) (H & E x 125).

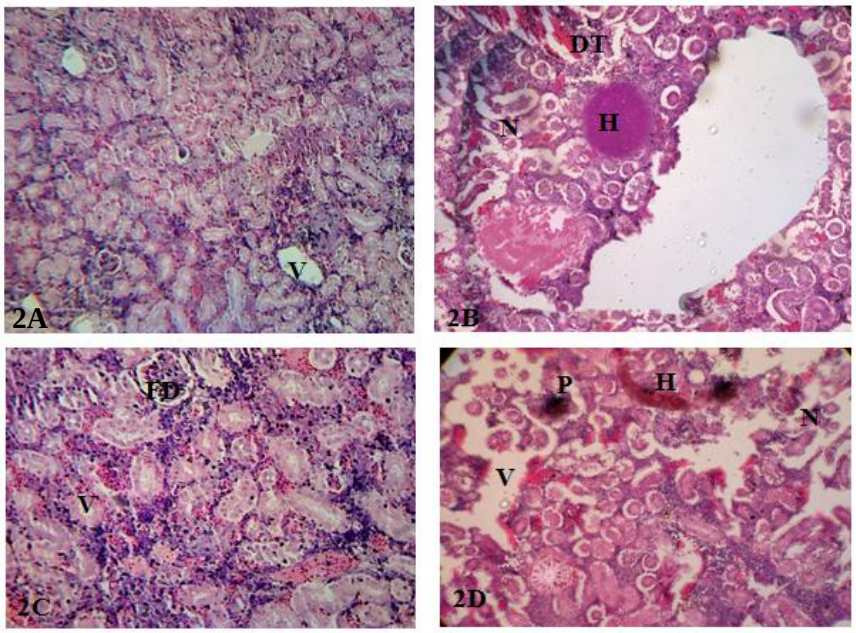

Figure 2. Cross section of normal kidney of pangus (2A) from control pond of Sherpur sadar upazila except showing hemorrhage (H), microbial colonies (MC) and vacuums (V) (H & E x 125). Section of moderately affected kidney of pangus (2B) from a treated pond of Sherpur sadar upazila having hemorrhage (H), vacuum (V), necrosis (N) and degenerated kidney tubules (DT) (H & E x 125). Cross section of normal kidney of Thai koi (2C) from control pond of Nalitabari upazila having hemorrhage (H), vacuums (V) and fat droplets (FD) having (H & E x 125). Section of mild affected kidney of Thai koi (2D) from a treated pond of Nalitabari upazila having hemorrhage (H), necrosis (N), vacuums (V) and degenerated kidney tubule (DT) (H & E x 125).

3.3. Impact on fish production

Koi production in Sherpur sadar upazila was 5000 kg/acre and 10000 kg/acre in control and treated ponds, respectively, and in Nalitabari upazila 6000 kg/acre and 11000 kg/acre in control and treated ponds respectively (Figure 3). Shamsuddin (2012) mentioned that production of Thai pangus and Thai koi in Gouripur and Muktagacha Upazilas were almost double in the chemical treated ponds compared with non-treated ponds. According to the author, production of Thai pangus in BAU experimental ponds was 7328.16 Kg/acre in control ponds and 6400.08 Kg/acre in the treated ponds. Shing production was 4000 kg/acre and 9000 kg/acre in control and treated ponds, respectively in Sherpur sadar upazila (Figure 3). However, in Nalitabari upazila Shing production was 4500 kg/acre and 11000 kg/acre in control and treated ponds, respectively (Figure 3). In Sherpur sadar upazilla Pangus production was 7000 kg/acre in control ponds, whereas, 12000 kg/acre in treated ponds (Figure 3). In Nalitabari upazilla Pangus production was 6500 kg/acre in control ponds, whereas, 13000 kg/acre in treated ponds (Figure 3). From the research findings of Ahmed *et al.* (2012) in farmer's pond, production of Thai pangus in chemical treated ponds was higher 8100 kg/acre than in the non-treated ponds having 4800 kg/acre.

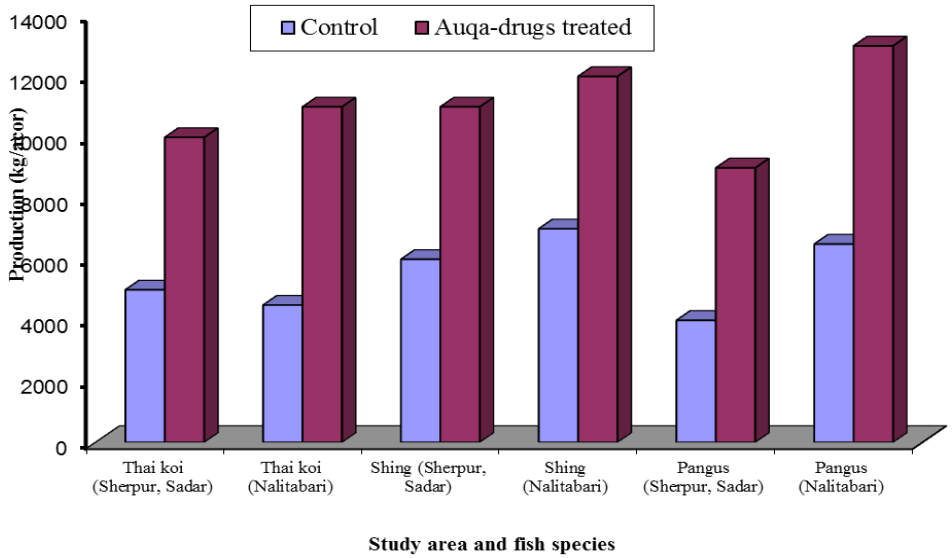

Figure 3. Fish production (kg/acre) in Sherpur district.

4. Conclusions

Forty nine different types of aqua drugs, and chemicals were recorded in the study area, among those, 16 types of drugs mainly ADDIC drugs were widely used by the farmers for different fish disease treatment because they got very satisfactory recoveries. From histologically, liver sections of Thai koi from treated ponds almost normal exhibited vacuums, necrosis, hemorrhage and karyorrhexis. Kidney sections of pangus in both of treated and control ponds were almost normal except some vacuums, necrosis and hemorrhage were found. Total production of Thai koi, Shing and Pangus was 10,000 kg/acre, 10,000 kg/acre and 13,000 kg/acre in drugs treated ponds respectively. However, it was 5,000 kg/acre, 4,500 kg/acre and 6,500 kg/acre in non-treaded ponds, respectively in both upazilas. End of the experiment, the author observed that maximum farmers of Sherpur region used Aqua Drug and Disease Information Centre (ADDIC) drugs and they got good results. Efficacy of drugs of Aqua Drug and Disease Information Centre was excellent. Based on water colour, water quality parameters, growth rate, PER, FCR, SGR, survival rate, and production, positive histopathological observations could be recommended to use (ADDIC) drugs in aquaculture at farmer's level.

Conflict of interest

No one to declare.

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