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Original Article

Determination on efficacy of selected common water quality treatment chemicals and drugs used in Bangladesh

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Keywords

Gift Tilapia, Drugs (Timsen, Geofersh, Geoprime, Geotox), Percent Weight gain, Specific growth rate, Average daily gain, Transparency, Water temperature, pH and Dissolved oxygen, Ammonia-nitrogen, Nitrate-nitrogen, Phosphate-phosphorous, Alkalinity (mgl^{-1}), Histopathology

A B S T R A C T

This experiment "determination on efficacy of common selected water quality treatment drugs and chemicals used in aquaculture in Bangladesh" was conducted for two months in pond at Freshwater Station Mymensingh, BFRI. Experiment was designed into four treatment **(**T_1 -Timsen, T_2 -Geofersh, T_3 -Geoprime, and T_4 –Geotox, Recommended dose of the company was used for treatment), with three replications. This experiment was conducted by using twelve ponds having an area of 40.00 m^2 each & average depth was 1.2 m. Twelve ponds were prepared through liming @ 250 kg/ha after drying of pond. After 5 days of liming each of the following drugs Timsen, Geofresh, Geoprime, Geotox was used for each pond. After 3 days of using drugs fingerlings of Gift Tilapia, (ABW: 6.25 ± 0.27 gm), were stocked in all the ponds with same stocking density of 100 fish/pond. Feeding fingerling was maintained twice daily in the morning & evening with commercial Saudi-Bangla feed at the rate of 10% of the body weight in the first week. For second week daily ration was adjusted at the rate of 5% of the body weight. Data on water quality parameters, survivality, and growth were recorded before and after using of drugs. Essential water quality parameters were recorded weekly and growth, survivality were recorded after ten days interval. Histological studies were done 1 month's interval. It was observed that after using drugs in all treatments the value in case of Timsen pH (8.12±0.58), alkalinity (119.40±9.67), nitrate (0.28±0.04) and phosphate (1.00±0.19), dissolved oxygen (4.56 ± 0.29), were maintained. Ammonia became reduced due to use of drugs. During observation of physical water quality parameters transparency (31.27±3.06) became increased and temperature (28.25±3.38) became lower than control water body. Net production of Gift Tilapia (1955.6 4± 24.28 kg/ha) also provided higher in Timsen treated pond than other treated ponds. Timsen treated pond provided higher tilapia production due to water quality of Timsen treated pond was more optimum than other drugs treated ponds. Histopathological study did not show any negative changes on the organ of fishes. Among all the drug, Timsen was the best in all aspects (improve tilapia fish health and water quality). Other three drugs (Geo-tox, Geo-fresh, and Geo-prime) resulted more or less same result.

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. This sector contributes 4.43% to gross domestic product (GDP), 2.70% of export earning and 58% of the total protein supply in the diet of the people of Bangladesh (DoF, 2011).

Fish culture in Bangladesh is sifting gradually towards commercial practice where stocking densities is increasing and commercial feeds are being used. Management of water quality and maintenance of culture environment is becoming

difficult, and thus the cultured species are becoming more susceptible to diseases. Farmers are now interested to use chemicals in pond to maintain water quality, combat disease and increase production. With the intensification of aquaculture, different farms are trying to introduce chemotherapeutics, feed additives, and growth enhancers etc. in order to increase the production and combat disease outbreaks. Different Pharmaceuticals companies are advocating for their chemicals and biological products as remedy to diseases, water quality treatment and as growth enhancer. Unfortunately, at present there is no complete information on the use of chemicals in aquaculture practices in Bangladesh (Faruk *et al*, 2005). In aquaculture; chemicals are used mainly in the water treatment and prophylaxis of disease problems, which constitute the largest single cause of economic losses. Indiscriminate use of aqua-drugs and chemicals often lead to problems like drug resistance, tissue residues, adverse effect on species biodiversity, etc, which ultimately affect the cultured species, human and environment. Several of these aspects have been well documented (Anderson and Levin, 1999; Tendencia and De la Pena, 2001). On the other hand, in recent time various chemicals/biological products are used in aquaculture as feed additives and water treatment compounds targeted high fish production. However, the increasing use of chemicals in aquaculture has lead to widespread public concern. Moreover water quality treatment drugs led to increase fish production by maintaining water quality but it may have negative impact on fish. The chemicals are different forms of limes, fertilizers, and various commercial forms of growth and water productivity enhancer products. Unfortunately, there is a lack of information regarding the present status and impact of aqua-drugs and chemicals used in Bangladesh in aquaculture industry. The present study have been undertaken to determine the efficacy of common selected water quality treatment drugs and chemicals on aquaculture in Bangladesh. Water quality parameter plays an important role in aquaculture. As fish is a cold blooded animal, its growth, reproduction, maturity, survival and production mostly depend on water temperature. Water quality parameters also influence the growth and reproductive parameters of fish in several ways. Inadequate maintenance of water quality might cause severe problems in their production. Sometimes, lack of maintenance of water quality may cause great loss for the farmer. It also serves as an important technique to increase the fish production by increasing the primary production in the water body. Present aquaculture is dealing with that requires high amount of feed, fertilizers and chemicals which are responsible for water quality deterioration. Therefore, aquaculture requires a regular management of water for maintaining a suitable environment as well as to maximize their production. Water quality i.e. the physico-chemical and biological characteristics of water, plays an important role in plankton productivity as well as the biology of the cultured organisms and finally yields. Water quality determines the species optimal for culture under different environments (Dhawan and Karu, 2002). The physico-chemical attributes of a water body are principle determinants of fish growth rates and development (Jhingran, 1991). Good water quality in fish ponds is essential for survival and adequate growth (Burford, 1997). Water quality also influences the fish health condition. Good water quality is the main manage mental way for keeping disease free environment. Clear water is not always an indication of healthy water. In fact, most pond pollutants are not visible. Testing is the only way to accurately measure and monitor these pollutants. Some important pond water parameters are introduced below:

Ammonia is a toxic chemical byproduct released during the breakdown of protein in uneaten fish food and decaying wastes that is excreted by fish through natural metabolic processes. Nitrite is a toxic byproduct of ammonia and is produced when beneficial bacteria process ammonia.

Nitrate is a chemical compound formed during the final stage of the nitrogen cycle. It is the least toxic nitrogen byproduct, but in large quantities, nitrate is still dangerous to pond inhabitants.

Proper oxygen level is essential for healthy fish. Chronic low oxygen levels can increase fish susceptibility to disease and can also compromise biological filtration.

pH is the negative logarithm of hydrogen ion concentration. It is a measurement of acidity or alkalinity in water. Maintaining stable pH level is vital for fish health. A pH range between 6.5 and 8.5 is ideal for fish. It affects fish's ability to digest and utilize food and adjusts fish diet based on water temperature. Water temperature also influences dissolved oxygen level. Total alkalinity is a measure of dissolved carbonates in the pond. The value should be above 100 mg/l for the healthiest pond. Carbonates are used by both fish and even more importantly, beneficial bacteria, to build cell walls. Ponds with rapidly growing thriving colonies of beneficial bacteria are the cleanest ponds. To maintain water quality parameters to optimum level water quality treatment drugs are used.

The study of impact of common selected water quality treatment drugs (Timsen, Geolite, Geofresh, Geotox) on water quality parameters, fish organ and fish production will provide better knowledge to fish farmer about using of these water drugs and also provide using of water quality treatment drugs is suitable or not, if suitable which is best.

Materials and Method

Description of study area

The present study was conducted in ponds of **Bangladesh Fisheries Research Institute (BFRI),** Mymensingh. We consider this site for suitable fisheries research area in Bangladesh.

Duration

The research was carried out for 60 days (20, April - 20, June, 2012) to find out the determination on efficacy of selected common water quality treatment chemicals and drugs in Aquaculture in Bangladesh.

Description of selected common water quality treatment chemicals and drugs

From literature, many survey, research and conversation with Upazila Fisheries Officers (UFO), Scientific Officers (SO), four common chemicals and drugs were selected for this research. Common water quality treatment chemicals and drugs are:

I. Timsen (Company: EON)

Active ingredients: n-alkyl dimethyl benzo ammonium chloride=40%
Inert- ingredients: Stabilized urea=60%
Pond preparation (Before Stocking) = 100g/acre (Water depth: 3-4 ft)
Culture period (After Stocking) = 60g/acre (Water depth: 3-4 ft) every 3 week interval.

II. Zeoprime (Company: SKF)
Active ingredients**:** SiO_2, Al_2O_3, FeO_3, CaO, MgO, Na_2O, K_2O, TiO_2, MnO_2, P_2O
Pond preparation (Before Stocking) =18-24 kg/acre
Culture period (After Stocking) =60g/acre (Water depth: 3-4 ft) every 3 weeks interval

III. Geotox (Company: Novartis)
Active ingredients**:** SiO_2, Al_2O_3, Fe_2O_3 CaO, MgO,
Pond preparation (Before Stocking) = 20-25 kg/acre (Water depth: 3-6 ft),
Culture period (After Stocking) = 10-20 kg/acre (Water depth: 3-6 ft), every 3 week interval.

IV. Geo-Fresh (Company: Square)
Active ingredients: SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, LoI, K_2O
Pond preparation (Before Stocking) = 24 kg/acre (Water depth: 3-6 ft),
Culture period (After Stocking) = 10 kg/acre (Water depth: 3-6 ft), every 3 weeks interval.

Experiment Design
The results of Timsen, Geoprime**,** Geotox, and Zeofersh on aquaculture activities were tested in the earthen ponds of Bangladesh Fisheries Research Institute (BFRI), Mymensingh from the period of April- May, 2012. Experiment was designed into four treatment **(**T_1-Timsen, T_2-Zeofersh, T_3-Geoprime, and T_4–Geotox, Recommended dose of the company), with three replications. Common chemicals and drugs are used during pond preparation and every 3 weeks interval during culture with recommended dose of company.

Ponds selection
This experiment was conducted by using twelve ponds having an area of 40.00 m^2 each & average depth was 1.2 m.

Ponds preparation
Twelve ponds were prepared through liming @ 250 kg/ha after drying of pond. After 5 days of liming each of the following drugs Timsen, Geofresh, Geoprime, Geotox was used for each pond. The ponds were filled with underground water up to a depth of 1m.

Collection and Selection of fishes for research
GIFT tilapia was collected from BFRI, Mymensingh. After 3 days of using drugs fingerlings of monosrx male tilapia, (ABW: 6.25 ± 0.27 gm), were stocked in all the ponds with same stocking density of 100 fish/pond. Before starting the experiment the fish were acclimatized to the experimental conditions for one week.

Feeding
Feeding of fingerling was maintained twice daily in the morning & evening with commercial Saudi-Bangla feed at the rate of 10% of the body weight in the first week. For second week daily ration was adjusted at the rate of 5% of the body weight. Essential water quality parameters were recorded weekly and growth of fish was recorded after 10 days interval.

Water quality monitoring
Throughout the experimental period, the water quality parameters were recorded weekly. Water quality measurement and sample collection were before and after using of drugs. Transparency (cm), water temperature (^oC), pH and dissolved oxygen (mgl^{-1}), Ammonia-nitrogen (mgl^{-1}), Nitrate-nitrogen (mgl^{-1}), and Phosphate-phosphorous (mgl^{-1}) were measured every week before and after using of drugs.

Methods used for water quality analysis
During the study period, water temperature was recorded with a Celsius thermometer. Transparency was measured with a Secchi disc of 20 cm diameter. pH of the water samples was measured by a direct reading digital pH meter (Jenway, model 3020 CORNING 445 pH meter) and dissolved oxygen was also measured by using a digital DO meter (YSI, model 58) on the spot. The concentration of nitrate-nitrogen (NO_3-N) was determined by HACH kit (DR-2010, a direct reading spectrophotometer) using NitraVer-6 and NitriVer-3 powder pillow. Ammonia-nitrogen was also determined by the HACH kit with Rochelle salt and Nessler reagent. The same HACH kit and Phosver-3 powder pillow was used to determine phosphate-phosphorus (PO_4-P).

Sampling of fishes
Sampling was done after 10 days interval by using a seine net to observe the growth of GIFT Tilapia to adjust the feeding rate. Small and rather inadequate sample 10-15 fish were taken to make some rough assessment of growth trends, even knowing that such samples might not present the actual growth situation. Growth of Gift Tilapia in each sampling was measured by using a digital electronic balance (Denver-XP-3000; precision=0.1 gm). The sampled fish were handled very carefully as the species are very susceptible to handling stress. To determine survival and growth of fish sampling of fish was done after 10 days interval. Sampling was done for 60 days.

Analysis of Physical, chemical and production data
The following equations were used to determine the growth parameters,

a) Weight gain (g) : Weight gain = Mean final weight − Mean initial weight
b) Percent weight gain (%):

$$\%\,\text{Weight gain} = \frac{\text{Mean final Tilapia weight} - \text{Mean initial Tilapia weight}}{\text{Mean initial weight}} \times 100$$

c) Average daily gain (g):

$$\text{ADG(g)} = \frac{\text{Mean final weight} - \text{Mean initial Tilapia weight}}{T_2 - T_1}$$

d) Specific growth rate (% per day)**:**

$$\text{SGR (\% per day)} = \frac{\log_e W_2 \;\; \log_e W_1}{T_2 - T_1} = \times 100$$

Where,
W_1 = Initial live body weight (g) at time T_1 (day)
W_2 = Final live body weight (g) at time T_2 (day)

Harvesting
Fishes were completely harvested on 20, June after 60 days of rearing. Primarily, the partial harvesting of fishes was performed by repeated netting, using a seine net. Final harvesting was done by de-watering the ponds using pump.

During harvesting all fishes of each pond were collected and weighed individually to assess the survival rate and pond production.

Histological procedure

For histopathological study, monthly sample was collected from various organs such as skin, muscle, gill, liver and kidney by a sharp scalpel and forceps. Skin-muscle were collected from the place between anterior part of dorsal fin and lateral line and by removing operculum, gills samples were collected. For liver and kidney, fishes were dissected and then portions of liver and kidney were collected. All collected samples were fixed in 10 % natural buffered formalin. The amount of fixative was 10 times to bulk of tissue fixed. The sizes of the samples were 1 cm^3. The preserved samples were taken out and trimmed by scalpel. Trimmed samples were placed separately in perforated plastic holders and covered by perforated steel covers. Labeling was made with dark pencil (2B) on perforated plastic holders. The samples were then arranged in a steel rack and processed through an automatic tissue processor (SHADON, Citadel 1000) for dehydration, clearing and infiltration. Alcoholic series of higher concentration, Xylene and paraffin (3 series) were used in the processor maintaining at various time schedules as mention below:

Table 1. Time schedule in the automatic tissue processor.

Container	Chemicals	Times (hour)	Process
01	50% Alcohol	1	Dehydration
02	80% Alcohol	2	
03	100% Alcohol	2	
04	100% Alcohol	2	
05	100% Alcohol	2	
06	100% Alcohol	2	
07	100% Alcohol	2	
08	Xylene	2	Clearing
09	Xylene	1	
10	Molten wax	1	Infiltration
11	Molten wax	2	
12	Molten wax	2	

The samples were then embedded with melted wax, steel mold and perforated plastic holder. Proper care was taken for the placement and orientation of skin-muscle and gill in steel molds during the embedding. After embedding, the paraffin blocks were placed on table to become hard. Then the blocks were placed in a deep freeze for half an hour and after that steel molds were separated from the paraffin blocks. Trimming was done from the side and surface of the block by scalpel and a microtome machine (Leica JUNG RM 2035). Embedded blocks were then placed in the deep freeze for 30 minutes before final sectioning. After having sections, the ribbon of sections was placed on a water bath (Electro thermal, paraffin-section, mounting bath) at 40˚ C. A suitable section was selected and separated from ribbon, which was finally picked up over a glass slide. To fix the section, the prepared slide was placed on a hot plate (37˚ C) for overnight. The sections were then cleared with xylene, rehydrated with alcoholic series and stained with haematoxylin and eosin stains proceeding through various chemicals of different concentrations and time schedules as mentioned in Table

Table 2. Staining procedure followed during the experiment.

SL. No.	Process	Solution	Times (min)
01	Clearing	Xylene	2
02		Xylene	2
03	Rehydration	100% alcohol	2
04		100% alcohol	2
05		95% alcohol	2
06		70% alcohol	2
07		Running tap water	2
08	Stain	Haemotoxylene	10
09	Reduce stain	Running tap water	2
10	Counter stain	Eosin	12
11	Dehydration	70% alcohol	3 dips
12		95% alcohol	3 dips
13		100% alcohol	2 dips
14		100% alcohol	2 dips
15	Clearing	Xylene	2
16		Xylene	2

After staining the sections were mounted with Canada balsam and covered by cover slip. The prepared slides were left on clean platform to hold the cover slips permanently and then examined under a compound microscope. Photomicrographs of the stained sections were done by using a photomicroscope. Comparisons of structure and pathology of organs were made among treatments.

Results and Discussion

Table 3. Water quality parameters of three treatments have been presented in the following.

Variables	Drugs							
	Timsen		Geofresh		Geoprime		Geotox	
	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment	Befoe Treatment	After Treatment
Transparency (cm)	28.40±2.16	31.27±3.06	27.73±1.75	29.53±1.88	27.47±2.39	29.20±2.76	28.67±2.23	30.07±2.52
Temperature (°C)	28.41±3.36	28.25±3.38	28.48±2.77	28.38±2.73	27.78±2.09	27.71±2.07	28.29±2.98	28.27±2.96
DO (mg l^{-1})	3.72±0.33	4.56±0.29	3.44±0.28	4.14±0.29	3.30±0.16	4.07±0.17	3.33±0.26	4.06±0.26
pH	6.93±0.25	8.12±0.58	6.62±0.34	7.71±0.31	6.49±0.19	7.64±0.14	6.42±0.17	7.56±0.18
Alkalinity (mg l^{-1})	95.00± 8.84	119.40±9.67	94.07±6.56	115.73±11.13	93.33±8.01	115.3±6.97	92.47±6.32	110.3±9.19
NO_3-N(mg l^{-1})	0.12± 0.05	0.28±0.04	0.11±0.04	0.18±0.03	0.12±0.04	0.19±0.04	0.13±0.05	0.21±0.03
NH_3-N(mg l^{-1})	0.19±0.04	0.01±0.01	0.17±0.04	0.04±0.02	0.19±0.04	0.05±0.03	0.19±0.03	0.06±0.03
PO_4-P(mg l^{-1})	0.61±0.21	1.00±0.19	0.37±0.09	0.58±0.12	0.44±0.10	0.62±0.08	0.44±0.11	0.65±0.13

Table 4 (a). Mean values of water quality parameters (mean ± SD) recorded before using drugs in different treatment for showing level of significance.

Variables	Drugs				Level of significance
	Timsen	Geo-fresh	Geo-prime	Geotox	
Transparency (cm)	28.40±2.16	27.73±1.75	29.20^{b} ± 2.76	27.47±2.39	NS
pH	6.93±0.25	6.62±0.34	6.49±0.19	6.42±0.17	NS
DO (mg l^{-1})	3.72^{a} ± 0.33	3.44^{b} ± 0.28	3.30^{b} ± 0.16	3.30^{b} ± 0.16	*
Temperature (°C)	28.25±3.38	28.38±2.73	27.71±2.07	28.27±2.96	NS
Alkalinity (mg l^{-1})	95.00± 8.84	94.07±6.56	93.33±8.01	92.47±6.32	NS
Nitrate (mg l^{-1})	0.12± 0.05	0.11±0.04	0.12±0.04	0.13±0.05	NS
Ammonia (mg l^{-1})	0.19± 0.04	0.17±0.04	0.19±0.04	0.19±0.03	NS
Phosphate(mg l^{-1})	0.61^{a} ± 0.21	0.37^{b} ± 0.09	0.44^{b}±0.10	0.44^{b} ± 0.11	*

NS= Means are not significantly different (P>0.05)
* Mean values with different superscript letters in the same row indicate significant difference at 5% significance level.

Table 4 (b). Mean values of water quality parameters (mean ± SD) recorded after using drugs in different treatment for showing level of significance.

Variables	Drugs				Level of significance
	Timsen	Geo-fresh	Geo-prime	Geo-tox	
Transparency (cm)	31.27^{a} ± 3.06	29.53^{ab} ± 1.88	29.20^{b} ± 2.76	30.07^{ab} ± 2.52	*
pH	8.12^{a}±0.58	7.71^{b}±0.31	7.64^{b}±0.14	7.56^{b}±0.18	*
DO (mg l^{-1})	4.56^{a} ± 0.29	4.14^{b} ± 0.29	4.07^{b} ± 0.17	4.06^{b} ± 0.26	*
Temperature (°C)	28.25±3.38	28.38±2.73	27.71±2.07	28.27±2.96	NS
Alkalinity (mg l^{-1})	119.40^{a} ± 9.67	115.73^{ab}±11.13	115.33^{ab} ±6.97	110.33^{b} ± 9.19	*
Nitrate (mg l^{-1})	0.28^{a} ± 0.04	0.18^{c} ± 0.03	0.19^{bc} ± 0.04	0.21^{b} ± 0.03	*
Ammonia (mg l^{-1})	0.01^{a} ± 0.01	0.04^{b} ± 0.02	0.05^{b} ± 0.03	0.06^{b} ± 0.03	*
Phosphate (mg l^{-1})	1.00^{a} ± 0.19	0.58^{b} ± 0.12	0.62^{b} ± 0.08	0.65^{b} ± 0.13	*

NS= Means are not significantly different (P>0.05)
* Mean values with different superscript letters in the same row indicate significant difference at 5% significance level.

Water quality parameters

The present investigation showed that fish farmers of different categories used various types of chemicals. Commonly used chemicals found in the present study were lime, salt, oxygen suppliers, disinfectants, growth promoters, antibiotics, pond preparatory, fish poisons, insect killers and microbe's killer. Few previous studies also revealed the similar reports about the use of aqua-drugs and chemicals used in aquaculture of Bangladesh (Brown and Brooks, 2002; Phillips, 1996). There are problems associated with the use of chemicals. With the expansion of aquaculture in Bangladesh, there has been increasing trend in using chemicals in aquatic animal health management. Commonly used chemicals in Bangladesh aquaculture are lime, rotenone, various forms of inorganic and organic fertilizers, phostoxin, salt, dipterex, antimicrobials, potassium permanganate, copper sulphate, formalin, sumithion, melathion etc. (Phillips, 1996; Hasan and Ahmed, 2002; Brown and Brooks, 2002; DoF, 2002 and Faruk *et al.*, 2005). These chemicals and drugs had impact on water quality parameters. The present study determined efficacy of water quality treatment drugs and their impact on water quality parameters.

Physical parameters

This study resulted after using of water quality treatment drugs in pond water transparency became increased. Before using of Timsen and after using Timsen transparency was 28.40±2.16cm and 31.27±3.06cm respectively. Before and after using of Geofresh, Geoprime, and Geotox water transparency was 27.73±1.75cm, 27.47±2.39cm, 28.67±2.23cm and 29.53±1.88cm, 29.20±2.76cm, 30.07±2.52cm respectively. Among Timsen, Geoprime, Geofresh Geotox, Timsen was suitable to increase water transparency. Other three drugs provided more or less same result in case of transparency. Water transparency did not provided that water is more productive way turbid water is not suitable for aquaculture. Water quality treatment drugs increased water transparency which is suitable to aquaculture (Author observation).

After using drugs water temperature became reduced. In case of temperature before and after using of Timsen temperature was 28.41±3.36°C and 28.25±3.38°C respectively. Before and after using of Geofresh, Geoprime, and Geotox water temperature was 28.48 ± 2.77°C, 27.78 ± 2.09°C, 28.29 ± 2.98°C and 28.38 ± 2.73°C 27.71 ± 2.07°C, 28.27 ± 2.96°C respectively. This also provided suitable for fish culture, Swann (2009) described the suitable ranges of water quality parameters for aquaculture water temperature suitable for warm water species would be 24 to 32°C this study agreed to the present study. The author observed that Timsen& other three drugs maintained water temperature is 28.41 ± 3.36 is suitable to fish culture.

Chemical parameters

The present study showed after using of water quality treatment drugs pH, DO, phosphate, Nitrate, became increased, before and after using of Timsen pH was 6.93±0.25 and 8.12±0.58 respectively. Before and after using of Geofresh, Geoprime, and Geotox water pH was 6.62 ± 0.34, 6.49 ± 0.19, 6.42 ± 0.17 and 7.71 ± 0.31, 7.64 ± 0.14, 7.56 ± 0.18 respectively. Before and after using of Timsen DO was 3.72 ± 0.33mg/l and 4.56 ± 0.29 respectively. Before and after using of Timsen DO was 6.93 ± 0.25 and 8.12 ± 0.58 respectively. Before and after using of Geofresh, Geoprime, and Geotox water DO was 3.44 ± 0.28, 3.30 ± 0.16, 3.33 ± 0.26 and 4.14 ± 0.29, 4.07 ± 0.17, 4.06 ± 0.26 respectively. Before and after using of Timsen Total Alkalinity was 95.00 ±

8.84 and 119.40 ± 9.67 respectively. Before and after using of Geofresh, Geoprime, and Geotox water Total Alkalinity was 94.07±6.56, 93.33±8.01, 92.47±6.32 and 115.73±11.13 , 115.33± 6.97, 110.33±9.19 respectively than control water body, which was similar to Swann (2009), he described the suitable ranges of water quality parameters for aquaculture water temperature suitable for warm water species would be 24 to 32°C, dissolved oxygen content of water would be 5 mg/l, P^H would be 6.5 to 9.0, alkalinity would be at least 20 mg/l for recirculation system, nitrite-nitrogen would be 0.03 to 0.06 mg/l and nitrate-nitrogen would be 0.0 to 3.0 mg/l. It was found that ammonia, nitrite, alkalinity, dissolved oxygen, hardness and P^H ranged from 0.7 to 4.0 mg/l, 0 to 0.2 mg/l, 115 to 180 mg/l, 3.0 to 4.0, 100 mg/l and 7.3 to 8.2 during the study period after used of drug. This study agreed to the present research.

Timsen kept ammonia (0.01±0.01) level close to 0.1. Boyd (1998) reported that desired concentration of ammonia in an aquaculture pond should be <0.1 mg/l. He observed that ammonia was toxic to culture animals in the gaseous form and can cause gill irritation and respiratory problems. Hossain (2002) stated that a huge cumulative amount of supplementary feed utilization (57.1 to 134.4 tons/ha/18 months) and high level of both plankton and fish biomass lowered the dissolved oxygen level to 0.7 mg/l but caused no fish mortality and formation of black soil at pond bottom was also minimum. This experiment agreed to Hossian (2002) because using of drugs oxygen level in case of Timsen (4.56±0.29) which is suitable for fish culture. The author observed that using water quality treatment drugs P^H became increased that was similar to Chinabut *et al*. (1992), he stated that quick lime and slaked lime both have a very high pH and in addition to increased alkalinity, can have a sterilizing effect against disease.

The present experiment agreed to Hoq *et al.* (1996), he measured dissolved oxygen from 4.00 to 5.90 mg/L in chemical treated polyculture of Thai pangus with 7.50 months culture period, which is almost similar with the values of present experiment. Authors observed that these drugs was acted as water treatment due to no disease was introduced & drugs containing active ingredients like aluminium sulfate, lime, etc. GESAMP (1997) found that for soil and water treatments, alum (aluminium sulfate) at the rate of 10-20 mg/L, gypsum at concentrations of 250-1000 mg/L, lime at dose of 100-8000 Kg/ha, geolite at a dose of 100-500 Kg/ha. Antibacterial agent, amoxicillin, nitrofuran, macrolides active against gram-positive bacteria. Used of sulphonamides to control diseases such as furunculosis, enteric red mouth disease and vibriosis. The author observed after using of water quality treatment drugs DO, pH, Phosphate, and nitrate became increase and temperature became reduced. Which agreed to Hossain *et al.* (1999), he studied the growth and survival of the Indian major carps and found a negative correlation between temperature and dissolved oxygen, pH and carbon dioxide, dissolved oxygen and free carbon dioxide. In the present experiment. The author was also agreed to DoF (1996), because drugs kept water suitable to aquaculture. In this research using of water quality treatment drugs showed DO level (4.56±0.29) and pH level (8.12±0.58) & DOF reported that dissolved oxygen and P^H of a suitable water body for fish culture would be 5.0 to 8.0 mg/l and 6.5 to 8.5 mg/l respectively. Davis *et al.* (2009) described that feeds used for fish growth had some negative impact on water quality because feeds were also source of pollutant, which ultimately caused water quality deterioration and disease outbreak. This agreed to author due to use of drugs water remained optimum in case of quality. Tamuli and Shanbhogue (1996) reported the efficacy of some commonly available chemicals in the treatment of anchor worm (*Lernaeama elraensis*) infection in India. The authors observed that efficacy of some commonly available chemicals in the treatment of water quality in Bangladesh, among all Timsen was best in case of water quality.

Fish production

To determine efficacy of water quality treatment drugs fish production was considered as indicator of determination of water quality treatment drugs. Four drugs were treated in different fish culture pond to determine efficacy of water quality treatment drugs. Among all water quality treatment drugs Timsen provided best result in fish production. Timsen showed (1955.64±24.28 kg/ha/60 days) as net production which is higher than other drugs.

The present study provided higher fish production in drugs treated ponds where as Khaled and Mamun (1996) achieved production of *tilapia* as 339.39 Kg/ha, 600.00 Kg/ha and 624.24 Kg/ha over a period of three months in three earthen ponds by using two prepared and one commercial diets.

Table 5. Tilapia Production table showing production and survival% of different drugs treated pond.

Treatment	Drugs				Level of significance
	Timsen	Geo-fresh	Geo-prime	Geo-tox	
Harvest no.	85.00±1.73	77.00±2.00	75.67±1.53	79.00± 1.00	NS
% Survival	85.00±1.73	77.00±2.00	75.67±1.53	79.00± 1.00	NS
Total weight (gm)	7728.8^a ±101.61	5860.83^a ±198.48	5668.40^b±257.17	2289.36^a ±319.02	*
% weight gain	1472.80^a ±28.93	1247.84^b ±32.28	1230.40^b±28.14	1215.52^b ± 9.98	*
Specific Growth Rate	0.23^a ±0.01	0.13^b±0.01	0.12^b±0.01	0.12^b ± 0.01	*
Net production (kg/ha	1955.64^a ±24.28	1501.14^b±47.66	1455.12^b±61.94	1500.5^b ± 30.11	*
Gross production (kg/ha	835.38^a ±10.16	648.58^b±19.85	629.34^b±25.72	649.57^b±12.65	*

NS = Means are not significantly different ($P > 0.05$)

* Mean values with different superscript letters in the same row indicate significant difference at 5% significance level.

Hussain *et al*. 2000 found tilapia production 125-140 kg/m^2 in cage system. Nahid, S.A.A *et al*. reported tilapia production 13832kg/ha/ya. Production of Thai pangus in the control pond at BAU pond was higher (7328.16 Kg/acre) than in the treated ponds (6400.08 Kg/acre) which disagrees to this experiment. Whereas, production of Thai koi in the treated pond at BAU pond was higher (1471.92 Kg/acre) than that of control ponds (1296.00 Kg/acre) which agrees to the present study. In the present study survival rate showed 85.00±1.73 which agreed to the present investigation at BAU ponds, survival rate of Thai pangus was recorded 85.67% and 81.67% in treated and control ponds, respectively. Sayeed *et*

al. (2008) also found the survival rates of Thai pangus was 94 to 97% in nine earthen chemicals treated ponds with a period of 11 months which is more or less similar to this experiment. Islam (2009) studied survival rates (%) were 70.4, 80.75, and 72.25% for native koi, Thai koi and other two hybrids respectively. Khan, *et al* 2011 reported that using of water treatment drugs mostly Geoprime is suitable to fish production that's disagrees to the present investigation because this experiment show Timsen is best. Faruk *et al.* (2008) mentioned that Geotox, JV Zeolite, Green Zeolite, Pontox plus, Zeolite, Zeo care, Mega Zeo, Bis Zeolite, Timsen, Bio-Tuff, Well Zeolite and Aqua zet were found in Mymensingh region but Faruk *et al.* (2008) did not mentioned among which was best this research showed Timsen was best for fish culture among Geo fresh, Geoprime, Geotox.

Histopathological study of different organs of Gift Tilapia

To identify effects of drugs and chemicals on different organ of fish liver, gill, muscle & kidney were observed by histological study. Histological study did not show any change of the following organ, so drugs had no negative impact on different organ of fish.

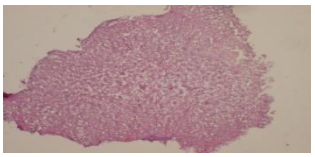

Plate 1Liver

Plates 2 Gill

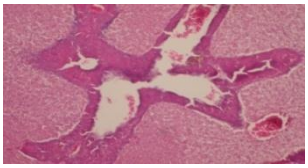

Plate 3 Kidney

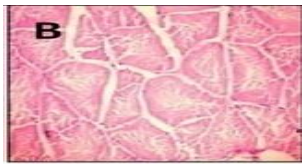

Plate 4 Muscle

Histopathological study was done to know negative impact of water quality treatment drugs on different organ of fishes. In this study water quality treatment dugs did not show any remarkable changes to the different organ (liver, kidney, gill, muscle). Clinically the fishes of treated and control ponds did not show any remarkable changes which is similar to the present research, but another.(Samsuzzaman.*et.al* 2011) disagreed to the author study, he reported histopathologically in the control treatments at both the BAU ponds and farmer's level ponds, skin, muscle, liver, kidney and gill of fish had almost normal structure the present experiment did not show any remarkable change to the different organ of fish, However, in the chemical treated ones, the above mentioned investigated organs of fishes had remarkable pathological changes like necrosis, hemorrhage, vacuum, pyknosis, necrosis, hypertrophy and partial loss of some parts. It was observed that loss of epidermis, necrosis, vacuum, hemorrhage and pyknosis were found in the skin and muscle layer of aqua-drugs and chemical treated fishes which may be occurred other chemicals and drugs except water quality treatment drugs. Some important pathological changes such as hemorrhage, necrotic hepatocytes, pyknotic cells and vacuum were recorded in the liver of chemical treated fishes. Anderson *et al.* (2005) reviewed that malachite green is readily absorbed by fish tissue and is metabolically reduced to leucomalachite green (LMG) which is lipohilic and can be stored in edible fish tissues for extended periods of time.

Ahmed *et al.* (2009) also found similar result for freshwater eel in winter season which was occurred due to antibiotic treatment. This disagreed to the present study. Ahmed *et al.* (2007) found that necrosis, pyknosis, inflammation, hypertrophy, hyperplasia, missing of gill lamellae in the months of December and January in *Anabas testudineus*. The author agreed to Ahmed *et al.* (2007) the author did not found any remarkable changes in the organ of fishes by using water quality treatment drugs and culture period was april to June. Haemopoeitic necrosis, hemorrhages, vacuolation in haemopoeitic cell were common pathological changes in kidney of chemical treated fishes. Ahmed *et al*. (2009) also observed necrosis, vacuums, hemorrhage and blood cells in kidney tubule of *Anabas testudineus* during the month of November. Water quality treatment drugs using in aquaculture did not show any remarkable changes in the different organ of fishes. In case of gills of aqua-drugs and chemical treated fish exhibited pathological changes which include hypertrophy, haemorrhage, missing of secondary gill lamellae and necrosis Ahmed *et al*. (2009).In this study gill had no remarkable change due to treated water quality treatment drugs. Liver had highly necrotic hepatocytes, pyknotic and inflammatory cell during the months of December and January (Roy *et al*. 2006). Hossain *et al*. (2009) reported that severe necrosis of hepatocytes, pyknosis, vacuoles, fat droplets and hemorrhage were observed in small indigenous species during December and January. The author agreed to that research because the present research duration is April to june. Ahmed *et al.* (2007) found that necrosis, pyknosis, inflammation, hypertrophy, hyperplasia, missing of gill lamellae in the months of December and January in *Anabas testudineus*. The author agreed to Ahmed *et al.* (2007) the author did not find any remarkable changes in the organ of fishes by using water quality treatment drugs during the culture of April to June.

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