

Chemicals Used in Freshwater Aquaculture with Special Emphasis to Fish Health Management of Noakhali, Bangladesh

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Abstract: Present study was conducted in fish hatcheries, nurseries and culture farms to find out different chemicals used in freshwater aquaculture activities in Noakhali District, Bangladesh. Data were collected through questionnaire interview, personal contact, market survey and participatory rural appraisal (PRA) like focus group discussion (FGD) with fish hatchery owners, nursery and culture farmers and retailers of aqua medicine and representatives of pharmaceutical companies. Twenty two different chemicals were used for different purposes as artificial breeding, pond preparation, water quality management and fish poisoning, insect killing, disinfectant and fish disease treatment in this region. Lime and Zeolite were used for pond preparation and water quality management. Rotenone, phostoxin tablet, bleaching powder and endrin were used as fish toxicant of which rotenone was widely used (70% of nursery farmers, 80% of grow out farmers). Although endrin and phostoxin were banned fish toxicant but these were frequently used in this region. In addition, sumithion, Malathion, diesel and dipterex were used as insecticides. 53% of the nursery farmers and 43% of grow-out owners used sumithion. Triple super phosphate and urea were the most widely used fertilizers in this region. Formalin, bleaching and EDTA were used as disinfectants of which formalin was the most widely (43% farmers) used disinfectant. Four types of feed additive were frequently used in culture activities. Fish health management and disease treatment were the key areas where majority of different chemicals were used. Farmers used six types of chemicals in disease treatment namely lime, salt, potash, malachite green, copper sulphate and formalin where 30% farmers used potash. Oxytetracycline was the most widely used (47% farmers) antibiotic besides farmers used chlorotetracycline and amoxicillin for disease treatment. The study shows that lack of knowledge regarding use of chemicals, appropriate dose, application method and indiscriminate use of chemicals is the major problems in Noakhali District.

Key words: Antibiotics • Disinfectants • Sumithion and Malathion • Fish Health Management

INTRODUCTION

Aquaculture in Bangladesh is intensifying rapidly through diversification [1, 2] where one of the inputs required for successful fish production is chemicals [3]. The types of chemicals not only include chemotherapeutants rather than pesticides, oxidants, disinfectants, algaecides, herbicides and biocides in general and these compounds are used to prevent and treat disease, control aquatic pests and protect farm

infrastructures from fouling and so on [4]. Chemicals and antibiotics are important components not only in health management of aquatic animals but also for soil and water management, improve aquatic productivity, transportation of live fish, feed formulation, growth promotion and processing and value addition of the final product [3, 4]. A large variety of other chemicals are also used in aquaculture for health management of fish apart from antibiotics. Some common chemicals include sodium chloride, formalin, malachite green, methylene blue,

potassium permanganate, hydrogen peroxide, copper compounds, glutaraldehyde and trifluralin [5]. A range of disease could be found in farmed aquatic animals in Bangladesh [3] and hence farmers are using a range of chemicals and antibiotics for the treatment of diseased fish and other cultured aquatic animals as well as pharmaceutical companies and chemical sellers are influencing fish and prawn farmers to buy their products [3]. Most of the farmers are not aware of knowing the necessity and effectiveness as well as proper dose of these chemicals is frequently ignored. Due to the increasing demand of fishery product in Greater Noakhali region, a lot of hatchery and fish farms are establishing in the region. This is due to the availability of the quality spawn, fries or broodstock of different fish species. As a result, the use of antibiotics and other pesticide, insecticides are increasing day by day.

Considering the above facts the present study was conducted to identify different types of chemicals used in aquaculture activities in Noakhali District with its purpose, methods and dosages of application and assessing their problems upon using.

MATERIALS AND METHODS

Area Covered and Timing of the Survey: The study was conducted in the month of January to July 2010, in some private hatcheries, nurseries and culture farms of Noakhali

Districts (Table 1) and its nearby areas like Sonapur, Chowmuhani, Mannan nagor, Steamer ghat, Thanar hat, Kaderpur and around it (Figure 1). However study also conducted in some aqua drug shop and some medical representative of respective company. The study was in the form of the field survey and was conducted with a view to locate and identify the existing and present application of chemicals or fish poison in hatchery, nursery and fish farms management.

Data were collected through questionnaire interview with hatchery owner, culture farm, chemical seller, medical representative of Pharmaceuticals Company.

During visiting the hatcheries, nurseries and culture pond, the elements that were considered with importance about chemicals and fish toxicants are purpose of use of chemicals or toxicants, variation in methods of application, effectiveness of chemicals or toxicants, side effect of chemicals and toxicants, variation in applied dose of chemicals or toxicants, ban on chemicals or toxicants by the government, price and availability of the chemicals, specific remark and recommendation of the chemicals. Some of information was also found regarding the numbers, areas of the hatcheries and nurseries and use of drug and chemicals from the survey section of Department of Fisheries (DoF) office, Noakhali. Data were collected through semi-structure questionnaire, personal contact, market survey and participatory rural appraisal (PRA) like focus group discussion (FGD).

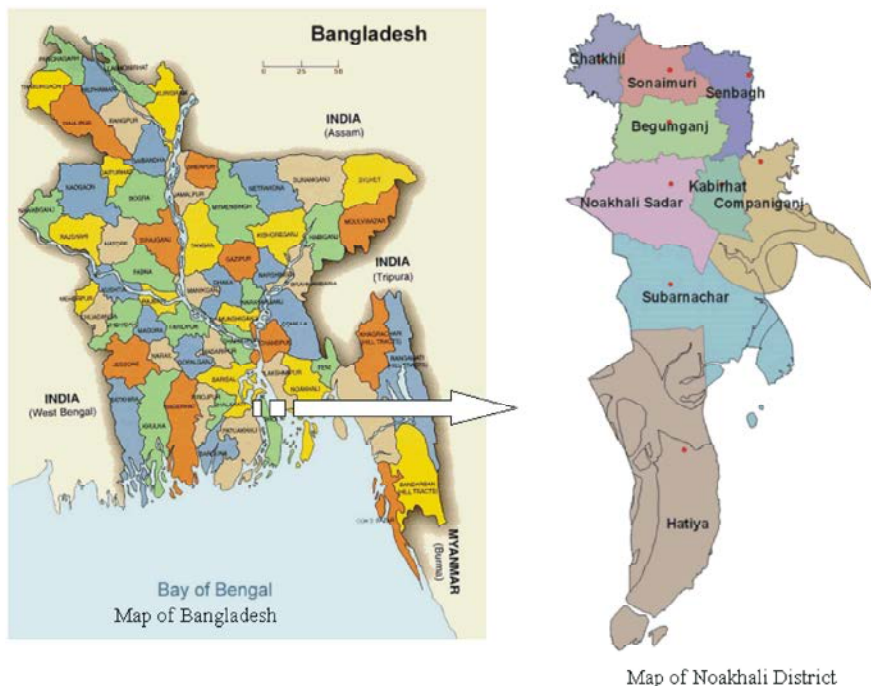


Fig. 1: Map of Study area

Table 1: Some of the major and large scale hatcheries, nurseries and farm; types and position

No.	Name of Farm	Types of Farm	Position of Farm
1	Globe Agrovate LTD.	Hatchery, Nursery and Grow out (white fish)	Steamer ghat
2	Al-Amin Agro Fisheries LTD.	Grow out	Steamer ghat
3	Noakhali White Gold	Hatchery (Prawn)	Sonapur
4	Southern Agro Trades	Nursery and Grow out	Thanar hat
5	Upakul Fresh Water Prawn Hatchery	Hatchery (Prawn)	Sonapur
6	Subarna Agro-based Initiative	Nursery and Grow out	Sonapur
7	Foyez Matsha Hatchery and Fisheries	Hatchery and Grow out.	Dosghoria
8	Bismillah Agro Complex.	Hatchery and Grow out	Sompara
9	Sonaimuri Agro Farm	Hatchery and Grow out	Sonaimuri

Analysis of Data: The data were analyzed using tabular and descriptive statistical techniques. The summary tables were prepared in accordance to the objective of the study. The technique of analysis included the classification of tables into meaningful result by arithmetic mean, percentage and ratios.

RESULTS AND DISCUSSION

The status of different chemicals available in the market and used in Noakhali for aquaculture activities like pond preparation, fish poisoning, insect killing, increasing oxygen concentration, disinfectant, fish disease treatment were collected and compiled in this study (Table 2). Fish disease treatment was the major area where plenty of such compounds were used. The local animal feed and pharmaceutical shops were the main sources of such compounds. 21 types chemical were found to be using in this region.

Observation of Chemicals in the Greater Noakhali Region Used in Different Purposes: Twenty two types of chemicals were found in this region. The present study identified a range of chemicals were used in fresh water aquaculture activities in Noakhali district. For pond preparation and water quality management, farmers used lime, zeolite, fish toxin, insecticides and different fertilizers (Figs. 2-6). Lime was very effective in different purposes such as pH maintain, water color and turbidity maintaining, increase the rate of decomposition and also act as disease treatment. Most of the farmer used lime because of its low price and effectiveness in water quality management and it also acts against different diseases. Sultana [6] observed that, lime is very effective and widely used common chemical in Bangladesh.

From the study, it is found that rotenone; phostoxin, bleaching and endrin were used as fish toxicants in this region. Rotenone was the most widely used fish toxicant in this region. 70% farmers used rotenone in nursery preparation and 80% farmers in culture preparation.

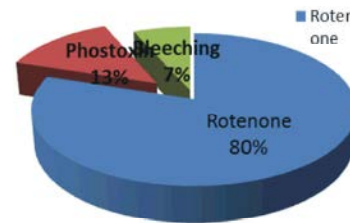


Fig. 2: Different fish toxicants used in culture preparation in Noakhali region

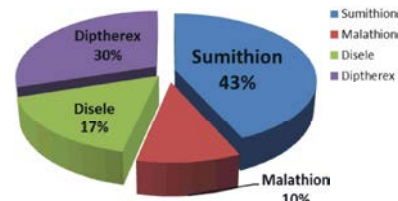


Fig. 3: Different insecticides used in culture preparation in Noakhali region

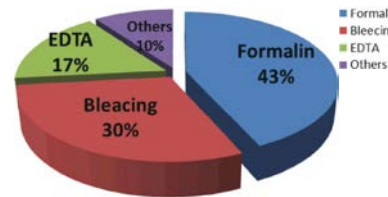


Fig. 4: Different disinfectants used in major farm in Noakhali region

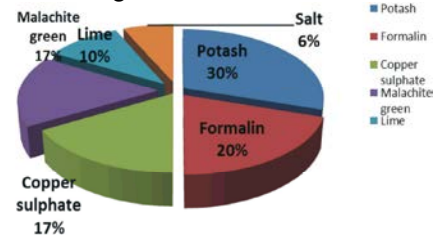


Fig. 5: Different chemicals used in disease treatment in Noakhali District

Rotenone was cheap fish toxicant which was available in this region. Chemicals like Rotenone and Predator were used for controlling unwanted fishes as well as other harmful aquatic animals [3]. Different types of zeolite (JV Zeolite, Mega Zeo Plus, Mega Zeo) were chosen for

Table 2: List of Chemicals with their purpose of use and doses in the study area

No.	Name	Trade name	Chemical formula	Purpose	Dose
1	Lime	<i>Chun</i> / lime /agriculture lime	CaO, hydrated or slaked lime, Ca(OH) ₂ and CaCO ₃	Improve liberation of bases, biological activity, oxygen, decomposition. maintain pH of pond water, remove turbidity	0.5-1 kg /dec
2	Zeolite	JV Zeolite /Mega Zeo Plus /Mega Zeo	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ CaO, MgO, Na ₂ O, K ₂ O	Remove gas. Maintains water color and removes turbidity of water.	200 g /dec
3	Rotenone	Rotenone /aquatin /aqrte-gold	C ₂₃ H ₂₂ O ₆	Fish poison or toxicants	20-35 g /dec in nursery pond and 15-30 g /dec in culture pond
4	Phostoxin	Quickphos /phostoxin tablet	Aluminium phosphide	Fish poison	3-5 tablets /dec
5	Bleaching	Calcium hypochlorite	Ca(ClO) ₂	Toxin, disinfectant and effective against saprolegniasis.	350-400 g /dec as toxicant and 60 g /dec as disinfectant.
6	Endrin	Endrin	C ₁₂ H ₈ Cl ₆ O	Fish poison	50-60 ml /dec
7	Fenithrothion	Sumithion 50ec	Sulfur-by-phosphate O, O-methyl-2-O -(3-methyl-4-nitrophenyl) ester	Insect kill	2-3 ml /dec
8	Malathion	Malathion 70ec	C ₁₀ H ₁₉ O ₆ PS ₂	Pest control	2-3 ml /dec
9	Trichlorfon	Dipterex 80sp	dimethyl-(2, 2, 2-trichloro-1-hydroxyethyl) phosphonate	Insecticide	6-12 ml /dec
10	Fertilizer	TSP, Urea and MP	43-45% P, 40-45% N, 48-62% P	Increased primary productivity	50-70g/dec 100-150g/dec 20-30g/dec.
11	Vitamin and mineral	Aqua Cal C /Aqua C /Aquavit	Vitamin C, Calcium plus /Ultra vita F	Anti-oxidant, developed body growth and weight	0.1-0.3 g /kg feed.
12	Formalin	Formalin	40 % HCHO	Employed as an antifungal agent and in the control of ectoparasites, most often in hatchery systems	1-3 ppm as disinfectants and 3-5 ppm for disease treatment
13	EDTA	Ethylene diamine tetra acetic acid	C ₁₀ H ₁₆ N ₂ O ₈	Widely used to disinfectants of the hatchery equipment and also water treatment	0.1-1 ppm
14	Potassium permanganate	Potash	KmnO ₄	Active against saprolegniasis, dactylogyrosis, gyrodectylosis, Argulosis	5-15 mg/dec
15	Malachite green	Malachite green	C ₂ H ₂ O ₄	Active against the oomycete Saprolegnia, which infects fish eggs in commercial aquaculture.	1-5 mg/dec, 1-2 ppm
16	Copper sulphate	<i>Tut</i> / Copper sulphate	CuSO ₄	Effective against external parasites.	15-25 mg/dec
17	Salt	<i>Lobon</i> / <i>Nun</i> / Salt	NaCl	active against for coastiasis, chilodonelliasis, trichodiniasis, Dactylogyrosis	500-1000 g/dec
18	Hydrogen per oxide	Oxyflow/ Oxymax/ Bio care/ Bio- Ox/ Oxy plus	10% H ₂ O ₂	Oxygen supplier	5-10 g/dec
19	Oxytetracycline	Oxy-dof-f/ Aquamycine/ Renamycin	Oxytetracycline 20%, doxycycline 10%. Oxytetracycline hydrochloride 25%, Oxytetracycline	Effective against a wide range of Gram-negative and Gram-positive bacteria.	2-6 mg /kg feed
20	Amoxicillin	Acimox(vet) Powder/ Renamox 15%-vet/ Ranamox	Amoxicillin Trihydrate	Effective against columnaris, edwardsiellosis and mycobacteriosis.	3-7 mg/kg feed
21	Chlorotetracycline	Captor/ Orgacycline-15%	Chloro-tetracyclin Hcl BP 45, Chlorotetracycline	Effective against <i>Aeromonas</i> , <i>Vibrio</i> spp. in fish	3-7 mg/kg feed.

quick result of water quality maintaining and are being used by large farms in this region. Although removal of ammonia (NH₃), hydrogen sulfide (H₂S), carbon dioxide (CO₂) and nitrite (NO²⁻) are frequently done by zeolite.

It also maintains water color and removes turbidity of water. Geotox, JV Zeolite, Green Zeolite, Pontox plus, Zeolite, Zeocare, Mega Zeo, Bis Zeolite, Bio-Tuff, Well Zeolite, Aquazet are found in Mymensingh region [3].

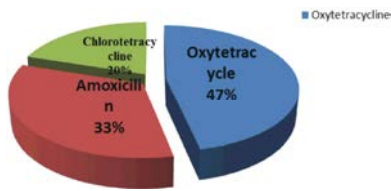


Fig. 6: Different antibiotics used in farm in Noakhali District

In case of insecticide, Sumithion was cheaper than other insecticides. It's also effective against various types of insects which cause serious damage of fries and fingerlings in both nursery and culture pond. As a result 53% and 43% farmers used sumithion in nursery and culture preparation, respectively. Whereas dipterex is used by 27 % and 30 % farmers in nursery and culture preparation, respectively. 7% and 10% of farmers prefer Malathion for nursery and culture preparation.

All the respondents used fertilizers in their ponds and these fertilizers were used for increasing primary productivity which helps to reduce feed cost of farmers. Triple super phosphate whose active ingredient is phosphorus and urea whose active ingredient is nitrogen are the most widely used fertilizers in this region. A study conducted to identify growth and survival of rohu (*Labeo rohita*) spawn and best survival of fry (73.3%) was found from the pond treated with fertilizer urea and triple super phosphate at the rate of 112.5 and 37.5 kg/ha, respectively [3].

During use of different chemicals in aquaculture activities, farmers of Noakhali district usually do not maintain the recommended dose and this feature is more or less common to throughout the country. Sometimes farmers observed that recommended dose is not effective in case of fish poisoning, insect killing and disease treatment. Therefore, they apply higher dose than the recommended dose. This higher dose cannot be tolerated by other organisms which results serious biodiversity loss of aquatic organisms [7, 8, 9]. It also creates an imbalance in the pond ecosystem and increase resistant of different pathogen to these chemicals. Besides effluent of aqua farm is not treated properly and release directly to open water which cause serious problem in open water ecosystem. Application dose also vary from farm to farm because of inappropriate knowledge about chemicals and lack of extension work of respective authority.

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