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Present Status of Good Aquaculture Practices (GAP) in Shrimp Farms of South-Western Coastal Area, Bangladesh

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Abstract: This study was conducted to evaluate the present status of Good Aquaculture Practices (GAP) in shrimp farms (*Ghers*) of Shyamnagar and Kaliganj upazila under Satkhira district, Bangladesh. Data were collected from randomly selected 54 shrimp farmers by personal interviewing with a well structured questionnaire, Focus Group Discussion (FGD) and Crosscheck Interviews (CI) with key informants. In Shyamnagar upazila, 61% shrimp farmers were found to use their land for paddy culture as an alternative purpose and among them 81% treat their land with chemicals before shrimp culture while in Kaliganj upazila, 75% farmers use their land for paddy culture and only 29% treat their land before shrimp culture. Ring toilets were present near 42% and 18% shrimp farms of Shyamnagar and Kaliganj upazila respectively. To control the pest, 35% and 25% shrimp farmers of Shyamnagar and Kaliganj upazila were found to use banned chemicals (Sumithine and Thiodine), respectively. For disease control, 19% and 18% farmers were found to use chemicals (Lime, Sumithine and Thiodine) in Shyamnagar and Kaliganj upazila, respectively. In Shyamnagar, 92% farmers use formulated brand feed (Aqua-P) whereas only 18% farmers use it in Kaliganj. In both Shyamnagar and Kaliganj upazila, farmers do not know the proper way of harvesting, scientific holding system of shrimp and appropriate ration of shrimp and ice for preservation.

Key words: Good Aquaculture Practices (GAP) · Shrimp · HACCP · Bangladesh

INTRODUCTION

Bangladesh is one of the pioneer of frozen sea food exporters country and ship mainly frozen shrimps to mainstream market in USA, EU, Japan, Saudi Arabia, the UAE and Gulf States [1, 2]. Fisheries sector contributed about 2.73% of the total export earning and 22.21% to agricultural sector [3, 4]. Export earnings from fisheries sector have increased from BDT 1283 core in 1995-1996 to BDT 3025.93 core in 2009-2010 [5]. However, the exported shrimp is rejected many times by the importing countries because of high bacterial load, decomposition and due to the presence of filth, unexpected foreign materials as well as pathogenic microbes *(E. coli, Salmonella, V. cholerae* etc). Due to insufficient attention toward standard of hygiene and quality of the product, reasonable numbers of seafood products have gone out of business. As a result, the export of shrimp products has suffered considerable losses in rejection from 1975 to 1978 and the country was placed under automatic detention by United State Food and Drug Authority, USFDA [6]. In October 1979, Bangladesh was black listed along with other countries by USFDA for having the evidence of *Salmonella*, filth, flies, cockroach and other insects in frozen shrimps and frog legs.

After 17 December, 1997 it was mandatory to prepare all the seafood products under the HACCP regulations [7]. But the implementation of HACCP in a processing plant is not only narrative task. Good Manufacturing Practices (GMPs) as well as Good Aquaculture Practices (GAPs) and sanitation are the perquisite for the implementation of HACCP system. Now-a-days, imported countries have developed standard criteria and a full certification system for the shrimp production line from farm to table. In recent times, the GMPs and sanitation procedures of many fish processing plants are excellent,

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hence their product performance (quality) earn a better place in the foreign markets. However, sometimes remarkable contamination in shrimp is found due to improper management in culture stage. That's why Good Aquaculture Practice (GAP) has become a mandatory task for implementation of HACCP system in a better way. Good aquaculture practices (GAP) are a series of considerations, procedures and protocols designed to foster efficient and responsible aquaculture production and expansion and to help in ensuring the final product quality, safety and environmental sustainability [8]. GAP include considerations for: site location; production system design; incoming seed stock; facility bio-security; feeding management, procurement and storage; production techniques to maximize fish health; harvest; and cleaning and sanitation basics to ensure final product quality and safety. Considering those circumstances, the present study was therefore carried out to evaluate the present status of Good Aquaculture Practices (GAP) at culture stage in shrimp ghers of Shyamnagar and Kaliganj upazila in Satkhira district of Bang;adesh.

MATERIALS AND METHODS

The study was carried out in the shrimp farming area of the Kaligonj and Shyamnagar upazila under the district of Satkhira, Bangladesh from February 2011 to July 2011.

Data Collection: Data were collected from 54 randomly selected shrimp farmers. To collect the data, a questionnaire was prepared in accordance with the objectives of the study. Questions related to culture system, prestocking management, stocking management, health management system and other relevant aspects of Good Aquaculture Practices (GAP) were included in the questionaire. Participatory rural appraisal (PRA) tool such as, Focus Group Discussion (FGD) was conducted with shrimp farmers. FGD was used to get an overview of particular issues such as, using of chemicals, using of antibiotics, proper farming management etc. After collecting the data from the farmers, cross-check interviews were conducted with key persons such as, Upazilla fisheires Officer and relevant NGO workers for confirmation of the information.

Data Analysis: All the collected data were summarized and scrutinized carefully and analyzed by MS-Excel and then presented in textual, tabular and graphical forms to understand the present status of Good Aquaculture Practices of the studied area.

RESULTS

Good Practice Status in Site Selection for Shrimp Farming: It was found that most of the shrimp farmers in Satkhira district use their land for paddy culture as an alternative purpose (61% in Shyamnagar and 75% in Kaliganj upazila). During this period, many farmers use various types of chemicals in the land such as pesticides, fertilizers etc. (61% in Shyamnagar and 75% in Kaliganj upazila). In Shyamnagar upazila, 81% farmers treat their land with cow-dung before shrimp culture, while it was only 29% in Kaliganj (Fig. 1).

Good Practice Status in Water Use: In Shyamnagar upazila, 77% shrimp farmers were found to use only river water, 23% farmers use both river and underground tube-well water, 81% farmers treat water by screening. On the other hand, in Kaligonj upazila, 36% farmers use only river water, 21% farmers use only underground tube-well water and 43% farmers use both river and underground water, 68% farmers treat water by screening (Fig. 2).

Good Practice Status in Surrounding Environment and Pest Control of the Farm: In both Shyamnagar and Kaliganj upazila, any polluting agents like industries, poultry farms, dairy farms etc. were not observed near the shrimp farm. In Shyamnagar, 42% shrimp farms were located near the ring toilets which were found within 10 m from the farms, while it was only 18% in Kaliganj upazila. Various types of pests like rats, mongoose, birds, insects etc. were present on the dike of all the shrimp farms in both Shyamnagar and Kaliganj upazila due to the presence of excessive grasses and bushes on the dike. In both Shyamnagar and Kaliganj upazila, 35% and 25% shrimp farmers use many banned chemicals (Sumithine and Thiodine) for pests control respectively. Moreover, 19% and 18 % farmers control these pests by physical methods i.e. using sticks, *fulkuchi*, *kala* (wounding gear) and 46% and and 57% farmers use many unknown pesticides in Shyamnagar and Kaliganj upazila respectively (Fig. 3, 4 and 5).

Good Practice Status in Feed Management: In our country, most of the shrimp farmers are illiterate and they consider only the growth performance of feed other than its quality. Generally they use locally available, low-cost feed. In Shyamnagar, 92% farmers use brand feed with supplementary feed and 8% use only supplementary feed, whereas in Kaliganj, only 18% farmers' use brand feed with supplementary feed and 82% use only supplementary feed (Fig. 6).

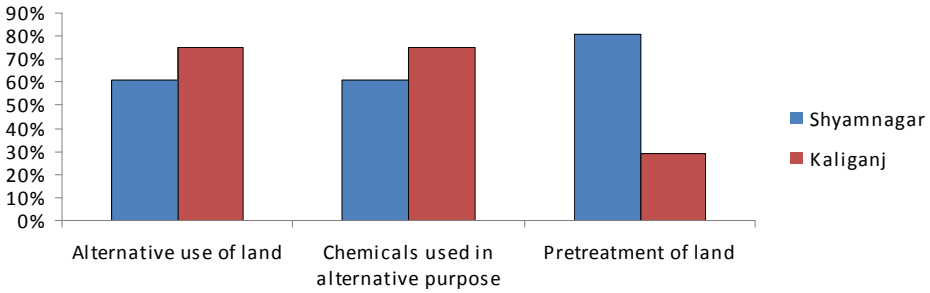

Fig.1: Good practice status in site selection for shrimp farming.

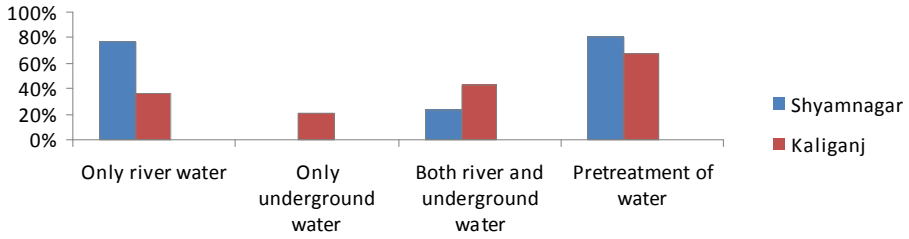

Fig. 2: Good practice status in water use.

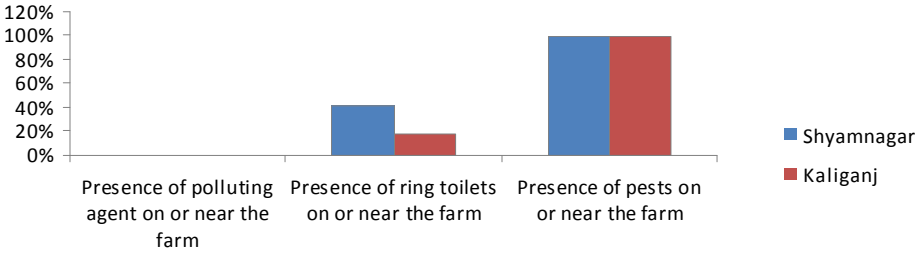

Fig. 3: Good practice status in surrounding environment of the farm.

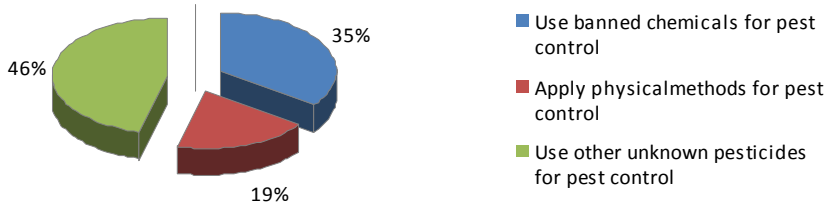

Fig. 4: Pest control system of the farm in Shyamnagar upazila.

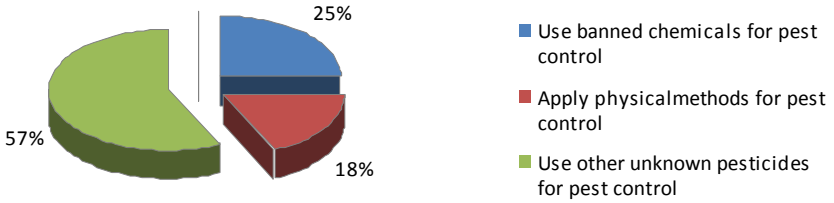

Fig. 5: Pest control system of the farm in Kaliganj upazila.

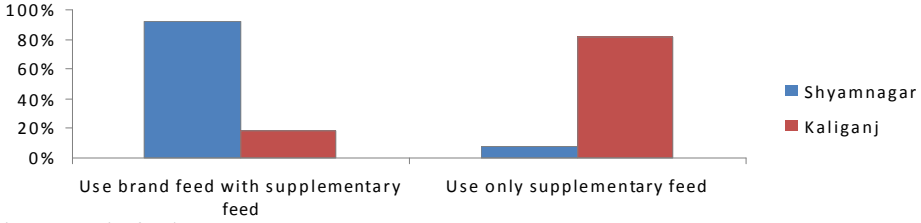

Fig. 6: Good practice status in feed management.

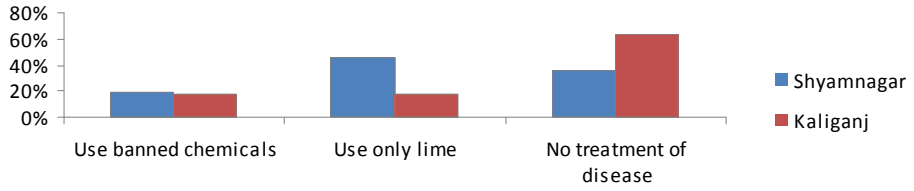

Fig. 7: Good practice status in disease management.

Good Practice Status in Disease Management: Shrimp is very prone to diseases. So, the use of drugs and antibiotics in shrimp farm is very common which has a residual long term effect and is a major cause in creating health hazards of its consumers. In Shyamnagar upazila, 19% shrimp farmers were found to use banned chemicals, 46% farmers use only lime and 35% farmers do not use any chemicals for disease control. On the other hand, in Kaliganj upazila, it was observed that 18% shrimp farmers use banned chemicals, 18% farmers use only lime and 64% farmers do not use any chemicals for disease control (Fig. 7).

Good Practice Status in Harvesting and Post Harvesting Management: Improper way of harvesting and poor post harvesting management is a reason of physical damage as well as quality deterioration of shrimp. In both Kaliganj and Shyamnagar upazila, all the farmers supply their product to nearby depot, not directly to processing industries. After harvesting, it takes about 15 to 20 minutes to reach the depot. During this time interval, the farmers do not preserve their product. So, microbial degradation may occur within this period which accelerates the quality deterioration of shrimp.

DISCUSSION

Due to the unavailability of sufficient land in Shyamnagar and Kaliganj upazila, most of the farmers use their land for alternative purpose (paddy culture). During this period, they use many types of chemicals such as insecticides, fertilizers etc on their land. Alternative approaches of using chemicals in shrimp farm are observed in many Asian countries including Bangladesh [9]. In the study area, many farmers do not treat their land before shrimp culture. So, the residues of these chemicals remaining in the soil have a significant harmful impact on shrimp and its health. Thus, the accumulation of these harmful chemicals in shrimp has some hazardous health risks to it as well as among its consumers.

Water quality as well as water source is considered as a key factor in Good Aquaculture Practices. In case of shrimp culture, certain amount of fecal Coliform bacteria is said to be considered as acceptable level. According to World Health Organization, WHO [10], the number of Coliform bacteria for culture purpose must be less than 1000 per 100 ml of water. In the study area, farmers use river and underground tube well water as the main source of water. Many farmers use water directly from the sources without any primary treatment. If the water is used without primary treatment before using it in shrimp farm then some risks will arise in maintaining the quality of the shrimp due to the presence of various types of pollutants and microbial organism. It was found that many farmers treat the water only by screening it with fine meshed net which is not enough for protecting the culture species from contaminated diseases and heavy metal pollutants.

Surrounding environmental condition of a farm has a crucial role in health management of the culturable species. Due to the presence of excessive grasses and bushes on the dike, various types of pests such as rats, birds, mongoose etc may present on the dyke of shrimp farm which is the source of various microbial contaminations such as *Salmonella, E. coli* etc. That's why significant number of shrimp farmers was found to use banned chemicals and unknown pesticides for the pest control in both Shyamnagar and Kaliganj upazila. Considerable number of shrimp farms in both areas, Shyamnagar and Kaliganj upazila were found to be present near ring toilets (within 10 m) which are very dangerous source of contamination. Because the excreta of warm blooded animals including human being is the principle source of various hazardous intestinal parasites such as Coliform and *Salmonella*. Moreover, presence of any polluting agents such as industries, poultry farms, dairy farms on or near the shrimp farm may have hazardous effects on shrimp quality through the discharged wastage of these.

In Good Aquaculture Practices, the feed quality should be considered as a prime factor for maintaining the product quality. Use of locally available raw feed such as flesh of mussels, fishes and other animals is a dangerous source of contaminants i.e. *Salmonella, E. coli* etc. So, shrimp farmers must have to consider the source and brand of feed and its quality for feed selection.

Table 1: Good practice status in harvesting and post harvesting management

Practices required to follow during harvesting	Percentage of the farm in Shyamnagar	Percentage of the farm in Kaliganj
Time of harvesting- Early in the morning	100%	100%
Stopping of feeding before harvesting	100%	100%
Preservation in ice after harvesting	0%	0%
Using of insulated box during transportation	0%	0%

As shrimp is very prone to disease, the farmer should be careful in diagnosis of disease and its treatment. In Good Aquaculture Practice, the farmers have to consider some issues like allergic reaction, toxicity and withdrawal period of the drug in using them. In Satkhira, most of the shrimp farmers do not use any drug for disease treatment. Most of the farmers cannot diagnose disease properly and apply same treatment for all abnormalities. The farmers who use drugs for disease control do not apply the appropriate drugs for specific diseases and also do not follow the prerequisite conditions in using the drugs. That's why some risks of quality deterioration may arise during evaluation of their product as a sea food.

In Good Aquaculture Practice, there are some guidelines for harvesting and post harvesting handling. At least two days before harvesting, farmers should stop of feeding and harvesting should be done at very early in the morning in cool environment. During harvesting, handling of harvested shrimp should be performed carefully with less possible damages of the product and harvested shrimp must be preserved with ice at 1:1 ratio as early as possible. In Satkhira, all the shrimp farmers harvest their product at early in the morning, they stop feeding 4 to 5 days before harvesting, but they do not preserve the product properly for long time transportation to depot. Freshly caught whole shrimp contain 1.8×10^6 bacteria per gram [11]. If the harvested shrimp is not properly preserved in fresh condition, microbial contamination may increase and product quality may be deteriorate.

Moreover, the farmers do not use appropriate packaging materials for transporting the shrimp and also do not follow the scientific handling system of shrimp during harvesting which may deteriorate product quality (Table 1). Ahmed [12] found the similar causes of quality loss of shrimp in Shyamnagar upazila in Satkhira district. He identified the major causes of quality loss at depot and markets were poor quality non-chlorinated water, non-maintenance of personnel hygiene, poor drainage and sanitation system, unscientific holding system, poor quality of ice and ice shrimp ration, long time transportation in unscientific packet material, defective infrastructure of the market place etc.

CONCLUSIONS

The study was focused on the present situation of Good Aquaculture Practices (GAP) in Satkhira district, which is required to ensure the quality and increase the acceptability of the product to the international markets of shrimp. Competitiveness in food production in the near future will be more dependent on the reliability of the safety and quality of the food and acceptability of production procedures. Therefore, the study will be beneficial for creating awareness among the shrimp farmers to adopt Good Aquaculture Practices in their ghers and thereby protect all types of contamination in shrimp and maintain its quality as a food in the World's international markets. Thus we can be able to recapture our reputation in foreign markets.

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