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Control and Treatment of White Spout (*Ichthyophitirius multifiliis*) in Recirculation System

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Abstract: Fishes are exposed to different diseases infection in extensive farm production. In addition to stress, high density cause to pathogens transfer being easier. In recirculation systems, rainbow trout is maintained with high density and severe parasitic infections are observed such as parasitic ciliates *Ichthyophitirius multifiliis*. Control and treatment of this disease was used as a case study of disease epidemic by secure treatment of the materials (formalin and sodium chloride) in this experiment. The results of current study have shown that individually treatment with formalin and repeated several times, despite had the ability for quick elimination of the disease, had no capabilities to control and prevention of the repeated diseases. But sodium chloride, if it carefully applied, will certainly inhibit the parasites. It seems that after quarantine the best strategy for control and treatment of disease is 4 mg LG^1 sodium chloride

Key words: Recirculation System % *Ichthyophthiriasis multifiliis* % Formalin % Sodium Chloride

INTRODUCTION

The presence of population of fishes in intensive farm production may lead to increase of some parasitic species. The numbers of parasites need to induce harm effects in fishes considerably vary depending on species, size and health of its host [1]. *Ichthyophthiriasis multifiliis* (Ich) is considered as the most pathogenic protozoan parasite of fishes. No reports are available regarding the annual economic losses of Ich, however, it identified as a major problem in aquaculture [2]. Parasites are global expansion and all freshwater fish are sensitive to them. However, environmental factors such as stress, nutritional deficiencies and poor immunity are important in the incidence of Ich. *Ichthyophthiriasis multifiliis* are only known species of ichthyophthiriasis genus which is not specific to the host and all the fish are sensitive to some extent [3]. The ichthyophthiriasis prefer high water temperatures; however, certain breeds of parasites have ability to live with the temperature according to the host. The ideal temperature of cellar ichthyophthiriasis is 7.2 to 10.6 [3]. This parasitize was eliminated from Iranian fish [4]. The sensitive pollution in rainbow trout fishes was found in Firozkoh (Iran) recirculation system [5]. One of the most problems in recirculation system is merge of pools output water together for filtration. This may lead to transferring of pollution from each pool to other one and will be epidemic in whole system. This situation is probably regarding bacteria, virus, fungi and parasitize diseases. In the most recirculation systems due to high water flow volume and cost of permanent sterilization, generally only disinfection of small part of water was done with common treatments. Despite numerous health surveys conducted in the guidelines and diverse health care against Ich such as formaldehyde and formaldehyde-Malachite green, the practical way is not present to control and cure of this disease in these systems. Therefore, in this experiment with the appropriate management the best approach were studied in dealing and complete treatment of this disease.

MATERIALS AND METHODS

Characteristics of the System: The system is located in the city of Hamadan (Iran). The total roofed area of ??2000 m and two pool set 20 pcs (40 pools totally) with a holding capacity of 30 tons of biomass rainbow trout and the incoming water supply from deep wells with a flow rate maximum activity of 24 liters per second. The system is designed in such a way that the output of the water pool was transferred inside the complex network of fine mechanical filter (drum filter) or a 60 micron mesh screen and after physical refining the elimination of solid was out from system and is transferred to a sedimentation pond

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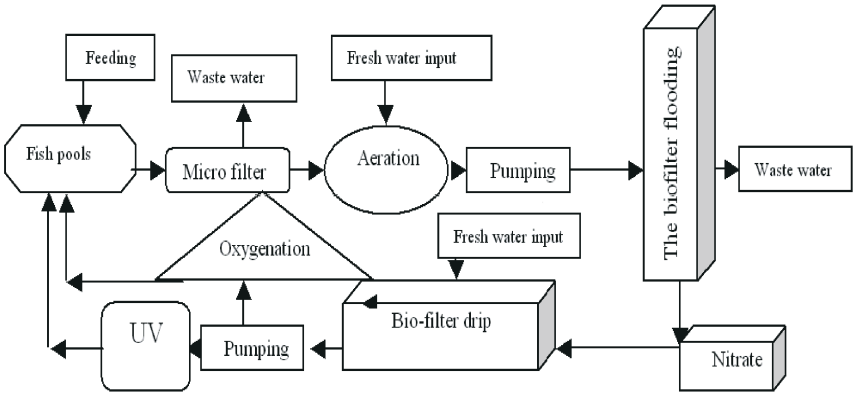

Fig. 1: View of the recirculation system where Ich detection and treatment

that is built outside of the site. Also, the biological treatment process was set in the biofilter and after oxygenation and pass under ultraviolet lamps re-enter to the pools set again. The Figure 1 is shown tested recirculation system.

Identification of Parasites in Recirculation System: The first enough information was gained about sick fish in recirculation system. The collective behavior of the fish was considered in ponds. The accumulation of fish near the inlet water pipe or sucked by water tube collectors, occurrence of fish along with in each edge pool, spring and frictional movement of fish to the pool wall were considered as symptoms of disease conditions and probably parasites in fish. Then after live fishes was used for clinical trials.

The pink clove is used for anesthetize of fishes. In order to detect of parasites the samples were taken from mucus, particles of damaging skin and gills. The freshly prepared samples were examined under a microscope. Adult samples had diameter of about one millimeter and grains was visible with the eyes as a white coating inside the screen. Its shape was spherical or slightly oval. Its entire surface covered with a mass of delicate eyelashes. Mouth was at one side and shrinkage cavities were scattered in the cytoplasm of dark granules. The nucleus was near the center, relatively large and crescent-shaped half. The young parasite had round nucleus.

The Primary Treatment

Formalin: Examined fishes were discontinued fed before individual treatment for 24 hours. Pool water was reduced to the extent possible and by obtaining the amount of water in the pool the formalin was added 0.25 mg LG^{1} and this treatment was continued for 1 h.

Sodium Chloride (NaCl): Estimate the amount of water in circulating Water in ponds, pools, afferent and efferent pipes, exact volume of biofilters water, pool pumps and water storage was calculated as follows:

- 20 pool storage with capacity of 420 m^3
- 3 biofilters flooding with capacity of 243 m^3
- 3 biofilters drip with capacity of 120 m^3
- Water storage pool with capacity of 110 m^3
- Pumping water pools in different parts of farm with capacity of 187 m^3
- Water in pipes the amount of 20 m^3 and total water flow was estimated at 1100 m^3

Estimation and Control of Replacement Water: The replacement water was calculated for 24 hours at this time. To reduce drug concentrations than adding to stabilize the desired amount of the drug dose was required. The performed calculations showed that the replacement water was in 10-20% of total collection were circulated.

The Concentration of Drug: The common salt was used for the treatment of Ich in this experiment. Salt concentration was 4 ppm and was maintain for 5 days. Salt in 50 kg bags were hung from the pools marginal so that the dissolution of salt was created for ponds.

RESULTS

The amount of mortality in the first round of treatment with formalin was very low shown (Figure 2). In spite of constant all medical conditions the mortality rate was 10 times in the next round.

The monitoring of samples was determined according to Figure 2. With the arrival of the warm seasons and higher temperatures the number of pools involved in the

Table 1: The method of salt adding to recirculation system

Treatment day	Drug does	Drug adding time	Time and water replacement amount	Feeding percentage	Salinity measurement
1	1000	20-Aug	0	0	2 times in 14 and 21 hours
2	1000	20-Aug	0	0	2 times in 14 and 21 hours
3	1000	20-Aug	0	0	2 times in 14 and 21 hours
4	1000	20-Aug	0	0	2 times in 14 and 21 hours
5	745	8-12 400 kg 14-20 345 kg	1 hour from 13 to 14	0	2 times in 14 and 21 hours
6	345	14-20	1 hour from 13 to 14	10	2 times in 14 and 21 hours
7	345	14	1 hour from 13 to 14	15	2 times in 14 and 21 hours
8	345	14	1 hour from 13 to 14	20	2 times in 14 and 21 hours
9	345	14	1 hour from 13 to 14	25	2 times in 14 and 21 hours
10	0	0	2 hour from 12 to 14	30	2 times in 14 and 21 hours
11	0	0	2 hour from 12 to 14	40	1 time in 14 hour
12	0	0	2 hour from 12 to 14	50	1 time in 14 hour
13	0	0	2 hour from 12 to 14	70	1 time in 14 hour
14	0	0	2 hour from 12 to 14	80	1 time in 14 hour
15	0	0	2 hour from 12 to 14	90	1 time in 14 hour
16	0	0	2 hour from 12 to 14	100	1 time in 14 hour
Total	6125				

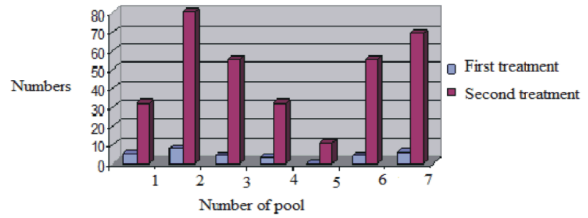

Fig. 2: Mortality rates during the two round treatment with formaline

system has increased. The clinical diagnosis of the disease was initiated in April and the highest rate of infection has been recorded June.

The disease control strategy has been set according to Table 1. Treatment duration was 16 days and food withdrawal was 4 days. Most drugs were obtained on day 5 and their maximum concentrations last for 4 days. The amount of drug was gradually reduced to 16 day so that the salt concentration in water was zero.

DISCUSSION

The establishment of quarantine pools to enter fish was not available at recirculation system. This factor makes susceptible mentioned recirculation system to the disease by the fish from less crowding farm which may never show symptoms of disease. Also, only 1/3 volume of water were exposed to ultraviolet light. Most farms in Iran due to the disproportion between design and long shelf life of these lights or depositing a layer of lime and water even this amount of water as fully and effectively not disinfect [6]. So, it appears to combat with pathogens in these system sit is suitable to create isolated pools, select the desired fish from trusted and verified ponds, control of pools as a daily basis and microscopic assay. In most cases despite consideration the precautions and exercised management, prevention of some agents in other farming systems lead to disease in these extensive system. These systems must be cost effective so fish density is much more than natural environment [1].

The most obvious feature of the fish which can be occurring if treatment was effective was fish behavior. During the second day of treatment, reducing the stress state, less fish jumping and swim mass was observed. Fish were slightly lower than the surface of water and reduces body friction to wall pools. Under the microscope, especially after the seventh day had severely reduced numbers of parasites and no parasites is virtually seen after the tenth day. Several mechanisms have been proposed to treat this infection. Increasing the temperature to 28-30 C° is the solution to remove contamination at least three weeks. But because the rainbow trout cannot tolerate this temperature is not suitable applicable in this system [7]. Also using Acriflavin is administered (1 ppm of water for 10 days), but it was clear that fish does not have the ability to tolerate this drug amount and also in America and most European countries this material is not authorized for food fish usage. Quinine HCl (0.05 ppm) was recommended but due to its poisoning effect to the rainbow trout is not usable in this system. The Malachite Green alone (1 in 666 thousand) or Malachite Green with formaldehyde (5 and 0.04 ppm, respectively) was effective in treating this disease [1]. But because carcinogenesis, mutagenesis and

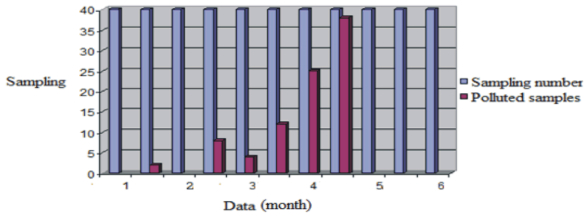

Fig. 3: Effect of initial treatment and trend of increased pollution

toxicity of these drugs [8, 9] and also ban the use of these materials in fish foods it is not recommended. Potassium permanganate (0.25 ppm) [1] only will be able to eliminate young parasites which due to pools of water flow interfere with each other they have virtually have no proper performance.

Despite being satisfied with formalin treatments but due to the incorporation of individual pools water output and also capable of producing cysts by parasites [10] and because of creation a proper environment to set up parasites cyst at the end of pools, this treatment only reduces complications and the number of parasites in pools and after a short time fishes showed dieses symptoms again. All pools with temperature rises in the next months involved with disease the dangerously and deadly contamination (Figure 3).

Basics mechanism of salt is osmotic gradient changes between the parasite and fish. Osmotic gradient was changed by adding salt to the water and direction osmotic flow will change water out the body of parasite [11]. It is reported that the amount of needed salt to combat this parasite is 3 % to a daily hour [1]. Also, it recommended that small salmon fishes (less than 5 g) should not be exposed to higher amounts of 10 parts per thousand salt and salmon less than 100 g aren't exposed to more than 20 parts per thousand salt. The fishes with different weights are always kept in these systems, the proportional should select with the most critical layers (less weight). Also due to the no effects of this drug on subcutaneous forms should fish exposed to the drug solution proportional to the temperature of circulating water in the right time with the birth. It is obvious that because of the stepped enter and exit time of drug therapy it actually takes approximately 15-16 days.

CONCLUSION

Entering of contamination to fish farms could occur by culturing unhealthy and contaminated fish fries, contaminated water and supplies, contaminated water and supplies. Principles of quarantine, preparation the fish from reliable sources and confirmed by veterinary as well as parasitological accurate tests can be a mechanism to prevent entering of infection into the pool. The reduction in fish density and proper nutrition can be useful in this respect. The results of current study have shown that the use of salt can be effective in controlling and treating of disease and preventing the cause of mortality in recirculation farm systems.

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