International Journal of Fisheries and Aquaculture Vol. 4(8), pp. 170-177, September 2012
Available online at http://www.academicjournals.org/IJFA
DOI: 10.5897/IJFA12.007
ISSN 2006-9839 ©2012 Academic Journals

Full Length Research Paper

Evaluation of physicochemical parameters of waste water from rainbow trout fish farms and their impacts on water quality of Koohrang stream – Iran

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Accepted 25 July, 2012

Physicochemical parameters of rainbow trout farm water were evaluated to assess the potential of fish farm effluents on stream water quality. Seven fish farms were selected at Rostamabad region located on 70 km at south-west of Shahrekord-Iran. Water samples were collected from fish farms inlet and outlet at first and second sampling point. Significant differences were observed in some water factors such as total hardness, total dissolved solid, total suspended solid, COD, BOD_5, dissolved oxygen, phosphate, nitrite, nitrate and total ammonia between inlet and outlet water of fish farms where as there were no significant changes in pH, sodium chloride and water temperatures. All of the water factors because of self-purification potential of the stream were in desirable amounts in third sampling point. Feasibility study carried out to assess the distance for making consecutive fish farm along the stream. It was observed that it is possible to make consecutive fish farms at around 1500 m distance but it is depended on stream water discharge and self-purification of the stream.

Key words: Water pollution, trout farm effluents, environmental impact, Koohrang stream.

INTRODUCTION

Nowadays, water pollution from discharging waste water of fish farms is real concern in the world (Boyd, 2003). Changing on river and bank of river ecosystems by effluents of consecutive fish farms is caused to revise on managing of fish farms waste water control (Mumpton and Fishman, 1997). Fish farms could have different types of environmental effects on rivers such as changing on river hydrology, introducing non-native species in natural water and water pollution (Read et al., 2001). In flow-through fish farms system, effluents discharges into the environment with high concentration of nutrients and solid materials. If fish farms effluents discharge into the environment without treatment, it will have undesirable and harmful effects on the environment (Schulz et al., 2003; Miller and Semmens, 2002; Forenshell, 2001). Determination of physicochemical parameter of fish farms effluents and their environmental effects will help fish farmers to manage and develop their waste water systems (Pulatsu et al., 2004).

Generally salmonids fatten by consuming lots of nutrients. Different types of metabolites will release in their body which is known as unpleasant impact on aquatic environments (Papatryphon et al., 2005; True et al., 2004; Bureau and Cho, 1999). Recently, according to sustainable development in fish farming, aquaculture industry is moving toward reducing resources of pollutions by proper managing of fish feeding and waste water treatment. Although competent authorities must

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also have supervision and control on water resources in order to minimize environmental impacts of fish farms (Forenshell, 2001; Read et al., 2001; Midlen and Redding, 1998). Fish farms pollutants are fish metabolic products and fish feces as well as not-used nutrients residue (Kajimura et al., 2004). The amounts of pollutants are related to food chemical composition and its stability as well as fish feeding methods. Fish food ingredient or composition which is precipitated in fish farms can be very broad (Teodorowicz et al., 2006). Some of physicochemical parameters of waste waters which can impact on the aquatic environments are including total suspended solids, total dissolved solids, total hardness, BOD_5, $N\text{-}NO_2$, $N\text{-}NO_3$, $N\text{-}NH_3$ and pH.

It is common to see a certain amount of turbidity in fish farms due to existing suspended clay, soil sediments, artificial and natural sludge coming from constructional activities, mining or separating sediments from fish farms bed. Solids suspended materials cause asphyxia during incubation period on growing eggs. They can also have injure or scratch and cover fish gills physically. There are no standards for suspended solids particles such as volcanic ashes with irregular and sharp edges which potentially can injure fish gills (Wedemeyer, 1996).

Water pH could be affected by the type of water resources, geological conditions as well as aquatic plants. Discharging of acidic and basic waste water and also sewage with different types of minerals can either have effect on water pH. Total hardness and water alkalinity are usually known as touchstone for buffer capacity. Soft and hard waters are usually acidic and basic respectively. Soft water has got low calcium and other minerals, therefore fishes can endure this situation if the amounts of these materials increase in fish diets (Wedemeyer, 1996).

Warm water fishes are able to endure low dissolved oxygen in comparison with cold water fishes (Lawson, 2001). Nitrogenated compounds as well as metabolites which are produced by metabolism in fish body are harmful for aquatic. Total ammonia in water depends on water temperature and salinity. Non-ionic nitrogen compounds are toxic for fishes, although most of excreted nitrogen compounds from metabolism in fish body are in shape of ammonia. High amount of ammonia in water causes different problems in fishes such as toxicity which is harmful to the gills and blood hemoglobin. It reduces capability of blood for transferring oxygen as well as increasing oxygen demand in fish tissues (Lloyd and Orr, 1969). Nitrite is a toxic nitrogenated compound accumulated in anaerobic sludge which is able to combine with hemoglobin to form methemoglobinemia. This compound cannot carry oxygen, thus fishes will suffer from anoxia. Nitrate has less toxicity in comparison with other inorganic nitrogenated compound with LC50, 1000 – 3000 mg/L in 96 h (Forenshell, 2001). Phosphate is found in different shapes of water and waste water. Main sources of phosphate are detergents, fertilizers and industrial sewages which are harmful for fish's life.

Objectives of the study are (1) to monitor water quality through determination of total suspended solids, total dissolved solids, total hardness, total phosphate, NaCl, COD, BOD_5, $N\text{-}NO_2$, $N\text{-}NO_3$, $N\text{-}NH_3$, electrical conductivity and pH and (2) to assess required distance between two consecutive fish farms along the stream. In this study, it will be shown whether the self-purification potential of stream could have effect on improvement of physicochemical properties of the water in stream at a distance of 1,500 m far from trout farms. Therefore it will be investigated if the self-purification of stream allows reusing water for aquaculture.

MATERIALS AND METHODS

Study area

The study area where is known to be Rostam Abad is located on distance of 70 km at south-west of Shahrekord-Iran. There are seven trout farms in this region. The water supply of the farms is a mountain spring which is called Sardab Rostamabad spring with average discharge of 1500-2000 L/s. Fish farm effluents discharge into Koohrang stream, which is one of the branches of Karoon River (the biggest river in west of Iran). The annual production of these farms is almost 700 tons. Figure 1 shows three stations as sampling points where called; S-1(farms inlet), S-2 (farms outlet) and S-3 (1500 m far from the farms outlets along the Koohrang stream). The times of samplings were at 10 am before fish feeding in the morning at three sampling points. Daily diets data was also recorded during sampling.

Sampling and water sample analysis

Water samples were collected from seven rainbow trout farms from July to December 2009 (summer and autumn). Water samples were kept in plastic and glass screw capped bottles. Glass bottles were used to determine dissolved oxygen (DO). The water samples in plastic bottles used for determination of twelve physicochemical parameters of water samples such as total suspended solids, total dissolved solids, total hardness, total phosphate, NaCl, COD, BOD_5, $N\text{-}NO_2$, $N\text{-}NO_3$, $N\text{-}NH_3$, electrical conductivity and pH which were determined by classic and new methods. Labeled bottles after sampling were transferred to the laboratory within 1-2 h. Testo$^{(R)}$ 240 – Germany, a portable measuring instrument, was used to measure temperature, electrical conductivity (EC) and the amount of sodium chloride. Water pH was measured by using portable pH meter (HACH-EC30, USA). The rest of the water factors were determined by classical methods. Total hardness (TH) was measured by ASTM-2340C method (EDTA titration method). ASTM – D5907 method was used to determine total dissolved solid (TDS) and total suspended solid (TSS). ASTM WK4052 method was used to determine total phosphate. COD and BOD_5 were determined by ASTM D1252-06 and ASTM D6238-98(2003) respectively. Nitrite and nitrate were measured by ASTM D3867-09 method and ammonia by ASTM D1426-08 method.

Statistical analysis

All data were expressed as mean ± SD and means between different months compared with statistical tests

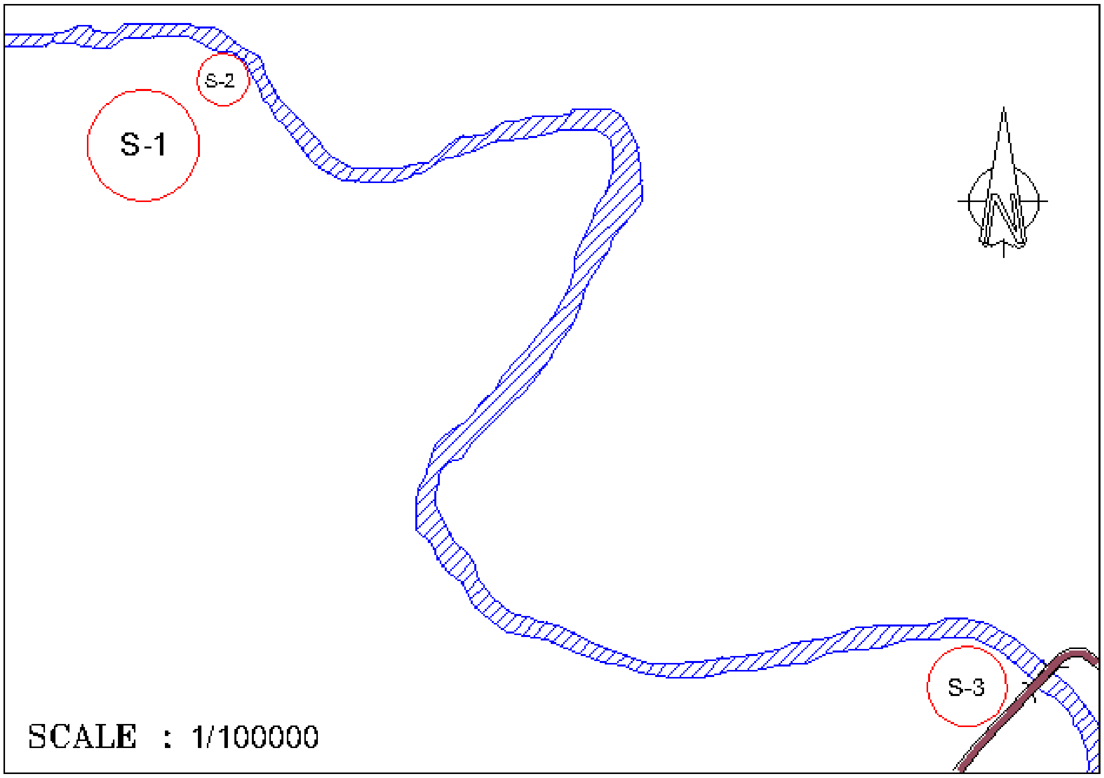

Figure 1. The location of sampling points at different stations along Koohrang stream-Iran.

(One Way ANOVA) analysis and Duncan's multiple at 95% confidence interval. Also SPSS software (version 19) was used for statistical analysis.

RESULTS AND DISCUSSION

Physicochemical parameters of water samples are given in Tables 1, 2 and 3. Physicochemical parameters of water inlets and outlets of seven fish farms were shown in Tables 1 and 2 respectively. Table 3 shows physico-chemical factors of water from the last sampling point where located at 1500 m far from the fish farm waste water discharge in Koohrang stream.

It was observed that there is no significant difference in electrical conductivity of the water inlet and outlet of fish farm (Tables 1 and 2). However there is a significant difference in water EC at third sampling point (Table 3). It is due to higher salinity, hardness, total dissolved solid, stream bed and the corrosion on stream bed. Significant difference was observed in third sampling point for sodium chloride which was more than others. It is due to the source of this compound in stream bed which could affect on water EC. A same trend was observed for total dissolved solid and total solid. It is due to presence of some metal carbonate, bicarbonate, sulfate and etc. Fish foods also have effect on TDS between inlet and outlet water, however it is not that significant because samplings were done before fish feeding.

Tables 1, 2 and 3 show the water pH which is almost same in all water samples in 3 sampling points at different sampling time. The impact of trout farm effluents on the pH of the receiving water was not significant. Water pH is affected by rainfall, snow melting and stream bed and sediments. Water hardness and alkalinity play a main roll to prohibit changes in water pH (Stoskopf, 1992). Water pH at range 6.5 – 9 is suitable for fish farming. If pH ranges were between 4 – 6 or 9 – 10, although fishes will be alive but fish growth rate will be reduced. Regeneration will also decrease if the water pH becomes less than 6. Fish mortality will start in pH less than 4 (acidic) or more than 11 (basic) in fish farms (Lawson, 2001).

Significant differences were shown between dissolved oxygen (DO) in inlet and outlet waters. Reduction of DO level, because of consumption of oxygen in trout farms, was found statistically significant. Fish biomass increases the level of excretory products of fish lead to a decrease in effluent DO level and an increase in BOD5, COD, and total nitrogen in the effluent (Maillard et al., 2005). There was a remarkable difference in DO between the third sampling point compared with inlet and outlet water (Figure 2). It was significantly higher than DO in inlet and effluent waters. However increase in third station is probably due to high river flows.

There is a direct relationship between stream water

Table 1. Comparison of all parameters (means±SD) of fish farm's inflows in the different months.

Month / Parameter	July	August	September	October	November	December
Temp (°C)	9.43± 0.59^{B}	10.33± 0.31^{C}	9.29± 0.27^{AB}	9.29± 0.27^{AB}	9.00± 0.0^{A}	9.00± 0.0^{A}
pH	7.96 ± 0.08^{A}	7.99± 0.13^{A}	7.96 ± 0.17^{A}	8.10 ± 0.37^{A}	8.09 ± 0.07^{A}	8.08 ± 0.08^{A}
NaCl (mg/L)	137.21± 52.09^{A}	150.91± 88.34^{A}	189.57± 119.27^{A}	147.86± 5.49^{A}	154.40± 39.53^{A}	158.43± 36.59^{A}
EC(µs/cm)	288.57 ± 106.29^{A}	314.57± 71.63^{A}	392 ± 241.65^{A}	307.86 ± 12.06^{A}	321.86 ± 80.35^{A}	330 ± 74.36^{A}
TDS(mg/L)	163.57 ±52.19^{A}	174.43 ±40.71^{A}	222.29 ±117.86^{A}	173.29 ±11.07^{A}	184.81 ±53.05^{A}	172.57 ±39.54^{A}
TSS(mg/L)	28.29 ± 14.80^{A}	15.29 ± 8.22^{B}	13.00 ± 4.90^{B}	13.14 ± 3.19^{B}	12.57 ± 3.69^{B}	10.14 ± 1.35^{B}
TS(mg/L)	191 ±52.07^{A}	189.71 ±47.55^{A}	233.86 ± 117.18^{A}	186.43 ±10.01^{A}	197.39±58.54^{A}	182.71± 40.39^{A}
TH(mg/L)	145.43±11.65^{D}	193.14±18.51^{BC}	244.29±20.77^{ABC}	230 ±39.16^{A}	191.29±17.51^{C}	226.86±17.04^{AB}
DO(mg/L)	8.33± 1.01^{A}	8.97± 0.52^{A}	8.56± 0.32^{A}	8.61± 0.50^{A}	8.72± 0.28^{A}	8.17± 0.30^{A}
BOD_5(mg/L)	3.64 ± 3.20^{A}	1.86±0.63^{AB}	1.64± 0.48^{AB}	2.21 ±0.95^{AB}	1.50 ±0.41^{AB}	1.30± 0.48^{B}
COD(mg/L)	25.14±13.38^{A}	10.29 ± 3.04^{B}	10.86 ± 5.87^{AB}	23.66 ± 11.55^{AB}	20 ± 3.83^{AB}	19.26 ± 11.44^{AB}
NH4(mg/L)	0.24± 0.17^{A}	0.17± 0.17^{A}	0.14± 0.18^{A}	0.05± 0.06^{A}	0.09± 0.06^{A}	0.04± 0.04^{A}
N-NO_2(mg/L)	0.02± 0.01^{A}	0.01± 0.01^{B}	0.01± 0.01^{B}	0.01± 0.01^{B}	0.01± 0.01^{B}	0.01± 0.01^{B}
N-NO_3(mg/L)	50.90± 1.50^{B}	2.51±1.23^{B}	1.61±0.80^{B}	5.06±1.46^{B}	6.37±3.79^{B}	14.57±10.18^{A}
PO_4(mg/L)	0.24±0.14^{A}	0.16±0.08^{ABC}	0.21±0.10^{AB}	0.10±0.05^{BC}	0.06±0.05^{C}	0.06±0.04^{C}

*Means within rows with different superscript letters are significant statistical difference (P≤0/01).

Table 2. Comparison of all parameters (means±SD) in outflow of fish farms in the different months.

Month / Parameter	July	August	September	October	November	December
Temp (°C)	10.77± 1.22^{B}	12.33± 1.07^{C}	10.00± 0.50^{AB}	9.29± 0.27^{AB}	9.50± 0.00^{A}	9.50± 0.00^{A}
pH	7.81± 0.11^{A}	7.70± 0.22^{A}	7.82± 0.26^{A}	8.10 ± 0.37^{A}	7.87± 0.14^{A}	7.81± 0.04^{A}
NaCl (mg/L)	139.22 ±52.94^{A}	157.50 ±42.03^{A}	172.14 ±51.53^{A}	147.86± 5.49^{A}	161.47 ±44.78^{A}	165 ±45.03^{A}
EC(µs/cm)	292.57 ± 108.30^{A}	311.29 ± 94.21^{A}	348.43 ± 108.85^{A}	307.86 ± 12.06^{A}	336 ± 91.29^{A}	343.71 ± 91.71^{A}
TDS(mg/L)	163.43 ± 43.91^{A}	181.43 ± 48.83^{A}	203.43 ± 44.21^{A}	173.29 ±11.07^{A}	203.14 ± 57.49^{A}	200.86 ± 55.92^{A}
TSS(mg/L)	28.86 ±16.32^{A}	22.71 ± 12.58^{A}	27.29 ± 11.57^{A}	13.14 ± 3.19^{B}	23.57 ± 6.55^{A}	22.86 ± 6.18^{A}
TS(mg/L)	192.29±50.81^{A}	204.14±59.92^{A}	230.71±52.13^{A}	186.43 ±10.01^{A}	226.71±61.60^{A}	223.71±58.80^{A}
TH(mg/L)	167.43± 18.61^{A}	216.76± 27.20^{A}	246.29 ± 24.78^{A}	230 ±39.16^{A}	210.14 ±22.21^{A}	241.14 ±21.41^{A}
DO(mg/L)	7.06^{A}±1.37	7.06^{A}±0.78	7.27^{A}±0.35	8.61± 0.50^{A}	7.76^{A}±1.19	6.90 ± 0.58^{A}
BOD_5(mg/L)	6.64±4.10^{A}	5.36±3.28^{AB}	5.50± 1.66^{B}	2.21 ±0.95^{AB}	2.86±0.63^{B}	2.63± 0.97^{B}
COD(mg/L)	47.20± 21.50^{A}	28.70± 15.50^{AB}	22.86± 7.80^{B}	23.66 ± 11.55^{AB}	37.14± 3.24^{AB}	35± 16.94^{AB}
NH_4(mg/L)	0.58± 0.33^{A}	0.31± 0.31^{A}	0.32± 0.17^{A}	0.05± 0.06^{A}	0.22± 0.13^{A}	0.25± 0.26^{A}
N-NO_2(mg/L)	0.06± 0.06^{A}	0.04± 0.06^{A}	0.02± 0.04^{A}	0.01± 0.01^{B}	0.01± 0.01^{A}	0.03^{A}±0.02
N-NO_3(mg/L)	4.76± 2.03^{C}	6.76± 3.52^{BC}	6.14± 3.36^{BC}	5.06±1.46^{B}	10.20 ±50.08^{BC}	20.31± 12.23^{A}
PO_4(mg/L)	0.14^{A}±0.31	0.20± 0.09^{AB}	0.24± 0.15^{AB}	0.10±0.05^{BC}	0.15± 0.10^{AB}	0.14± 0.03^{B}

*Means within rows with different superscript letters are significant statistical difference (P≤ 0/01).

discharge and total dissolved solid. Rainbow trout fishes are able to adjust themselves to 30 g/L salinity, but the highest amount of salinity which is suitable for non euryhaline fishes are 10 g/L. They are able to endure the osmotic pressure (Wedemeyer, 1996). Total suspended solid in effluent water was more than inlet water due to colloid particles, organometallic compounds, natural sludge, fish feces and left over foods. This causes to increase turbidity too. TSS more than 80 - 100 mg/L will cause injure fish gills (Teodorowicz et al., 2006). TSS, in all water samples, was less than 35 mg/L which does not have undesirable effect on fish farming. It was found that TSS in third sampling points has significant fluctuation (Figure 3). It was increased because of amounts of foods used in these months and changes in water discharge of the stream which is decreased in cold season. Stewart et al. (2006) treated waste water of rainbow trout fish farms by using artificial substrates for coagulation and baffled sedimentation basin simultaneously for TSS treatment. They reported that using these two techniques is useful

Table 3. Comparisons of all parameters at third sampling point (1500 m after waste water discharge of fish farms along the stream) in different months.

Month / Parameter	July	August	September	October	November	December
Temp (°C)	18.5	18.5	14	14	10	9.5
pH	8.35	8.25	8.20	8.22	8.14	6.55
NaCl (mg/L)	238	235	280	260	299	301
EC(µs/cm)	492	487	577	531	614	616
TDS(mg/L)	350	345	303	203	420	388
TSS(mg/L)	21	23	12	35	24	36
TS(mg/L)	371	371	315	238	444	424
TH(mg/L)	206	209	190	230	250	260
DO(mg/L)	10.6	10.1	7	8.5	9.8	8.76
BOD_5(mg/L)	4	4	4	4.8	3	3
COD(mg/L)	8	7	22	58	40	40
NH_4(mg/L)	0.15	0.14	0.10	0.15	0.03	0.11
N-NO_2(mg/L)	0.001	0.002	0.001	0.013	0.006	0.004
N-NO_3(mg/L)	4	4	7.7	11.5	10	24
PO_4(mg/L)	0.1	0.1	0.1	0.15	0.09	0.05

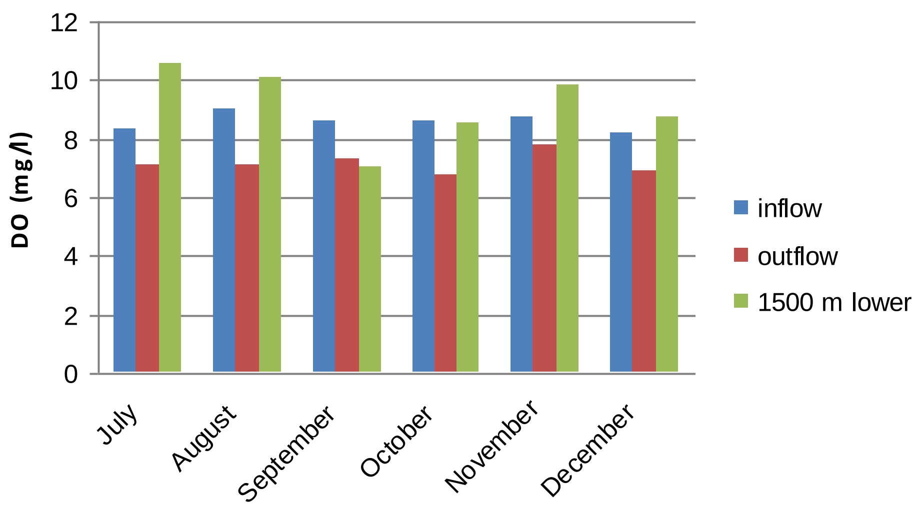

Figure 2. Change of dissolved oxygen in three sampling points; farms inflow, farms outflow and 1500 m far from the farms outflow along the Koohrang stream.

for TSS treatment.

Total hardness in effluent water was more than inlet water and in the third sampling point was more than inlet and outlet waters (Tables 1, 2 and 3). The minimum amount of hardness which is proper for fish growing in fish farming is 100 mg/L (Stoskopf, 1992). Hard waters is better than other types of water for trout farming because it can provide required calcium for fish growing. It also reduces required energy to regulate osmotic pressure for substitution of blood electrolytes (Wedemeyer, 1996). In fresh water, with hardness of more than 200 mg/L, fishes use methabolic energy to regulate osmotic pressure whereas in soft water with hardness of less than 30 mg/L, this energy is used for fish growing (Stoskopf, 1992).

According to the sampling time that was from summer to autumn, water temperature was gradually reduced. It has effect on water physicochemical factors and it is very important aspect in fish farming. Higher feeding rates increase the output of organic matter from farms either as left over food or feces and result in marked elevation in the BOD of receiving water (Miller and Semmens, 2002). BOD_5 in effluent water were more than inlet water, other researchers have also confirmed that the impact of trout farm effluents on the BOD_5 of the receiving water

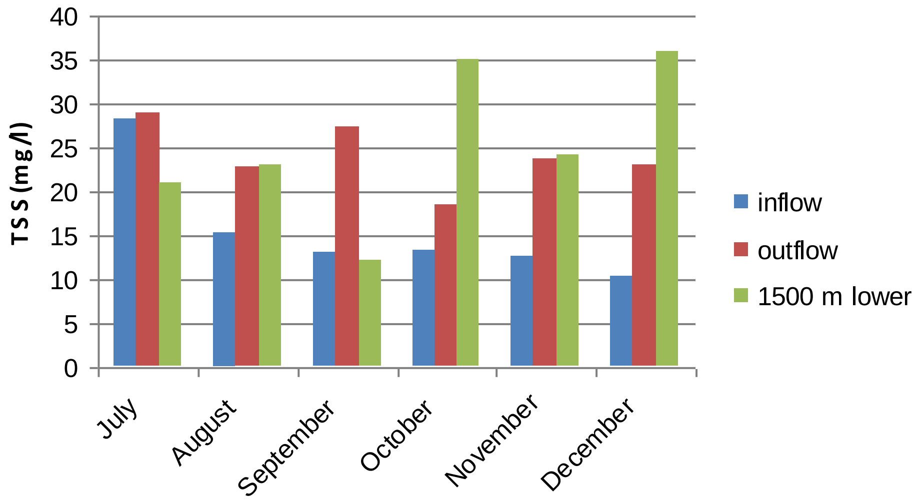

Figure 3. Total suspended solids in three sampling points: farms inflow, farms outflow and 1500 m far from the farms outflow along the Koohrang stream.

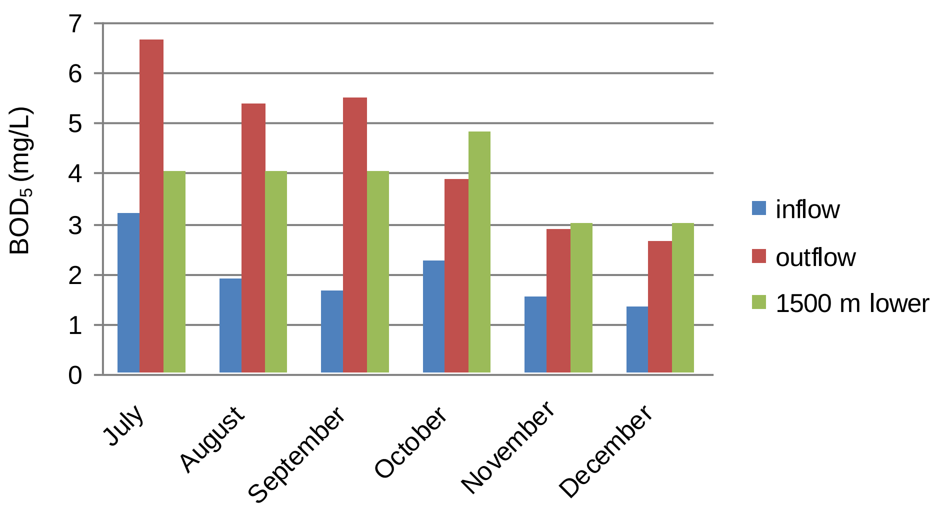

Figure 4. Levels of biological oxygen demand in three sampling points; farms inflow, farms outflow and 1500 m far from the farms outflow along the Koohrang stream.

was significant (Pulatsu et al., 2004; Maillard et al., 2005). It was observed that, in the third sampling point, BOD_5 was almost less than effluent waters (Figure 4). It should be due to stream's self-purification ability. A same trend was observed for COD. COD values in the effluent increase due to aquaculture activities (Pillay, 2004). Boaventura et al. (1997) has reported that BOD returned to the acceptable value for feeding water 2–3 km downstream from the point of effluent discharge in the Fornelo and Inha rivers in Portugal.

Same as BOD_5 and COD, total ammonia values increased in the discharged water. Figure 5 shows significant differences between amount of ammonia in inlet and effluent water which is due to the farm production capacity, feeding level and food composition. It was observed that, total ammonia at third sampling point was more than that in inlet water but it was less than that in effluent due to high flow of stream. It has a good consistency with previous studies (Sawyer and Mc Carty, 1978). The NH_3-N concentration of Koohrang stream remained less than the maximum allowable level of 1.0 mg/L recommended by the EEC for protection and improvement of fish in freshwater (Boaventura et al., 1997). It was found that the level of total ammonia decreased gradually from hot season to cold season due to reduction of metabolism of organic materials in aquatic ecosystems (Figure 5). A same trend was observed for nitrite and nitrate which is because of biological

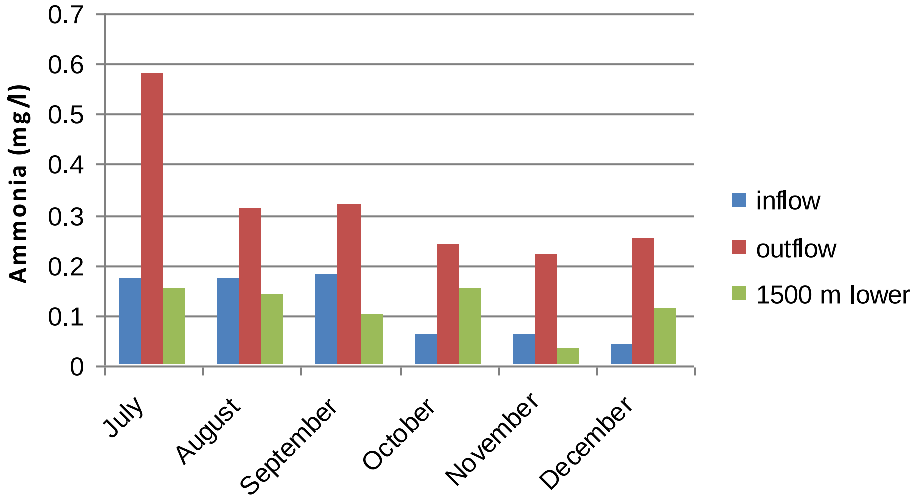

Figure 5. Changes of ammonia levels in three sampling points; farms inflow, farms outflow and 1500 m far from the farms outflow along the Koohrang stream.

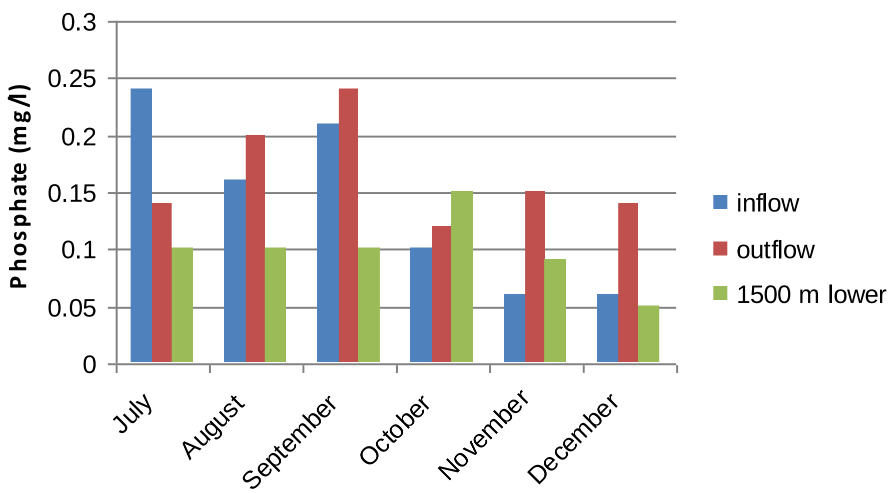

Figure 6. Amount of phosphate in three sampling points; farms inflow, farms outflow and 1500 m far from the farms outflow along the Koohrang stream.

degradation of proteins in water (Russo and Thuston, 1991).

It was found that the mean concentrations of NO_2-N and NO_3-N decreased significantly in the third sampling point (Tables 1, 2 and 3). The amount of nitrite in inlet water of fish farms was less than the standard amount which is 0.1 mg/L. The concentration level of NO_2-N and NO_3-N were below the recommended values for farm effluents (Schwartz and Boyd, 1994). Variation of phosphate in inlet, effluent and water samples from third sampling point were similar to total ammonia. It has got declining rate from hot season to cold season due to reduction of metabolic activities in aquatic animals. Maximum amount of phosphate which is harmful for fishes is more than 0.7 mg/L (Boaventura et al., 1997). Figure 6 shows that the amounts of phosphate in all water samples were less than 0.7 mg/L. Bergheim et al. (1982) studied on four fish farms in Norway. They found that each fish farm are able to make pollution 30 to 1260 times more than its biomass which is affected by fishes sizes, type of fish feeding, water flow rate and operation of fish farm cleaning. Metabolic products of fishes and left over fish's foods from fish farms make pollution in water environment. The pollution level depends on fish foods composition and its persistence in water as well as feeding practices. Amount and composition of precipitated fish foods in water could be very widespread (Teodorowicz et al., 2006).

It is possible to treat waste water by using zeolites which is able to keep ammonium ions in itself. If water flow rate in fish farms was maximum 10 L/s per 1 metric ton biomass, zeolite filters can treat waste water of fish farms, otherwise water should be diluted (Bergero et al., 1997). Sindilariu et al. (2009) studied on influence of pollution on thirteen rainbow trout fish farms which have water discharge with flow rate of 30 to 800 L/s. They found that inlet water quality, type of fish farming, amount of fish foods and the technique using for water treatment are affected on waste water treatment of fish farms. They also found that total phosphate, COD, BOD5 and TSS could be affected between 29 to 53% on waste water treatment. Mcmillan et al. (2003) found that precipitation of particles and materials in fish farm outlet water is the best way to reduce total solids in fish farms which flow-through system. Finally it is necessary to mention that the velocity and flow of stream water, seasons and effluent rate of farms could have great impacts on self-purification potential of the streams.

Conclusions

The results of this study were obtained from determination of twelve water physicochemical factors of three sampling point; (1) inlet water, (2) outlet water and (3) the last sampling point at 1500 m far from water outlet along the Koohrang stream. It was observed that trout farm effluents had a significant impact on the water quality of the Koohrang stream. There were significant differences in most of water physicochemical factors between inlet and effluent water, where as this variation were modified at third sampling point. The flow and velocity rate of Koohrang stream caused to reduce the level of some potentially harmful physicochemical water factors. Some of these factors have undesirable effects on stream water environment, although they can be treated by self-purification potential of the stream regarding to the water discharge of the stream. It was found that the level of all of the studied physicochemical factors of the water reduced to less than standard amounts for trout farming. It was concluded that there is a possibility to make other consecutive fish farms around 1500 m or nearer along the stream, but further studies are necessary to consider other environmental aspects of fish farm waste waters.

ACKNOWLEDGEMENT

Authors would like to show appreciation to the deputy of research of Islamic Azad University, Shahrekord branch because of its financial support for this project.

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