Determination of the effectiveness of the Medicaments and Vaccines used in Local Trout Farms in Keban Dam Lake (Elazığ)

Research Article

Ruhan Yanen[1]
İbrahim Cengizler[1]
Ruhay ALDIK[1]

[1] Faculty of Fisheries, Aquaculture and Fish Diseases Department, Cukurova University

Correspondence
İbrahim CENGİZLER
ibrcengizler@gmail.com

Abstract

In the present study, a survey on the determination of the effectiveness of the medicaments and vaccines used to treat and prevent the common diseases of rainbow trout (Oncorhynchus mykiss) cultured in 39 fish farms at Keban Dam Lake, one of the most important region for aquaculture in Elazığ (Turkey), was conductued by obtaining the necessary records in retro-perspective questioning.

TUKEY and ANOVA tests were used to analyze the data collected, and the results were evaluated statistically to be able to reveal the relation between the disease agents (pathogens) and the disease treatment/prevention methods used. No significant difference was found between the pathogens and the disease treatment/prevention methods ($p>0,05$) whereas significant differences were found between the pathogens and pharmaceutical efficiency ($p<0.01$). Significant differences were also observed between the annual production and the years (Jan.2015-Jan.2016) ($p<0.01$). Similarly, no significant difference ($p>0.05$) found between the number of staff working in farms, pathogens and prevention methods. It is also found that there is no significant difference between the production capacity and the workers ($p>0.01$). Interviews with the companies applying vaccines, it is learned that vaccination is more preferred, and the vaccines that applied cause pre-protection and detected that this pre-protection reduce application of antibacterial medicines.

Key Words: Oncorhynchus mykiss, Keban Dam Lake, Vaccine, Trout

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Introduction

Aquaculture based on quite ancient times. Aquaculture was first established in China in the 2000s BC, then spread from Asia to Europe (Koç, 2007). It is known that for the first time in the 1960s and 1970s, freshwater aquaculture began with trout and salmon breeding in Denmark and other European countries. It is pointed out that aquaculture began in the 1970s and the first produced fish was the rainbow trout (Oncorhynchus mykiss) in Turkey (Demir, 1992; Tekelioğlu, 2000). After the first fish production in the sector was established in Sakarya-Akyazı as a private sector enterprise, state-owned farms, which are public enterprises became active. Turkey, with an average of 1786 km long 33 streams, has an area of more than 26 million hectares of total aquaculture production and has a larger size in forest areas, close to existing agricultural areas (Anonymous, 2010). Fish is an excellent food and a source of high quality protein for people. Contributions to human nutrition of aquatic products are important for the country's economy due to employment creation, industrial raw material disposal and high export potential (Alpaz and Hoşsucu, 1996).

Significant advance have been recorded in terms of aquaculture in Turkey. Rainbow trout is the first order among cultivated species. The amount of annual production of trout was 36,827 tons in 2001, reached 122,873 tons in 2013 (Anonymous, 2013).

With the spread of cage systems, the amount of trout production was 10 tons in 1996, reached approximately to 32,115 tons with 160 fish farms registered in Keban as of 2014. Elazığ, which took the 59th order among the 60 cities that cultivated trout in Turkey in 1996, received the first order with the production amount approaching 32.155 tons in 2014. This amount of production covers 60% of our country's annual trout farming (Anonymous, 2013; Güner, 2015).

As a matter of fact, the main cause of the biggest crop loss in these enterprises is the disease factors. Disease agents must be used to eliminate some substances are present, but is given to medicaments name. Antibiotics, antifungals, antifungals and some disinfectants (iodophors, sodium hydroxide, formaldehyde, calcium cyanomide, chlorine, ozone, salt, copper sulphate, lime, etc.) are the main medicaments (Al-Dughaym, 2000; Cengizler, 2000).

When the factors causing the diseases observed in the enterprises that grow trout are examined, these diseases are mostly; Yersinia ruckeri, motil aeromonas, Aeromonas salmonicida, Flavobacterium psychrophilum, Vibrio anguillarum, Lactococcus garviae, Costia spp, Ichtyophthirius multifiliis, Hexamita spp., Myxosomat spp, Viral haemorrhagic septicemia viruses are caused by different researchers (Buchanan and Gibbons, 1974; Erer, 1981; Samuel et al.,1996; Cipriano, 2001; İspir et al., 2004; Sommerset et al., 2005)

Vaccines are biological products that are used in the treatment and protection of dead or weakened microorganisms (bacteria or viruses) and infectious diseases. The most effective method of protection from diseases; Taking hygienic precautions, not putting patients and porter into operation, and vaccinating fish with active immunization (Meyer and Scnick, 1989, Katırcıoğlu and Beyatlı, 2003; Lorenzen and Lapatra, 2005). Vaccination methods applied in fish shows some differences from other land animals (Post, 1987). Vaccinations in fish; Injection, spraying, immersion, bath, hyperosmotic infiltration and anal intubation. These are the inoculations of the vaccine through the

most effective injection route. Currently commercially in immersion vaccination method of prevention of bacterial diseases or bath method it is preferred (Kaper et al., 1981; Cengizler, 2000). It is known that the experiment of passive immunization in trout only delayed deaths and did not provide complete protection (Lavelle et al., 1997). However, passive immunization against Aeromonas salmonicida and Vibrio anguillarum resulted in very good results (Colwell et al., 1986; Ellis, 1988; Gado, 1998; Yambot, 1998). There are still studies to develop commercial vaccines against fish viruses and parasites. Experimental vaccines against IPN virus have been developed from viral diseases (Altun and Diler, 1996). Positive results have been obtained from vaccinations against viruses. Experimental vaccination against parasitic diseases of Ichthyophthirius multifiliis has been carried out (Austin and Austin, 1993; Rombout and Joosten, 1997).

In the present study, medicaments' and vaccines' that use for applied treatment method against common diseases at 39 rainbow trout farms at Keban Dam Lake, one of the most important fisheries area for our country, made by taking necessary records retro perspective questioning made, the efficacy of the vaccines and medicaments was investigated.

Thus, health management of sustainable fishing activities in the fisheries sector, and effective use of risk treatment methods investigated were compared efficiency values. The producers will be tried to be made conscious with the suggestions to be made. Treatment methods and the investigation of the effectiveness of these modalities are important for the prevention of disease agents occurring in enterprises. The aim of this research is to provide the bases for the future applications of the enterprises.

Material and Methods

The research was carried out between January 2015 and January 2016 for one year with fish farms once a month. The main material of the study; Surveys carried out face to face with 39 farmers in the Keban District of Elazığ Province, which produced trout farms, and as a result of these studies, they constitute the primary quality data obtained. The farms that are visited and collected within the scope of the study are located on the Keban Dam Lake (Elazığ) in about 50 km distance from the water source. There are 76 fish farms around Keban Dam Lake (Elazığ) and on Euphrates River. Their total annual production is 15 thousand tons.

Current vaccines against fish diseases are still in the developmental stage. Commercial vaccines have been developed with Yersinia ruckeri, Vibrio anguillarium, Pasteurella piscicida and Aeromonas salmonicida bacteria (Kanai and Wakabayashi, 1984; Türk, 2010; Şeker et al., 2011). Vibriosis, yersiniosis, franculosis and pasteurelosis vaccines are widely used commercially (Austin and Austin, 1993; Kumar and Sierp, 2003; Joh et al., 2010).

In this study, information about the medicines and vaccines used against the fish diseases seen in the farms which are engaged in trout farming in Elazığ - Keban Dam Lake were collected. The aim is to establish a basis for protection, control and treatment activities against trout diseases that may occur in aquaculture in the coming years. Suggestions will be made to the persons and institutions in the sector about the results of medicine application and vaccination.

For the research, the enterprises related to the trout farming registered in the Provincial Directorates of Agriculture in Elazığ - Keban Region were determined and visited to these farms at certain time intervals.

The fishery enterprises have been investigated and recorded beforehand whether they are sicknesses, the health conditions of the employer, whether they use medicines and vaccines.

Within the scope of this research, it was discussed with farm owners, fishery engineers or staff responsible for medicine and vaccine application and it was researched how many medicines and other medicaments used in the received data provide benefits to the enterprises and in this direction an attempt was made to remove the disease map of the aquaculture areas in Keban Dam Lake.

The data obtained in the study were subjected to One Way Analysis of Variance (ANOVA). In the event of significant difference in analysis results of the Tukey's test was applied multiple comparison test.

Results

Within the scope of the research; 39 farms on the Elazığ Keban Dam were visited and a survey was conducted under the name of "Farm Survey" given in Appendix 1 results obtained are as follows. Approximate values taken when examined in terms of diseases; Of the 39 fish farms, 2 had columnaris, 14 had yersiniosis, 10'side vibriosis and 13 had saprolegniasis diseases. The test result to determine the relationship between medicine efficacy and disease agents is given in Table 1.

Table 1. The relationship between medicine efficacy and disease factors in the Anova Test

		Sum of squares	SD	Squares average	F
Measures	Between Groups	16,417	4	4,104	
	Inside Groups	261,183	35	7,462	,550
	Total	277,600	39		
Medicine Efficiency	Between Groups	13,925	4	3,481	
	Inside Groups	65,675	35	1,876	1,855
	Total	79,600	39		
Production capacity	Between Groups	6,456	4	1,614	
	Inside Groups	155,444	35	4,441	,363
	Total	161,900	39		
Disease factors	Between Groups	107,737	4	26,934	
	Inside Groups	162,238	35	4,635	5,811
	Total	269,975	39		

As seen in Table 4.1, there was a significant difference ($p < 0.01$) as a result of the ANOVA test between medicine efficacy and disease agents. This has shown us that medicine efficacy is effective against disease agents. According to the information obtained from the questions asked by the responsible engineers working in the company, it is learned that the medicines they use are effective in eliminating the disease factors.

Table 2. Production capacity by years

Production capacity	Sum of squares	SD	Squares average	F
Between Groups	141,881	3	47,294	
Inside Groups	20,019	36	,556	85,050***
Total	161,900	39		

*** p<0.001

Comparing the production capacity of enterprises with the operating years shows a significant difference between the enterprises with 16-20 years and other enterprises (p<0.001).

Table 3. Comparison of production capacity and operating year compared to the TUKEY test

	(I) Farm Year	(J) Farm Year	Average Difference (I-J)	Std. Error	Squares average	P	95% Confidence Interval	
							Upper Bound	Lower Bound
	0-5	6-10	-,57407	,33656	4,104	,336	-1,4805	,3324
		11-15	,25926	,54647	7,462	,964	-1,2125	1,7310
		16-20	-5,74074(*)	,36306		,000	-6,7185	-4,7630
	6-10	0-5	,57407	,33656	3,481	,336	-,3324	1,4805
		11-15	,83333	,60886	1,876	,527	-,8065	2,4731
		16-20	-5,16667(*)	,45154		,000	-6,3828	-3,9506
Tukey	11-15	0-5	-,25926	,54647	1,614	,964	-1,7310	1,2125
		6-10	-,83333	,60886	4,441	,527	-2,4731	,8065
		16-20	-6,00000(*)	,62390		,000	-7,6803	-4,3197
	16-20	0-5	5,74074(*)	,36306	26,934	,000	4,7630	6,7185
		6-10	5,16667(*)	,45154	4,635	,000	3,9506	6,3828
		11-15	6,00000(*)	,62390		,000	4,3197	7,6803

The results of the ANOVA test based on years of production capacity showed a significant difference between the years (p<0.01). As a result of the ANOVA and TUKEY test statistics, it has been shown that the production capacity will also increase due to reasons such as experience and staffing in the multi-year enterprises.The result of the Anova Test, which is one of the measures taken for the disease factors, is given in Table 4.

Table 4. Measures against disease factors

	Sum of squares	SD	Squares average	F
Between Groups	36,552	3	12,184	
Inside Groups	241,048	36	6,696	1,820
Total	277,600	39		

As a result of analysis of variance between the factors of the disease and the measures taken, there was no significant difference (p>0.05). This has shown that the measures taken (such as vaccination, disinfectant use, medicine application, increase in the number of staff, increase in number, quarantine) are not effective enough to cause and spread disease agents. Number of engineers employed - number of disease agents and number of engineers employed - ANOVA test performed between the measures taken is given in Table 5.

Table 5. Variance analysis of the number of engineers working and the precautions taken

		Sum of squares	SD	Squares average	F
Diseases Agents	Between Groups	35,262	3	11,754	
	Inside Groups	234,713	36	6,520	1,803
	Total	269,975	39		
Measures	Between Groups	16,393	3	5,464	
	Inside Groups	261,207	36	7,256	,753
	Total	277,600	39		

There was no statistical difference in the number of engineers working on this chart - the number of engineers and disease agents (p>0.05). The result of the analysis of variance between the number of employees and production capacity is given in Table 6.

Table 6. Variance analysis between production capacity and the number of employees working

	Sum of squares	SD	Squares average	F
Between Groups	21,418	4	5,354	
Inside Groups	31,357	35	,896	5,977**
Total	52,775	39		

Table 6 When examined, there was a statistical difference between the production capacity and the number of personnel employed. As the number of qualified employees increases in the enterprises, conscious and correct applications will be realized, which will lead to positive increases in the production

capacity of the enterprises. So there is a direct correlation between the numbers of the staff employed by production capacity.

Discussion

From 39 farms in the middle of Keban Dam Lake and in the farms near the source, tetracycline, sulphanomide group antibacterial medicines and vibriosis and yersiniosis vaccines were applied in yersiniosis treatment. These practices provide a chance to protect from farm diseases or to treat illnesses within a certain period of time. However, it has not been possible to completely eliminate these diseases from the farms located at Keban Dam Lake. This is most likely due to contamination of farms in other areas of the source due to a number of reasons, such as the use of drainage waters from untreated drainage wastewater, and the use of rinsing water from the same source. In addition, misuse or frequent use of the chemicals used will cause the disease agents to gain resistance to these substances, thereby reducing the effectiveness of the chemicals.

It has encountered bacteria species such as Yersinia ruckeri, Pseudomonas sp. and Flavobacterium sp. in a trout. The data obtained in our study indicate that vibriosis, yersiniosis, saprolegniasis and columnaris disease factors are encountered throughout the enterprises (Kılıç et al., 2007).

A bacterial hemorrhagic septicemia disease was detected in trout (Salmo gairdneri irideus) in Çifteler-Sakaryabasi Fish Production and Research Station, and Aeromonas hydrophila was determined as a disease effect. In our study, no data on motil aeromonas septisemia were found in the 39 operations operated in the information field (Baran et al., 1981).

In study of rainbow trout; they reported that they found symptoms such as darkening of color, wilting in the gills, swelling and grayish color in the kidney, wilting in the liver and swelling in the spleen, increase in pigmentation, exophthalmos, swelling in the stomach and wilting in the gills. In the survey study conducted with engineers under this research, it was observed that these types of clinical symptoms were also taken into consideration (Austin, 1992; Bruno, 1992).

When the previous studies are examined, it is no doubt that the causes and consequences of this situation will affect the farm situation better by raising the awareness of the farm owners, conscious and responsible personnel and the fishery engineers. The results from the studies show that, compared with the information obtained from farms, it is an important factor in preventing diseases in general, with similarities.

In our study more import manufacturers of vaccines has been shown they prefer. When previous studies were examined, it was observed that the fish diseases were more observed in freshwater fish trout cultivation areas and various medicaments were utilized in elimination of these diseases (Cengizler, 2000; Ekici, 2010; Wiens et al., 2013).

In addition, vaccination in these areas has become a frequently used method of treatment to prevent diseases, and the fact that the application and the material used are financially expensive has led farming management to focus on protection and control. Furthermore, the information provided by the engineers showed that the control of diseases was prevented from being carried to other farms at the source farms in the light of the information. Although vaccination is regarded as the most important application in the treatment, it is understood as a result of the inquiry that we have made that antibacterial medicines and

disinfectants are more frequently used in regional farms due to financial difficulties and application difficulties.

Detect bacterial disease agents that cause economic losses in the study morphological and biochemical tests were carried out and Aeromonas salmonicida, Lactococcus garvieae, Vibrio anguillarum, Yersinia ruckeri such as were encountered in bacterial species whereas all of enrofloxacin of disease factors, florfenicol and were found to susceptible to ciprofloxacin and to be resistant to amoxicillin, ampicillin, simplexin, erythromycin, fusidic acid, gentamycin, chloramphenicol, lincomycin, nalidixic acid, neomycin, novobiosin, oxytetraicline, cefoxitin and sulfamethoxazole-trimethoprim (Akşit and Kum, 2008).

In the information we have received in the course of the work we have done, we have been informed that medicine administration has been done before these kinds of operations have been done in determining the disease state in the enterprises. Gentamycin, streptomycin, neomycin, sulfamethoxol-trimethoprim, oxytetracycline, amoxicillin / clavulic acid, clindamycin, erythromycin, penicillin and vancomycin antibacterial medicines were used in the operations. When engineers were asked how these antibacterial medicines were intended to be healed, they were reported to have a positive effect on the treatment.

However, antibiotics and other serological methods were not applied before medicine administration in these enterprises. If antibiogram work to be done by the pathogen, unnecessary or appropriate medicine use will be minimized (Midlyng, 1997; Cengizler, 2000). This may be possible, for example, by employing staff trained in fish diseases, or by providing a variety of training to fishery engineers working in the area.

It has found that uncontrolled use of chemicals, vaccines, and antibacterial medicines used in fish farming in the course of a study, provided resistance to disease resistance and negatively impacted sustainable fisheries. According to the information provided by the companies using the vaccine, vaccination is more effective than medicine administration (Midlyng, 1997).

They have compared the efficacy of vaccination methods by preparing an experimental vaccine against vibriosis seen in rainbow trout (Oncorhynchus mykiss) in his study. As a result of the research, injection vaccination provided high protection. In our work, we have been informed about vaccination against vibriosis and yersiniosis and successful protection by oral administration and injection method (Ekici, 2010).

It has been learned that 15 of the interviewed enterprises have been vaccinated. The vaccines are applied in the majority of the farms by injection and oral route. Imported vaccines are vaccines which use is preferred because of better activity than the native vaccine. It has been found that it creates an important frontal protection to fish health and reduces the use of antibacterial medicines.

Discussions with the responsible engineers of the farms emphasized the importance of using disinfectants and information on the applications they have been made about it is stated that the use of disinfectants has the lowest risk of passing disease fish from patient fish to healthy fish in other pools or to another operation. It is stated that all of the farms under investigation are given importance to the use of disinfectants. In conclusion, this study suggests that increasing knowledge and skills in the area of cultivation and increasing the use of vaccines and preparation of vaccines with native strains.

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