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Üç Farklı Çiftlikte Yetiştirilen Gökkuşağı Alabalıkları (Oncorhynchus Mykiss, Walbaum, 1792)'nın Toplam Kolesterol ve Kolesterol Tiplerinin Karşılaştırılması

The Comparison of Serum Total Cholesterol and Cholesterol Types of Three Different Farms' Rainbow Trout (Oncorhynchus Mykiss Walbaum, 1792)

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ÖZET

Erzurum' un 3 ilçesinde (Pasinler, Oltu ve Tortum) faaliyette bulunan alabalık üretim tesislerinden temin edilen gökkuşağı alabalıkları (Oncorhynchus mykiss)' nın toplam kolesterol seviyeleri ve kolesterol tipleri karşılaştırılmıştır. Aynı yemlerle besleme yapılan çiftliklerden, aynı yaşlardaki balıklardan örneklemeler yapılmıştır. Tüm parametrelerde (kolesterol, HDL, LDL, VLDL) en yüksek değerleri I. İstasyon (Oltu) vermiş ve sırasıyla 470,00 ± 91,83; 203,60 ± 45,79; 184,00 ± 27,48 ve 229,60 ±41,22mg/dl olarak belirlenmiştir.

Anahtar kelimeler: Gökkuşağı alabalığı, Kolesterol, HDL, LDL, VLDL

ABSTRACT

Fish were maintained from three different trout farms of three townships of Erzurum (Pasinler, Oltu and Tortum). Blood samples were collected from fish and total cholesterol and cholesterol types were compared. Fish of the same age were selected from the farms which use the same commercial feed. All parameters (total cholesterol, LDL, HDL and VLDL) took highest values in the first station (Oltu); 470.00 ± 91.83, 203.60 ± 45.79, 184.00 ± 27.48 and 229.60 ±41.22mg/dl, respectively.

Key words: *Rainbow trout, Cholesterol, HDL, LDL, VLDL*

1. Introduction

Hematological parameters have been used to describe the health of fish (Blaxhall and Daisley 1973), monitor stress response (Soivio and Oikari,1976; Kocabatmaz and Ekingen,1984) and predict systematic relationships and physiological adaptations of animals. They more quickly reflect the poor condition of fish than other commonly measured parameters (Alkinson and Judd, 1978). Hematological parameters are known to respond quickly to changes in enviromental conditions and have been studied in *Tilapia mossambica* (Aziz et al.,1993), *Ctenopharyngodon idella* (Shakoori et al.,1996) and *Heteropneustes fossilis* (Kumar et al.,1999).

Hematological values are widely used to determine systematic relationships and physiological adaptations including the assessment of the general health condition of animals and are more quickly reflected in the poor condition of fish than in other commonly measured variables (Reddy and Bashamohideen, 1989).

Cholesterol, triacylglycerols and other lipids are transported in body fluids by a series of lipoproteins classified according to increasing density: cyclomicrons, very low density lipoproteins (VLDL), low-density lipoproteins (LDL) and high density lipoproteins (HDL). VLDL's are primarily synthesized by the liver. VLDL delivers endogenously synthesized triacylglycerols to adipose tissue. The residue is transformed into LDL, which are rich in cholesterol esters. The role of LDL is to transport cholesterol to peripheral tissues and regulate de novo cholesterol synthesis at these sites. HDL's, which are synthesized by the liver, are rich in phospholipids and cholesterol. One role of HDL is to transport cholesterol from peripheral tissues to the liver (Stryer,1975).

Plasma lipoproteins are generally classified according to their density, i.e. the relative proportions of low density and high-density constituents (lipids and apoproteins, respectively). The four classes from the lightest to the heaviest are the following: chylomicrons, VLDL, LDL and HDL subdivided into HDL_2 and HDL_3 (Leger,1985).

Cholesterol, a component of all eucaryotic plasma membranes, is essential for the growth and viability of cells in higher organisms. However, too much cholesterol can

be lethal because of atherosclerosis resulting from the deposition of plaques of cholesterol esters. Cholesterol is also the precursor of steroid hormones such as progesterone, testosterone, estradiol and cortisol (Stryer,1975).

Plasma lipids also circulate as low-density lipoproteins (LDL) and high density lipoproteins (HDL). HDL is the major class of lipoproteins their content in trout is 3 – 5 fold higher than in man. The plasma level of lipids sometimes reaches very high values, 700 mg/dl in sardines, more than 2000 mg/dl in Pacific Salmon, about 1800 mg/dl in mature male trout. The lipoprotein levels may exceed 2000 mg/dl in salmonids. In trout, HDL are generally predominant and their plasma level reached between 1500 and 2000 mg/dl. The distribution of plasma lipoprotein classes varies widely between species. It also varies within one and the same species due to sexual status (Leger, 1985).

The present study was designed to compare total cholesterol and cholesterol types of three different farms' rainbow trout

2. Materials and Methods

Rainbow trout (*O. mykiss*) were obtained from three different farms and from three counties (Pasinler, Oltu and Tortum, Table 1) of Erzurum. The farms were using the same commercial feed. 10 immature fish (1+ aged) selected for analyses from the all farms.

Table-1: *The locations and distances of the farms to Erzurum.*

County	**Station No**	**Location**	**Distance to Erzurum (km)**
Oltu	III	North – East	120
Pasinler	I	East	37
Tortum	II	North	52

Blood was collected from the caudal vein and set to vacutaineer biochemical tubes (Blaxhall and Daisley,1973; Bridges et al.,1976; Pottinger and Carrick,1999; Atamanalp

et al., 2002a; 2002b; Atamanalp and Yanık 2003). Blood samples centrifuged at 4.000 rpm for 10 minutes, then analysed in autoanalyser, Merck-Mega/Toshiba (Bricknell et al.,1999)

Differences among the groups were statistical tested with variance analyses and the averages of groups analysed with Duncan's test (SAS,1996).

3. Results

In this study, feeding with the same pellet, three different farms' rainbow trout were compared for blood cholesterol values. The results that observed from the present study and the results of statistical analyses are given in Table 2. Total cholesterol took the highest value in I. station as 470.00 ± 91.83 mg/dl and the lowest in III. Station as 240.20 ± 42.66 mg/dl. Three types of cholesterol (LDL, HDL and VLDL) obtained different values depending on the stations (Table 2).

Table-2: *The general results of experiment (mg/dl).*

Stations	Total Cholesterol	LDL	HDL	VLDL
I	470,00 ± 91,83[a]	203,60 ± 45,79 [a]	184,00 ± 27,48 [a]	229,60 ± 41,22 [a]
II	339,60 ± 42,59 [b]	195,00 ± 46,05 [a]	74,20 ± 37,59 [b]	133,20 ± 19,59 [b]
III	240,20 ± 42,66 [c]	101,80 ± 22,26 [b]	92,40 ± 22,94 [b]	154,20 ± 38,51 [b]
The level of significance	**	**	*	**

(n=10; I. Station: Oltu, II. Station: Pasinler, III. Station: Tortum)
*: Important ($p<0.05$) **: Very Important ($p<0.05$)

4. Discussion

Total Cholesterol

The total cholesterol values changes depending on the farms. For example, I. Station was found as 470.00 ± 91.83 mg/dl (the highest value), II. Station 339.60 ± 42.59 mg/dl and III. Station 240.20 ± 42.66 mg/dl (the lowest value). The differences among the farms were very important.

The value for first station (Oltu) was very similar with Atamanalp et al (2003). He reported this value as 470.00 ± 36.38 mg/dl for this species. Except this report there was no record of cholesterol value of rainbow trout in literature archive. Because of this situation discussing this parameter became limited.

The value of blood cholesterol varies due to fish species. For example; in *Ctenopharyngodon idella* 10,19 ± 0,49 mg/g (Shakoori et al.,1991); 10,55 ± 0,47 mg/g (Mughal et al.,1993); 8,29 ± 0,38 mg/g (Shakoori et al.,1994) in *Heteropneustes fossilis* 340,9 ± 1,50 mg/100ml (Srivastava et al.,1995) in *Cyprinus carpio* 173 ± 21 mg/100ml (Shimeno et al.,1997) and in *Leuciscus cephalus* 420 ± 137 mg/dl (Haşiloğlu et al 2002).

LDL

LDL values of farms were observed as 203.60 ± 45.79 mg/dl; 195.00 ± 46.05 mg/dl and 101.80 ± 22.26 mg/dl in Oltu, Pasinler and Tortum farms, respectively. Accept III. Station the other values were similar to these observed in trout; 193-392 mg/100 ml (Leger,1985). But the values of Tortum were external from this interval. Beside this value was very similar with Atamanalp et al (2003) who reported as 195 ± 21.20 mg/dl for rainbow trout.

But our experiment's LDL results was found lower than these reports; 1156 mg/100 ml male trout (0,5 – 1,0 kg); 1189 mg/100 ml male trout; 879 g/100 ml (100 – 120 g) immature fish (Leger,1985). In the other hand, Leger (1985) reported that LDL value was trace in immature trout.

These differences among the literatures and our study can be explained with the sexual status of fish materials. Also in these reports there was no information about the species of trouts.

There was statistical importance between the differences of II. And III. Stations, but not with the I. and II. Stations.

HDL

In this experiment HDL was found as 184.00 ± 27.48 mg/dl for Oltu; 74.20 ± 37.59 mg/dl for Pasinler and 92.40 ± 22.94 mg/dl for Tortum. Comparing with the old reports these results were found low. For example; 1062-2216 mg/100 ml for male trout; >1500 mg/100ml for 0.7-1.9 kg female trout; 2344 mg/100 ml for immature trout; 518 mg/100 ml for 0.5-1.0 kg male trout; 331 mg/100 ml for male trout and 1750 mg/100 ml for 1.0 -1.2 female trout (Leger,1985).

Atamanalp et al (2003) reported HDL value for rainbow trout 114.00 ± 26.40 mg/dl. Since, the value of I. station was higher but the values of II and III. Stations were lower than this literature.

The origin of these differences among the reports and the present study may be from the species of trout and different sexual status of fish.

The differences among the HDL values of three stations were observed as very ($P < 0.05$).

VLDL

VLDL took the lowest value in II. Farm (Pasinler: 133.20 ± 19.59 mg/dl) and the highest in I. farm (Oltu: 229.60 ± 41.22 mg/dl). The III. Farm was between these values as 154.20 ± 38.51 mg/dl. Pasinler VLDL value was similar to Leger (1985) who reported VLDL value as 100 mg/dl for female trout in ovulation time. But the other stations' values were higher.

Some reports were higher than our experiments' results. For example, 673 mg/100ml for 0,7 – 1,9 kg female trout; 248 mg/100ml for immature trout; 586 mg/100ml 0,5-1,0 kg male trout, 335 mg/100ml for male trout and 650 mg/100ml for 1,0-1,2 kg female trout (Leger,1985).

It may, however, be pointed out that the values to different species of fish are difficult to compare because they are influenced not only by species but also by other factors such as temperature, pH, hardness and dissolved oxygen of breeding water.

The present study reveals that total cholesterol values and also the cholesterol types show significant differences according to the farms.

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