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Growth and Feed Conversion Ratios of Albino and Normal Pigmented Rainbow Trout (*Oncorhynchus mykiss*)

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Abstract

Here, we have compared the growth performance, daily feed consumption and feed conversion ratio of albino, normally pigmented rainbow trout (*Oncorhynchus mykiss*) and mixed group (albino and normally pigmented rainbow trout) which was subject to pure and mixed species culture conditions. In the study, initial average fish weights were 1.64 ± 0.1 g. Groups were normal pigmented rainbow trout (50), mixed (normal (25), albino (25)) and pure albino (50). The 120 day experiment was conducted as three groups and two replicates for each group. At the end of the study, average final weights were 19.3 g (pure normal), 17.2 g (pure albino) and 15.3 g mixed (normal and albino) were significantly different ($P < 0.05$). Mean feed conversion ratios and specific growth ratios were not statistically significant among the groups ($P > 0.05$). But, feed conversion ratio in mixed group was found slightly lower than others.

Keywords: Rainbow trout, *Oncorhynchus mykiss*, albino pigmentation, growth performance, feed conversion ratio.

1. Introduction

The purpose of industrial fish farming is to obtain maximum product from water. On this subject is conducted many researches both in the world and in our country. These researches particularly have concentrated on species with high economic value [1]. Rainbow trout is one of the most extensively reared species in Turkey and in other parts of the World [2]. The most important reason for the choice of rainbow trout for rearing shows the performance of the high development and the short duration of the incubation period and the adaptation to environmental conditions of these fish [3].

Albinism is a genetic disorder produced by an autosomal recessive gene in the homozygous state caused by the deficiency in melanin production [4]. The true albinism is recognized by the total lack of melanin, thus determining the pink or yellowish body color and red eyes [5]. However, there is another form of depigmentation considered partial albinism [6]. A recent term, known as leucism, has also been introduced to the animals with abnormal skin pigmentation but normal eye color [7]. Recently, it has also been used in ichthyology [8]. In natural environment, there are several reports of total or partial albinism in freshwater fishes [9, 10] and marine fishes [11, 12, 13]. Some cases of total or partial albinism in *Siluriformes* have been reported, e.g., *Ictalurus punctatus* [4], *Trichomycterus itacarambiensis* [14], *Rhamdella minuta* [5] *Schizolecis guntheri* [15], *Ameiurus catus* [16] and *Phreatobius cisternarum* [17].

In this study, the growth, daily feed consumption and feed conversion, specific growth of the albino along with normally pigmented rainbow trout which were cultured in tanks as pure normal, pure albino, and mixed groups were compared.

2. Materials and method

2.1 The Experimental animals and feeding

Fish, with an average weight of 1.64 ± 0.1 g, was obtained Atatürk University, Faculty of Fisheries Inland water fish breeding and Research Center. The fish were acclimated to the experimental conditions for one week prior to the start of the experiment. Fish taken randomly from each group were fed in controlled manner. Fish were weighed with a sensitive scale in every 15 days throughout 120 days and amounts of the daily feed given to

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fish at the end of weighing were determined. Throughout experiment, fish were fed with commercial trout feed (diameter 0.3, 0.5, 0.8 and 1 mm; crude protein 40-50%, fat 18%, ash 10%, Gross energy 3548 kkal) twice a day. At the end of trial, specific growth ratio (SGR) and feed conversion ratio (FCR) of the fish for each group were calculated using the following equations.

$$SGR = \frac{\ln \text{Final weight} - \ln \text{Initial weight}}{\text{Experimental duration}} \times 100 \quad [18]$$

$$FCR = \frac{\text{Weight gained by fish (g)}}{\text{Weight of feed consumed}} \quad [19]$$

2.2 Experimental design

50 fish for each group was placed in the tanks (six fiberglass tanks with 0.9 m wide, 0.7 m deep) with a volume of about 260 L water. Each tank was given to spring water with a flow ratio 5 L / min⁻¹, and they were controlled regularly every day.

Table 1: The experimental groups and replications in the study.

Groups or Treatments	Replications	Number of Fish
normally pigmented rainbow trout (pure normal)	2	50
all albino (pure albino)	2	50
mixed (N+A)	2	50

2.3 Water quality parameters

Water quality parameters of tank water are: temperature (9.6-10.5°C); pH (7.4 and 7.9±0.5); dissolved oxygen (10.5±0.60 mg/L); water hardness (174.1±3.21 mg/L).

2.4 Statistical Analyses

Results were given as mean±SD, the growth performance, daily feed consumption, feed conversion and the specific growth were calculated. All data obtained from the study were analyzed using a one-way analysis with the SPP (Statistics Package Program), version 11.5, followed by the LSD's multiple range test to determine significant differences between groups (Yanik *et al.*, 2002).

3. Results

The water inhabited fish is an artesian water that has a flow ratio of 1 L per in second. All fish were in good condition during the trial and they didn't have a parasite, disease or unwanted problems. There was not in any death in fish. The growths parameters such as mean weights, specific growth ratios (SGR), feed conversion ratios (FCR) were shown in Table 2.

Growth was alike for each group until the middle of the trial period, but growth of the fish were differed significantly at the end of trial period (P<0.05) (Table 1). Specific growth ratios (SGR) had average values of around 1.9-2.2%/day in all groups throughout the trial period. They were fixed gradually about 2.0%/day in the final period. The average SGR values were around 2.0%/day (Table 1). Daily feed consumption ratios (FC) were average 1.60% during the first period and decreased gradually to around 1.24% up to end of the trial in albino and rainbow trout. Values were similar in albino and

rainbow trout during the trial (Table 1). Feed conversion ratios (FCR) exhibited very similar trends in albino and rainbow trout during the study. Values in mixed group were found to be lower than those of pure albino and pure normal, but not significantly.

Table 2: The results belonged to mean weight, specific growth ratio (SGR), feed conversion ratio (FCR)

	Pure Normal	Pure Albino	Mixed (A-N)	ANOVA
Initial weight (g)	1.64±0.1 ^a	1.64±0.1 ^a	1.64±0.1 ^a	NS
Final weight (g)	19.3±0,02 ^a	17.2±0,03 ^a	15.3±0.05 ^b	*
SGR (%)	2.2 ^a	2.0 ^a	1.9 ^a	NS
FCR (%)	1.22 ^a	1.25 ^a	1.32 ^a	NS

Results are given as mean ± standard deviation. There is significant difference between parameters given as different superscripts (p<0.05) NS: not significantly different

4. Discussion

There were differences in term of growth performance between albino and normally pigmented rainbow trout varieties. Growth ratios, daily feed consumption, feed conversion ratios and consumer preferences of albino, and normally pigmented varieties of rainbow trout were done in the variable temperatures from 9.6 to 10.5°C during rearing period. Fish were between mean 15.3 g to 19.3 g at the end of the trial period of four months. The normally pigmented rainbow trout were showed a higher growth ratio than albino and mixed groups. There were significant growth variation between normal pigmented rainbow trout and mixed groups.

The specific growth ratios (SGR) of the experimental fish for the entire trial were between 1.9 and 2.2%/day. Highest, specific growth ratio was recorded at the normal pigmented rainbow trout when compared to other groups. Specific growth ratios decreased with increasing body size. The specific growth ratio is observed to vary depending on the size of fish; smaller fish grow faster than larger ones [20]. Growth ratio has economic importance for salmonid used in aquaculture [21]. When salmonid species reared in small units, as in intensive culture and when continuous access to feed is not possible, social hierarchy seems to be unavoidable [22]. This has been reported in *rainbow trout* [23], *Atlantic salmon* [24], *Arctic charr* [25, 26] and *brook trout* [27]. In this case dominant fish were more active and ate the most food.

The FCR values were between 1.22 and 1.32 up to the end trial. The values of feed conversion ratio for all groups in the present study were within the ranges reported for commercial feed by other investigators [28]. Feed conversion ratio increased with increasing fish weight, and it was better at normal pigmented group. Normal pigmented rainbow trout are benefiting their feed very efficiently [29].

In conclusion, based on the findings of the present study, our study showed that the development, SGR and FCR ratios of albino rainbow trout were better than mixed groups. This may be due to dominance status of normally pigmented rainbow trout. Further detailed studies are needed for resolving the exact cause(s) of this practical result.

5. Acknowledgement

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