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**Yaseen**  
Department of Zoology, GPGC  
Dargai Malakand, Pakistan

**Qadeem Khan**  
Department of Zoology, GPGC  
Dargai Malakand, Pakistan

**Hameed Ur Rehman**  
Department of Chemistry, Kohat  
University of Science and  
Technology-26000, Kohat, KPK,  
Pakistan

**Muhammad Naem**  
Department of Zoology, Hazara  
University, Mansehra.

**Munir Ahmad**  
Department of Zoology, Hazara  
University, Mansehra

#### Correspondence

**Yaseen**  
Department of Zoology, GPGC  
Dargai Malakand, Pakistan

## Artificial feed for rainbow trout (*Oncorhynchus mykiss*) in district Swat Khyber Pakhtunkhwa, Pakistan

**Yaseen, Qadeem Khan, Hameed Ur Rehman, Muhammad Naem and Munir Ahmad**

#### Abstract

The study conducted on the Rainbow trout (*Oncorhynchus mykiss*) culture shows various necessities for its growth. During the study, the necessities were analyzed and the prominent factors affecting its growth were frequently scrutinized. The very factors were dealt with and the effects made by variations in diet formula, were documented. By increasing the percent value of one of the parameters and decreasing the values of others, had a prominent role in the successful culturing of Rainbow trout. Similarly sample trout fish to which feed was provided in dirty pots and low standard habitat showed a retarded growth and thus lesser trout yield, while the ones provided with encouraging feed and habitat had high yield as expected. Also the water quality was brought into consideration and its impact was observed to be vital on trout growth. Two samples were differently analyzed providing high and low standard water qualities. The ones provided with standard water were more successful in growth. Standard water qualities and the proteins were found to be of keen importance in the growth.

**Keywords:** Artificial feed, rainbow trout, Swat

#### Introduction

Rainbow trout is present in Pakistan in the following area. Upper, Swat, Dir, Chital, Shangla, Mansehra, Kohistan<sup>[1]</sup>. The feeding and nutrition of rainbow trout, to a great extent, is similar to that of Atlantic salmon, specifically, the diets for anadromous trout and freshwater strains. Depending on the size of the fish, the pellet size and diameter vary to a great extent having high protein, lipid and energy content. The main ingredients include fish meal (FM) and fish oil (FO) along with other protein and lipid sources, grains and micronutrient premixes<sup>[2]</sup>. Fish feeds are the largest single operating cost in aquaculture production. Consequently, there is a continuous physical effort to reduce feed cost by using low-priced ingredients. Fish meal is a major ingredient in many feeds and is commonly targeted for replacement because of its high cost and finite world supply<sup>[3]</sup>. WHO reported that weight gain of rainbow trout, fed with a similar formulation was almost 90% of fish fed with commercial diet? Appropriate feeding management is necessary to gain an economic advantage and to maximize growth and feed conversion efficiency. Improper feeding or feeding strategies, together with low growth and feed conversion efficiency, have been identified as potential causes of extra labor cost<sup>[4]</sup>. Feed formulation is essentially applied. A number of terms and expressions are introduced that will be put to practical use as information is presented on the nature and qualities of various feed stuffs and the information presented on the nutrient requirements of fish. Precise understanding of these terms is essential to their correct application<sup>[5]</sup>. Feed consumption was significantly higher in fish fed with the control<sup>[6]</sup>.

#### History of the Trout Culture in Swat

The Trout culture in Swat state was initiated early in 1913 when about 250 yearlings of rainbow trout were planted in the main river of Puldeheri but were unfortunately died in 24 hour due to sudden change in temperature and lack of experience. The struggle was continued and in 1930 the political agent of the District Malakand implanted about 1800 fries and 200 adults in Kukari area but these fries were not survived and died. During 1952-53 eyed ova of trout were brought from Thinue Trout Hatchery Kaghan in the consignment of 5000 to 8000 fries and fingerlings and stocked in the rearing tank at Kalam. After about two months these fries also died due to turbid water<sup>[7]</sup>.

Later on merging of Swat state in government of Pakistan, the work of trout culture in Swat valley were ultimately entrusted to fisheries department of the provincial government. The department conducted a detail survey and preferred to establish a trout hatchery in village Tangar (Madyan town).

The efforts were started in 1960-61 and finally the trout hatchery was established and strengthened from time to time giving its fruitful results<sup>[7]</sup>.

### Materials and Method

Research was conducted in zoology lab Abdul Wali Khan University Mardan and Trout culture training center (TCTC) Madyan Swat.

#### Sampling

The Samples were collected from rainbow trout hatchery Madyan.

#### Pellets ingredients

Feed of the rainbow trout include 14 ingredients. These were grinded by mixture machine. The ingredients were brought to open room with a specific ratio. And then all the ingredients were mixed with the help of water meal. Chest wed were used during the practice. After the ingredients were mixed, the resultant mixture was supplied to the pellet machine. That pellet machine was basically for the suppressing the mixed ingredients to form different size of pellets for different sized fishes.

#### Preventive measures

These pellets were kept in a ventilated room for an hour to remove the moisture in the absence of sun. Now these pellets

were put in tub for provision to fishes. Then these pellets were supplied through automatic feeder to avoid wasting in the water.

### Results

The current research was carried out in the Trout Culture Training Center Madyan Swat, from December 2012 to May 2013. The lab oriented research work was conducted in zoology lab in Abdul Wali Khan University Mardan.

#### Feed formulation Rainbow Trout.

Rainbow Trout was provided with limited amount of Animal by product, such as liver and blood because if they were provided with large amount of net food then it could become a potential threat for their life. Many pathogens may possibly grow in this environment due to availability of nutrient for them. In the present findings, there were two recommended dietary formulations used in two distinct feed lines such as fingerlings and brooder trout fish. The diet formula for ingredients in table 1 and 2 were used for rearing brooder trout. In diet formula, mentioned in table 2, the percent ratio of most of the parameters has been changed. Consequently, fruitful results were obtained. Feed was prepared on the basis of this formula because of its vital role in fish growth; otherwise it might lead to reproductive failure, growth retardation, disease epidemics, change in coloration and other normal life activities. Feed formula for rainbow fish contain 14 ingredients, which are enlisted as:

#### Formula for brooder Fish

Table 1

S. No.	Ingredients	%	S. No.	Ingredients	%
1	Fish meals	35%	8	Rice bran	8%
2	Meat meals	12%	9	Vitamin premix	0.55%
3	Soyabean meals	12%	10	Vitamin mineral	0.075%
4	Wheat flour	20%	11	Vitamin C	0.075%
5	Dry milk	0.5%	12	Choline chloride	0.2%
6	Soyabean oil	4%	13	Butylated hydroxytoluene	0.1%
7	Bone meal	1%	14	Brewer's yeast	0.2%

Table 2

S. No.	Ingredients	%	S. No.	Ingredients	%
1	Fish meals	55%	8	Rice bran	5.68%
2	Meat meals	10%	9	Vitamin premix	0.55%
3	Soybean meals	11%	10	Vitamin mineral	0.035%
4	Wheat flour	12%	11	Vitamin C	0.075%
5	Dry milk	0.5%	12	Choline chloride	0.2%
6	Soybean oil	3.66%	13	Butylated hydroxytoluene	0.1%
7	Bone meal	0.1%	14	Brewer's yeast	0.2%

#### Feed preparation and Mixing of ingredients

At first, solid ingredients were grinded through water mill till it became powder. The powder ingredients were then mixed with each other by a hoe. After mixing the solid ingredients, liquid substance like B.H.T, soyabean oil etc, were poured into the mixture. In order to produce more sophisticated form of food, the mixture was re-shuffled. The mixture produced in this way was ventilated so that a paste form was obtained. The mixture was made ready for pellet formation through a

pellet machine, which had the capacity of producing variety of pellets for different fishes because of its different perforated plates. Smallest sizes of pellet were prepared for the fingerlings. The size of pellets was increased for large fish.

#### Evaluation Test of Water Quality on Brooder

**Procedure:** Two tanks were selected for this test, in an isolated environment.

**Table 3**

S. No	Tank 1	Optimum Value	Effect
1	H <sub>2</sub> O	Temp(55 to 60 °F)	No effect. Grow well.
2	pH	6.8 to 7.8	No effect. Grow well.
3	CO <sub>2</sub>	0 to 10 PPM	No effect. Grow well.
4	Dissolved O <sub>2</sub>	2 to 10 PPM	No effect. Grow well.
5	Chloride	0 to 100 PPM	No effect. Grow well.
6	Ammonia	0 to 2.5mg/L	No effect. Grow well.
7	Nitrate	0.0 to 1.8PPM	No effect. Grow well.
8	H <sub>2</sub> O Hardness	0.0 to 30.0PPM	No effect. Grow well.

Nine brooders were taken in tank 1 and tank 2 and kept under supervision for 6 months. Same number of brooder was taken in tank 2 as well

**Table 4**

S. No.	Tank 2	Increased Value	Effect
1	H <sub>2</sub> O	Temp(60 to 70 °F)	Not grow well.
2	pH	6.5 to 5	Not grow well.
3	CO <sub>2</sub>	10 to 20 PPM	Not Grow well.
4	Dissolved O <sub>2</sub>	2 to 10 PPM	Grow well.
5	Chloride	100 to 600 PPM	Not grow well.
6	Ammonia	3 to 4mg/L	Not grow well.
7	Nitrate	2 to 4PPM	Not grow well.
8	H <sub>2</sub> O Hardness	35 to 40PPM	Not grow well.

The tanks were provided with same feed in equal amount at regular interval. All the conditions, except the water quality were kept same for both the tanks. This was done in order to know the multiple effects of water quality on brooder fish growth. Tank one was provided with standard water satisfying all the conditions for the growth of brooder fish, while tank 2 contained water of substandard quality. The water in tank 2 was contaminated and had improper pH, CO<sub>2</sub> amount, Temperature and hardness. Fish in tank 1, showed proper growth. The reproductive capacity, coloration and other morphological aspects of fish in tank 1 are compared to that of fish in tank 2. It was due to the water quality and its related conditions. The retardation in fish growth in tank 2 might be due to the microbial growth in digestive cavity according to the literature. In the present work it is found that the water quality has a profound effect on the growth of rainbow trout which might not be under estimated. Water with standard pH, CO<sub>2</sub> amount, Temperature and hardness should be provided to the brooder fish.

### Discussion

The current research was carried out in the trout culture training Center Madyan Swat, from December 2012 to May 2013. The diets for salmonid fish having low protein (<40%) contents should be used because they support a high growth rate (increased protein deposition), (Hardy *et al.*, 2002).

The present results coincide with the previous studies. It is suggested that the normal /balance diet for rainbow trout growth should have protein ratio of 40-55%. Rainbow trout fish is considered a very nutritious food and it is one of the main source of protein providing 26.2% of animal meat and is growing food source in Asia and in developing countries. The protein is necessary for normal growth and other normal activities. (Delgado *et al.*, 2002) [8]. The natural feed of rainbow trout may vary widely from Plankton for fry, to insects, crustaceans and even small fish for larger trout [2, 9].

The growth of rainbow trout is not only dependent on natural feed but artificial proteins feed is also necessary for it, e.g. fish meal, liver, yolk of the eggs. The increased ratio of

protein in diet speed up the growth rate and thus the fish is available for marketing in less time. A two year study was conducted evaluating the performance of five diets on growth, feed conversion, fin quality and reproductive efficiency of Erwin strain brood stock rainbow trout (*Oncorhynchus mykiss*). The five diets evaluated in the study included a USFWS open diet, Silver Cup, Trout Grower (TG), a Vitals diet, and Mix 1 diet. Fish fed with high protein Vitals diet showed significantly better growth than fish fed with three of the other four diets. All diet groups showed significantly lower mean Dorsal Fin Index (DFI) values than previously established wild steelhead (*Oncorhynchus mykiss*) DFI values [10].

The same results were obtained in the present research (table 3 and 4). Special emphasis is given to elucidate the biochemical contents and dietary supplementation levels of feed additives by cultured fish species which has received relatively little attention. The development of a cost-effective new natural source of anti oxidant, the development of algal meal-based diets as feed additives [11]. Additive substance like vitamin mineral, BHT etc. are very necessary for the fish because these substances are very resistive to diseases. The absence of these additive substances leads to the fish gut disease and their growth is automatically affected. The additive substances affect the growth indirectly.

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