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# **Effect of feed allocation of daily ration on growth and feed assimilation of rainbow trout *Oncorhynchus mykiss* using recirculating systems**

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## **ABSTRACT**

The continuous quest for minimizing cost in aquaculture inevitably leads to issues relating to feed and feeding cost, always aiming to ensure, as animal scientists, the best possible feed quality for farmed animals. In this context, there was an investigation regarding the effect of feed allocation of the same daily ration on the growth and feed assimilation of juvenile rainbow trout *Oncorhynchus mykiss* (initial weight  $64.1 \pm 0.64$  g) using standard commercial rainbow trout feed and recirculating system. Feed was allocated in three daily meals by means of five different duplicated treatments (70-15-15%, 50-25-25%, 33-33-33%, 25-25-50% and 15-15-70% of 2.0-2.5% body weight) for 14 weeks.

Results indicate that treatment 25-25-50 led to significantly increased growth ( $242.9 \pm 3.67$  g) compared to groups 15-15-70 ( $223.6 \pm 3.99$  g) and 50-25-25 ( $227.2 \pm 5.00$  g), with treatments 33-33-33 and 70-15-15 having intermediate levels.

Present results demonstrate that feed allocation of daily ration affects growth significantly in juvenile rainbow trout. Therefore, growth and weight gain can be improved using the same feed energy possibly by means of improved assimilation under favourable and controlled rearing conditions.

Keywords: rainbow trout *Oncorhynchus mykiss*; nutrition; feed allocation of daily ration; growth; recirculating systems



## **INTRODUCTION**

Feed cost reduction in fish farming industry is constantly an important goal because feed comprises a large proportion of total rearing cost. At the same time, animal scientists and producers should aim for highest feed quality and respect to animal physiology and feeding ethology.

Improvement of feed utilization is particularly important because it ensures maximum efficiency of valuable feeds. The role of feeding ethology on nutrition physiology of different feeding types of reared fish is not yet clearly understood. Especially for carnivorous fish, which possess a muscular, extensible stomach serving as both storage and processing space, daily feed allocation may pose an important role regarding feed utilization. In this context, there was an investigation regarding the effect of feed allocation of the same daily ration on the growth and feed assimilation of juvenile rainbow trout *Oncorhynchus mykiss* using standard commercial rainbow trout feed and recirculating system.

## **MATERIALS AND METHODS**

### Experimental animals and design

Juvenile rainbow trout *Oncorhynchus mykiss* were obtained from a local trout farm and acclimated to the recirculating system experimental facilities of the Faculty of Animal Science and Aquaculture using standard commercial rainbow trout feed. Initial weight of experimental animals was  $64.1 \pm 0.64$  g and rearing conditions were within optimum limits for rainbow trout.

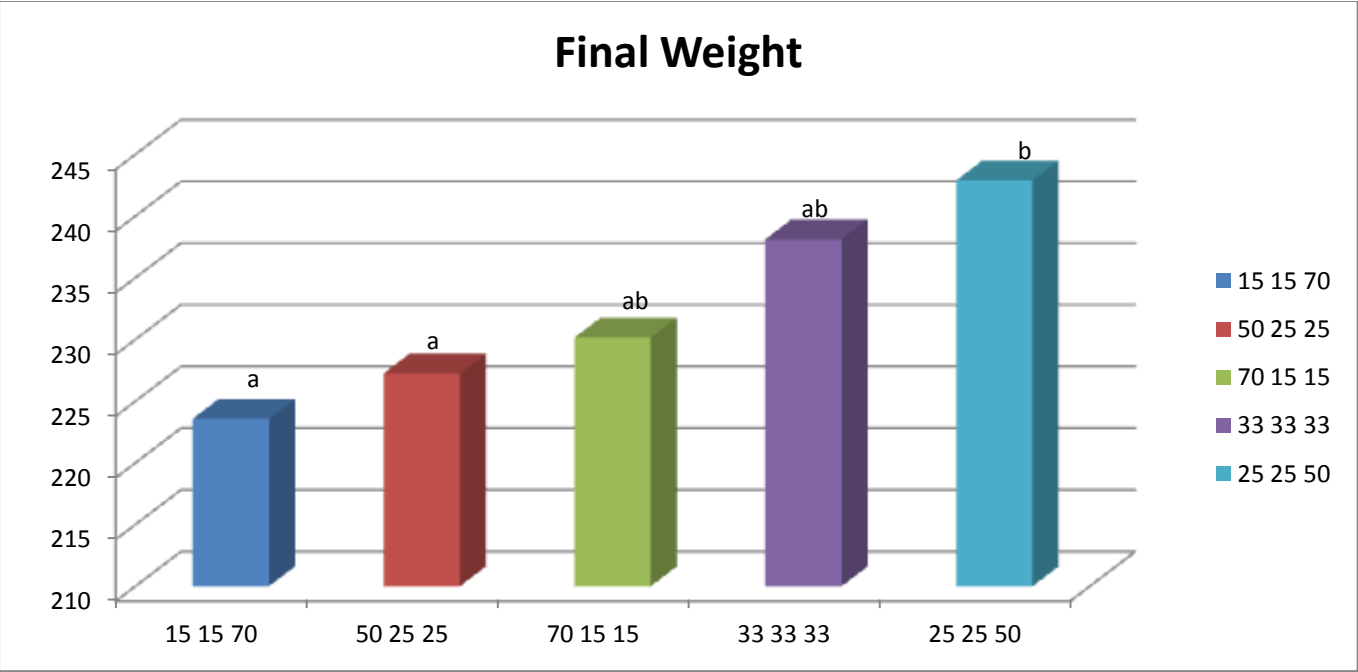
The experimental design involved the unequal allocation of daily ration. The same daily ration of 2.0-2.5% body weight was offered in three meals by means of five different duplicated treatments (70-15-15%, 50-25-25%, 33-33-33%, 25-25-50% and 15-15-70%) for 14 weeks.

## **RESULTS**

### Growth

Growth was significantly affected by different feed allocation, and treatment 25-25-50 led to significantly increased growth ( $P < 0.05$ ) ( $242.9 \pm 3.67$  g) compared to groups 15-15-70 ( $223.6 \pm 3.99$  g) and 50-25-25 ( $227.2 \pm 5.00$  g) (over 19 g of body weight, or 8% weight gain), with treatments 33-33-33 and 70-15-15 having intermediate levels.

Figure 1. Growth of *O. mykiss* under different feed allocation of the same daily ration.



## Chemical composition

No effect of feed allocation was observed for chemical composition, apart from increased lipid demonstrated for treatments 70 15 15 and 50 25 25, which presented intermediate weight values, as well as decreased lipid levels for group 25 25 50, which exhibited highest growth (Table 1).

Table 1. Chemical composition of *O. mykiss* under different feed allocation of the same daily ration.

<b>Treatment</b>	<b>Water</b>	<b>Protein</b>	<b>Lipid</b>	<b>Ash</b>	<b>Protein dw</b>	<b>Lipid dw</b>	<b>Ash dw</b>
<b>15 15 70</b>	72.4±0.10	18.94±0.15	6.83±0.10	2.495±0.215	68.63±0.24	24.75±0.24ab	9.035 ±0.755
<b>25 25 50</b>	72.3±0.15	18.98±0.15	6.71±0.15	2.355±0.215	68.41±0.0	24.20±0.15a	8.485±0.735
<b>33 33 33</b>	72.1±0.33	18.99±0.15	7.03±0.10	2.370±0.180	68.02±0.64	25.17±0.24ab	8.48±0.560
<b>50 25 25</b>	72.1±0.35	19.14±0.15	7.20±0.10	2.495±0.125	68.50±0.59	25.76±0.61b	8.955±0.395
<b>70 15 15</b>	72.6±0.45	18.95±0.15	7.76±0.15	2.120±0.020	69.04±1.08	28.26±0.38c	7.705±0.045

Mean values ± SEM; different letters denote significant difference (P<0.05)

## **DISCUSSION**

Present experiment comprises part of a series of nutrition physiology experiments performed recently in the Faculty regarding feed allocation, fasting and refeeding, digestive enzymes levels etc, using important reared fish species. These experiments have aimed to explore the effect of feeding type and ethology towards improved feed utilization and energy allocation.

Present results demonstrate that feed allocation of daily ration affects growth significantly in juvenile rainbow trout reared under specific controlled conditions. In more detail, increased growth was highest under present treatments when feed was allocated 25% at first and second meal and 50% of daily ration offered at the last meal. Interestingly, when the last meal was increased to 70%, growth was lowest. It is possible to extrapolate that growth was increased when meal size was twice as much in combination with significantly increased available digestion time in the last meal. In present experiment, when last meal was increased or decreased, growth was lower.

Therefore, growth and weight gain can be improved using the same feed energy possibly by means of improved assimilation under favourable and controlled rearing conditions, which are optimally monitored in recirculating water systems.