http://dx.doi.org/10.22161/ijeab/2.4.16 *ISSN: 2456-1878*

Comparative Study of Zootechnical Performances and Survival Rates in Rainbow Trout Subjected to Two Foods with Different Formulation

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Abstract— *Considering its economic and halieutic interest, the rainbow trout (Oncorhynchus mykiss, Walbaum, on 1792) is one of the species the most appreciated in the world, in particular for the sports fishing. To compare the effects of two food of different formulation, (the one premises(place) used by the center of salmon farming and the other one imported) on some biological parameters of the trout rainbow, an experimental study was realized between 1st Mars and June 15th, 2016 in the National Center of Hydrobiology and Fish farming of Azrou on 2000 fish fry stemming from the same prize of eggs and restarted randomly in 4 rectangular ponds fed with fresh water and fed four times by days during 107 days. The obtained results show good that the best performances of growth in length and in weight, the survival rate and feed efficiency are attributed to the imported food.*

Keyword— Rainbow trout, local food, imported food, feed efficiency, growth, rate of survival.

I. INTRODUCTION

Brown trout (Oncorhynchus mykiss, Walbaum, 1792) was introduct in Morocco since 1925 from France and North America (Mouslih, 1996; Abba *et al*., 2013). The objectives of this introduce are to promote the sport and comercial fishing in Morocco. The breeding of this salmonid is carried out in the structures belonging to the National Center of Hydrobiology and Fish Farming (CNHP) in the Middle Atlas, specifically in the province of Ifrane.

The objective of this study is compare the zoological performance, survival rate and growing of alevins in relation to the type of local feed used in the center. In this investigation we also performed the comparison between the conversion indices.

II. MATERIALS AND METHODS

1-Description of the breeding room

This experimental study was conducted in a room at the National Center of Hydrobiology and Fish farming, in specific rectangular troughs in parallel with a suitable volume of 0.16 m3, and circular tanks fed by taps, The water comes from the source with a flow rate of 0.97 m3 / h. Grids were placed downstream of each trough in order to avoid the exit of the fry. The troughs and tanks are equipped with a diffuser aeration system to maintain the dissolved oxygen concentration close to saturation.

2- Measures of water quality indicators

Ecological parameters influence the life cycle of fish, especially during the incubation and nursery period (Huet, 1970, Piper *et al*., 1982, MENVIQ 1990, Jalaber and Forestier, 2010). In situ measurements of water quality indicators for the nursery period (pH, dissolved oxygen, temperature, and electrical conductivity) were made by portable devices (Thermo orion 810 oximeter, IP67 pH meter, Conductimeter- salinometer-thermometer type Jenco 3250) during the experimental period spread over 4 months.

3- Biological materials and parameters

Digestibility and nutrient balance are more important in breeding fish, and any deficiency or imbalance in food

http://dx.doi.org/10.22161/ijeab/2.4.16 *ISSN: 2456-1878*

may lead to malformations and high mortality rates (Hilton and Slinger, 1981).

Feed control in breeding fish is an important step in the quality of the flesh of fish (Kolditz *et al*., 2008; Aba, 2013) compared to that of fish caught in the fishery. 2000 alevins of rainbow trout from the same batch of eggs were randomly distributed in four rectangular tanks with 500 alevins in each tank (A7, B7, A8 and B8). The alevins were manually fed by two different food, one imported for the alevins of the tank A7 and B7 and the other for the alevins of the tanks A8 and B8 (Tab.1). The daily ration was divided into four meals distributed from 9 am to 5 pm, seven days a week for 107 days. Each week 3 batches of 10 fish per trough were anesthetized by a biological anesthetic (clove) after 24 hrs in order to carry out the weight measurements to calculate the quantities of food required for all the biomass present in the tanks. The two foods tested are pellets with a diameter of 2 mm. In addition to the qualitative and quantitative differences, the structure of the granules of the imported food is homogeneous, while the local food has granules with a heterogeneous structure.

Table.1: Composition of the two experimented food

Constituents	Imported food	Local food
Crude Proteine	47%	48%
Crude fat	18%	22%
Crude fiber	1,33%	2,2%
Crude ash	8,75%	8,3%
total phosphorus	1,32%	0,8%
Calcium	0,80%	------
Sodium	0,62%	------

3-1 Feed rate:

The quantities of food distributed weekly were calculated and weighed according to the alevins density in each tank and the water temperature, which is measured daily throughout the experimental period.

The rate of feeding is calculated according to the following formula: (Total weight * Feeding rate) / 100

3-2 Growth parameters

Growth is the simplest criterion to be apprehended in the nursery stage. It is expressed by the evolution of the total length and the total weight of fish, estimated from a sample generally composed of 33 individuals, 33 alevins were taken at random in every tank. In order to take measurements of the growth parameters without stressing the fry, the latter are anesthetized by a natural anesthetic which is the clove (Syzygium aromaticum) thanks to its composition in eugenol. The total length (Lt) corresponding to the length of the fish from the tip of the muzzle to the end of the longest radius of the caudal fin is determined by an ichthyometer graduated in cm. The total weight (Pt) is determined using an electronic balance (Brehm type B30) with an accuracy of 0.1 g.

3-3 Zootechnical Parameters

- Weight gain% (W .G):

It allows evaluating the weight growth of the fish during a given time (Goubier, 1975). It is calculated from the following relation: W.G% = (Final average weight (g) - Initial average weight (g))

- Individual daily growth (I.D.G):

This parameter allows us to estimate the daily weight gain of farmed fish (DGA-IGA, 2008). It is determined from the following relation: IDG (g / d) = (Final weight (g) - Initial weight (g)) / Breeding time (Days)

- Specific growth rate (SGR)

Growth rate is a term used in aquaculture to estimate the production of farmed fish after a certain period; it is given by the formula (Goubier, 1975).

SGR (%/ Day) = ([ln (final weight) - ln (initial weight)] x 100) / Duration of the experiment in days

- Survival rate (SR):

The survival rate is calculated from the total number of fish at the end of the experiment and the number at the beginning of the breeding, according to the relationship below:

SR (%) = (Number of final fish x 100) / Initial fish number

III. RESULTS AND DISCUSSION

1. Water Quality Parameters

The water quality parameters at the station of the salmonids of the National Center for Hydrobiology and Fish Culture are shown in the table below

Table.2: Average values of water quality parameters in the nursery

Physicochemical parameters of water	T°C	O2 dissolved mg/ L	pH
Average values	14	6,9	7

The temperature of the water acts at several levels of the fish life cycle, impacting metabolism and incubation of eggs (Treasurer, 1983, Diamond, 1985, Gillet, 1991, Mallet 1999, Morin, 2012). The results obtained for the temperature of the water at the level of the various troughs and the rearing tanks are around 14 ° C, the same temperatures were recorded in 2011 (Abba, 2011). The results obtained for the temperature of the water at the level of the various tanks are around 14 ° C, the same temperatures were recorded in 2011 (Abba, 2011). The average dissolved oxygen content in the tanks is 6.90 mg / l. In addition, various tanks are equipped with a diffuser aeration system allowing the concentration of dissolved oxygen close to saturation to be maintained. For Hydrogen potential (pH), it is very close to neutrality (pH

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= 7). According to MENVIQ, (1990), Painchaud, (1997) and Morin, (2012), the physicochemical parameters of the waters at the salmonids breeding station meet the criteria for good water quality of the salmonids since the pH is between 6, 5 and 9, the temperature of the water is almost stable at 14 ° C. and between 10 and 15 ° C. and a concentration of dissolved oxygen of more than 6 mg / l.

2-1 Biological parameters

2-2 Growth of weight

The comparative growth curves show that the alevins weights in the different treatments evolve in the same direction during the first five weeks of the study (Fig. 1). After 14 weeks of feeding, the final weight of the alevins by the imported feed is very high compared to the weight of the fry fed with a local feed (up to 30% higher than the initial weight). According to (Philippart and Melard, 1987) growth is a complex biological process that involves many factors whose role and contribution must be known. In our case, the difference in growth resides in the type of feed received by each batch of alevins since the ecological conditions are the same (T °, pH and oxygen rate), so the growth seems to be the result of Increased feed intake in fry fed the imported food, poor digestion (Fig. 5) for alevins fed with local food, and a slight increase in weight.

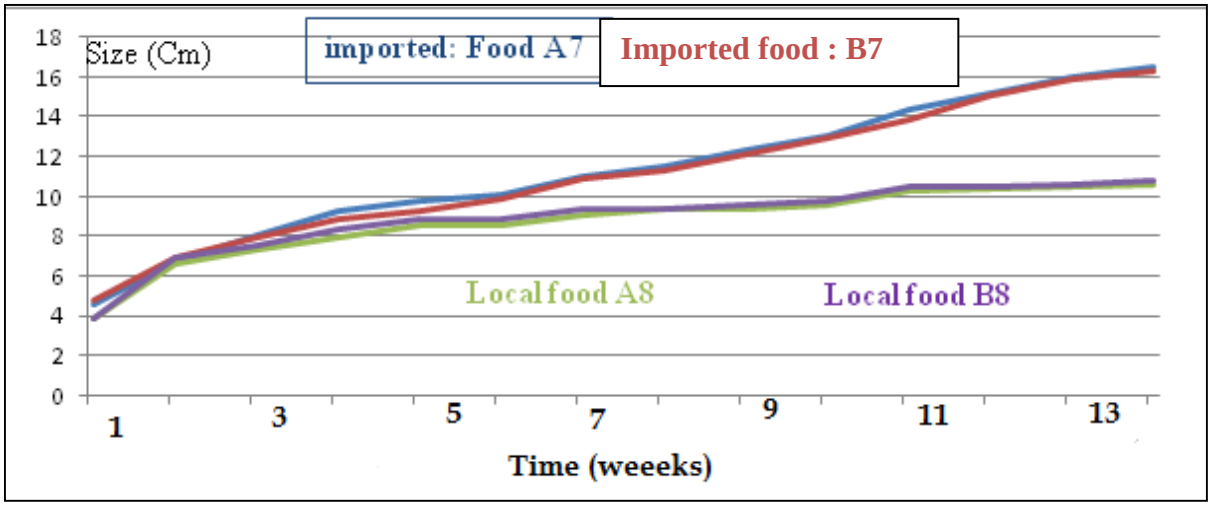

Fig.2: Evolution of the size averages alevins during the trial period

Photo.1: Difference in size between two trout alevins
(Top fingerlings fed by imported food, bottom alevins fed by local food)

2-4 Survival rate

The study revealed a very high mortality rate of fry (747) in troughs fed by local food throughout the study period (74.7%), compared with only 2 for fry fed imported food (0 , 2%) during the same test period (Fig. 4). The final number of fry in each trough is shown in Table 2. The results obtained can be explained by a poor digestion of the local food as shown by the dissection of the alevins after their mortality (Photo 1) since all the alevins of the troughs are subjected to the same environmental conditions. This bad digestion can be due to the high percentage of rate of lipid in the local food, because the food(supply) intended for the spawn and for the alevins have to contain lower levels of lipids with regard to(compared with) those of the food for fishes in phase of swelling (FAO, on 2017), either in a change of the quality of the food (oxidation under the influence of the light) due to the type of packaging (transparent plastic bags), against a packaging with plastic bags polyethylene opaque for the imported food.

http://dx.doi.org/10.22161/ijeab/2.4.16 ISSN: 2456-1878

Table.2: Final number of alevins in every tank

Tanks	initial Number	Final Number
A7	500	498
B7	500	500
A8	500	176
B8	500	77

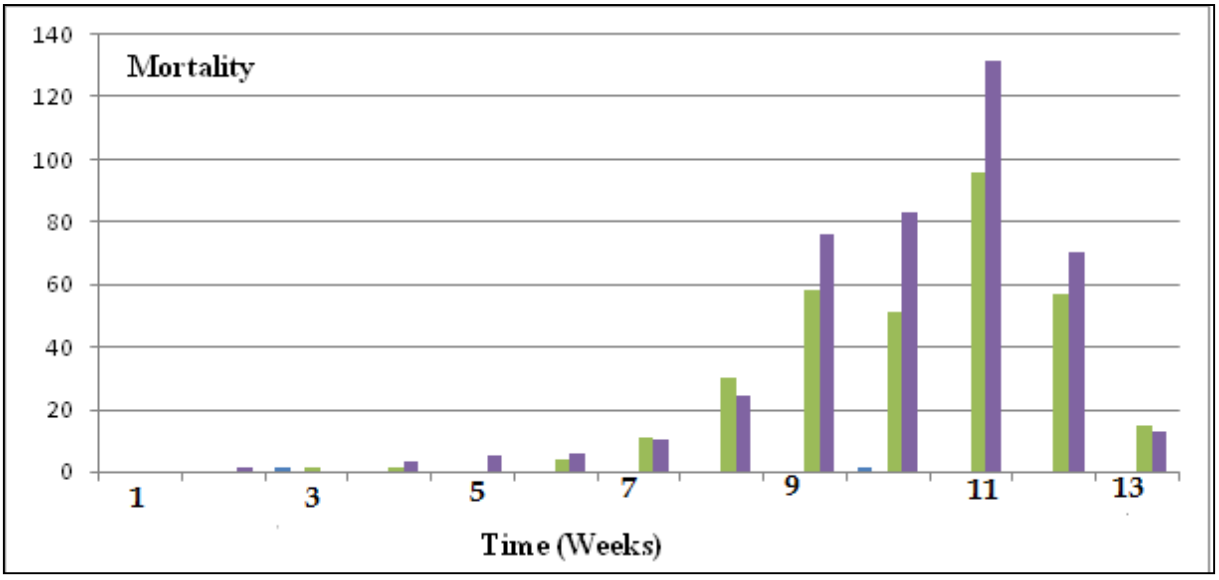

Fig.4: Mortality rate of alevins during the period of study (Local food (A8) (B8))

Fig.5: Dissection of the died alevin showing the bad digestion of the local food

2-5 Zootechnical Parameters

This experimental test shows that the performance of the zootechnical parameters varies significantly between the two diets (Tab.3). The highest values in terms of weight gain were obtained with the imported diet. For daily individual growth, the mean for fry fed imported food is 0.44 compared to only 0.065 for those fed on the local food. For the specific growth rate, it is 2.76% for fingerlings with imported diets; this growth is due to a high ingestion of the food by the fry. These results corroborate and explain well the mortality rate recorded in the other fry or the survival rate which is followed by 99.8% for the fry fed by the imported food compared with only 25.3% for the others.

Table.3: Results of the performances of the zootechnic parameters obtained during the experimental try

Indices	Tank 7		Tank 8	
	A	B	A	B
Weight Initial (g)	2,5	2,66	2,57	2,59
Weight Final (g)	51,3	48,7	9,04	9,52

Weight gain (g)	48,8	46,04	6,47	6,93
Individual Daily Growth (IDG) (g/j)	0,45	0,43	0,06	0,07
Specific growth rate (SGR) (% pc/j)	2,82%	2,71%	1,17%	1,21%
Survival rate (%)	99,6%	100%	35,2%	15,4%

IV. CONCLUSION

Fish culture, especially that of salmonids, requires the mastery of basic physicochemical parameters, namely temperature, dissolved oxygen, and the potential Hydrogen of the environment, as well as nutrition adapted to each stage of development of the cycle of life. The combination of these two parameters (ecological and food) is the key to all fish production. At the experimental station, key factors such as temperature, oxygen concentration and pH are very favorable. The results obtained (survival rate and growth in weight and size) of the alevins fed by the imported food are very satisfactory (auges A7 and B7), whereas the results obtained in the tanks A8 and B8 (Low growth, very high mortality High, etc.) are attributed to the type of local feed received by the fry during the same trial period. An analysis of this latter diet can answer the various hypotheses raised and which are the causes of poor results obtained. Similarly, this diet can also be a topic of study for later stages (pre-magnification and magnification).

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