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The Effect of Temperature and Diet on the Degrees of Specific Growth Rate Percentage (SGR %) and Weight Growth (WG %) of Angel Fish Fry (*Pterophyllum scalare*)

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Abstract: There are several factors affecting Angel Fish fry's (*Pterophllum scalare*) growth and quality. In this study, the effect of food treatments including dry blood worm, Artemia decapsulated cysts and dry blood worm together with Artemia decapsulated cyst in three temperature conditions i.e., 27, 29 and 31°C on specific growth rate and weight growth of angel fish fry (*Pterophllum scalare*) has been studied. For each food diet three repetitions took place. Thus, 27 aquariums with 30, 40 and 60 dimensions were allocated to the treatments. An observant treatment with 28°C and pollaki as the food was also used. The degrees of these indexes (SGR and WG) were examined in a 6 month experiment. Meanwhile, the other factors including the pH and the oxygen degree were fixed and similar for all treatments. The results showed that the temperature and food type are simultaneously effective on specific growth rate and weight growth of the fish. Among all food and temperature treatments and the observant treatment, the degree of SGR and WG for the fish was believe to be more in the food treatment with 31°C and powdered dry blood worm. This result confirms that temperature and food diet simultaneously affect the Angel Fish fry's SGR and WG.

Key words: Angel fish, temperature, powdered dry blood worm, decapsulated Artemia cyst, specific growth rate, weight growth

INTRODUCTION

Angel Fish (*Pterophyllum scalare*) is a kind of ornamental fish which belongs to tropical regions and is believed to be really beautiful and has variety of colors. This fish belongs to Cichlidae family which its *Pterophyllum* type has three kinds. *Pterophllum scalare* kind, commonly known as Marbel, is so popular and accessible (Endoh and Sprung, 2007).

This fish spawns and takes good care of its spawns, larvae and fry. The number of its spawns in each spawning is 300-400. Spawning in this fish is influenced by different factors including sexual relations (Laplaza and Morgan, 2005). Water for culturing these fish needs to be equipped with a strong filtration in order to clear the food leftovers (Perez *et al*., 2003). These fish prefer acid water and the appropriate temperature for the weight-gaining is 29-31°C, whereas another study believed the proper temperature for culturing and weight-gaining of the Angel Fish is 27°C (Axelrod and Waiker, 2000). In order to prevent the spawn and fry losses, they shouldn't be kept in waters lower than 28°C and the adult types would get a kind of fungus if kept in lower than 20°C environment, an illness which can be cured by increasing the temperature to 35°C and great pumping.

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Angel Fish is omnivorous and the best food for its fry in the first 4 weeks is Artemia nauplii (Laplaza and Morgan, 2005). Afterward, it enters the multi-nutrition phase. Having an appropriate and proper diet is a key factor for culturing and keeping this kind of fish.

In the recent ten years, fish culturing industry in aquariums has scientifically grown a great deal. In addition, aquarium owners use better techniques and equipments for keeping, reproducing and propagating these fish which is related to hydrochemical and hydrobiologic sciences. Among ornamental fish such as Angel Fish the collection process of different breeds and genetic inbreeding have been done by selecting reproductive and best fish according to their beauty, color and resistance against pollution and illnesses. In Iran, Fishery Organization - the authority for aquaculturing - owns a small part of this kind.

The aim of this research is to study the effect of temperature and diet on the degree of Angel Fish fry growth indexes and introducing food and desirable temperature in order to provide efficient conditions for keeping the fry.

MATERIALS AND METHODS

In order to conduct this research in 2008, 28 aquariums in 30, 40 and 60 cm dimensions were built and 30 L water was poured into each. Central pumping equipment characterized with 8 exits, 20 watt power, 20 L min^{-1} air exit, 9908 AS model, plastic diversion with 4 exits, in addition to the hose and related diversions for providing the required air were used. For providing the light all during the research, three fluorescent lamps, each 12 watt, were used. Sixteen hours light and 8 h darkness consisted the lighting period. In order to evaluate the water temperature and the workshop air a thermometer was used and for keeping the quality of aquariums' water, a sand filter was used in each aquarium. For checking and controlling the pH and dissolved oxygen a pH-meter and an oxygen meter were used. The food for the 6 month period research was powdered dry blood worm, decapsulated Artemia and pollaki cyst. The number of Angel Fish fry was 1850 of which 60 were sent to each aquarium and 10% was considered for possible losses. After preparation of the aquariums, the temperature of each was set for conducting the experiment according to temperature treatments in 27, 29 and 31°C.

Aeration was done in order to balance the oxygen, isotherming and letting the harmful gases out. After this phase, the fry were introduced to the aquarium. Letting the newly transferred get used to the new environment, preventing replacement stress and food pollution, they were not fed for the first 12 h. Afterwards, in order to measure the special growth rate multiplied by weight growth indexes, 5 fish were chosen at random from the total 60 fish in each aquarium and their weight and length were measured through a ruler and a digital-0.001gram-accurate scale. The dead samples were ignored after being taken but their number was considered in later statistical calculation.

For the next phase the temperature of each aquarium was set regarding the 27, 29 and 31°C treatments. Food treatments including powered dry blood worm, decapsulated Artemia cyst and a combination of both were given to the fry. Thus, in each temperature treatment, three kinds of food, each with three repetitions took place. Twenty seven aquariums were allocated for these treatments and in order to compare the temperature and food kind experimental treatments, an observant treatment characterized with 28°C as the temperature and pollaki as the food was determined. The fry were fed four times a day with 8 g food for each 30 L aquarium. In order to prevent the food leftovers and fish waste from being piled a siphon was daily used. After the 6 month period was over, in order to measure the fry biometrics, 5 fry were taken from the aquariums at random and the formula below was used to calculate the growth factors SRG (Wantable *et al*., 1993) and WG (Ergun *et al*., 2003):

$$SGR = \frac{L_n w_1 - l_n w_0}{\text{Duration of the experiment (day)}} \times 100 \text{ (Wantable } et\ al.\text{, 1993)}$$

Where:
SGR = Specific growth rate
$L_n w_0$ = Primary weight logarithm
$L_n w^1$ = Secondary weight logarithm

$$WG = \frac{(W_1 - W_0)}{W_0} \times 100 \text{ (Ergun } et\ al.\text{, 2003)}$$

Where:
WG = Weight growth percentage
W_0 = Primary weight
W_1 = Secondary weight

ANOVA was used to examine whether there was any significant differences between different food and temperature treatments. For studying the mean in various treatments, multi-amplitude mean comparison test with 95% trust was used and data analysis was done through SPSS.

RESULTS

The experiment result i.e., temperature and food effect on specific growth rate are shown in Fig. 1.

The experiment results effect of food and temperature on weight growth percentage are shown in Fig. 2.

Using the mean test between SGR index and WG percentage, it became known that there is no significant difference between the temperature treatments regarding the food (p>0/05). The amount of specific growth rate and weight growth percentage mounts through increasing the temperature. The temperature factor is more influential comparing to food diet. The maximum SGR degree belongs to a food treatment in 31°C and with powdered dry blood

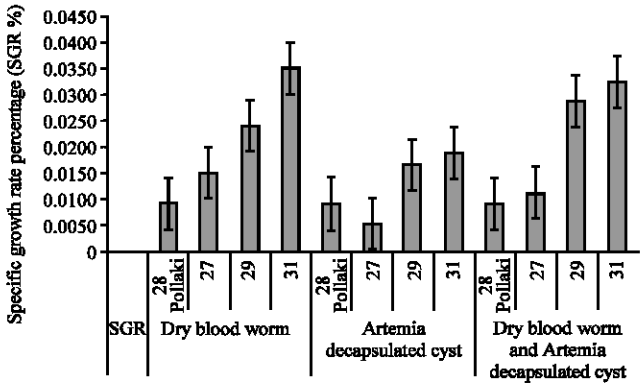

Fig. 1: The SGR regarding the temperature and food in 31°C and consuming dry blood worm was more than other types of treatments and the least one is the treatment with 27°C and decapsulated Artemia cyst consumption

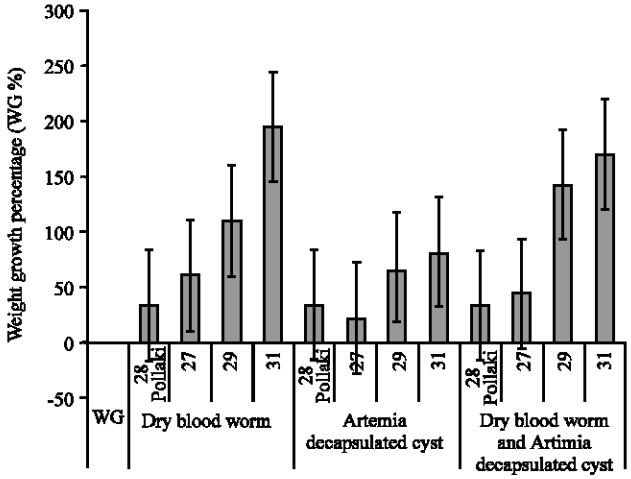

Fig. 2: Weight growth percentage based on the temperature and the food type in 31°C environment and dry blood worm as the food diet was more than all other types of treatments

worm resulting in 0.0350±0.0083 and the minimum amount is the temperature treatment with 27°C and decapsulated Artemia cyst resulting in 0.0053±0.0082. For the weight growth increase, the maximum mean belongs to 31°C temperature treatment and dry blood worm and is 194.444±73.102 and the minimum belongs to 27°C temperature treatment and decapsulated Artemia cyst which is 20.556± 28.148.

DISCUSSION

The results of this experiment show that temperature and the food type are influential on SGR and WG. Based on the research conducted by Axelrod and Waiker (2000), it is believed that the proper temperature for Angel Fish fry's culturing and weight-gaining is 27°C while the outcome of this research considers 31°C as the appropriate temperature (Perez *et al*., 2003).

In addition, according to the studies of Andrew *et al.* (2003) SGR and WG in 31°C are more than 27 and 29°C which is another proof for the current study. Also, based on Ohret *et al.* (2001) rotifer is known to be the best food for Angel Fish Fry and Artemia decapsulated cyst is considered to be the best food for the growth and increase in WG, SGR indexes which is in contrast to the current study's result. In 2003, Lime considered the proper temperature together with appropriate food diet an effective factor for SGR and WG indexes growth which is a proof for the study here.

According to Perez *et al.* (2003) food is less effective than temperature on the degree of these indexes which is in contrast to the current study's result because food and temperature are simultaneously effective on SGR and WG indexes. Since, the amount of SGR and WG in 27°C treatment with dry blood worm or dry blood worm together with Artemia decapsulated cyst was increase comparing to the observant treatment whereas these amount in 27°C treatment with Artemia decapsulated cyst as the food comparing to the observant treatment was decreased and this is the result of simultaneously effect of food and temperature on SGR

and WG. Lima *et al.* (2003) studied the effects of different food diets on Angel Fish fry weight growth. He considered dry blood worm a suitable food for the fry growth which is confirm this study's result.

Axelrod and Waiker (2000) considered temperature and food as effective factors for Angel Fish fry weight-gain which is compatible with the results of this study. The maximum amount of these two indexes was when in 31°C and using dry blood worm, whereas the lowest amount belongs to 27°C and decapsulated Artemia cyst. Andrew *et al.* (2003) in addition to food, considered temperature a key factor for SGR and WG indexes, another proof for the study here; whereas Laplaza and Morgan (2005) believed temperature is ineffective on the amount of the mentioned indexes.

Taking into consideration all the above-mentioned researches and having them all as a proof, what the current study concludes is that temperature and food kind are simultaneously effective for WG and SGR indexes and none are ineffective. Temperatures more than 27°C are positive on the indexes and 31°C is the ideal temperature.

Further studies and researches are crucial for expanding reproduction and culturing ornamental fish. It is suggested that the temperature and food changes in addition to the effects of various storage densities on Angel Fish or other kinds of aquarium fish must be studied and researched so that achievements can be gained in the field of ornamental fish culturing.

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