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Effect of Growth and Pigmentation on Acceptability of Different Feeds by *Colisa lalia* (Hamilton, 1822)

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Abstract: Bright colouration always attracts the people; it is also true in case of ornamental fish. The colour creates a natural eye catching environment to the visitors, Buyers and hobbyist. Now, it is well established that the colour of ornamental fish can modify by the feed. In case of fish, without dietary addition of carotenoids leads to dull colour resonance. Which leads to poor market demand and it's directly related to the profitability *i.e*. determine their market demand and price. In the present study, an experiment was conducted to evaluate the efficacy of four different types of feed (Living Tubifex, Dried Tubifex, Dried Daphnia and commercial food) for *Colisa lalia* (Hamilton, 1822). Carotenoid content and specific growth rate (SGR) of the fish were analyzed after the treatment and *Colisa lalia* consume the live organisms more efficiently than the artificial feed. The Living Tubifex gave the best result for *Colisa lalia* to increasing the colouration and growth.

Keywords: Indigenous Ornamental fish, carotenoids, fish feed, *Colisa lalia*, Specific growth rate.

1. Introduction

Ornamental fish farming is among the most valuable industries in the recent times. Ornamental fishes are often referred as living jewels due to their colour, shape and behaviour. They are peaceful, generally tiny, attractively coloured and could be accommodated in confined spaces. Among the different characteristic of ornamental fish, the colour is the prime and important quality for selection and propagation to the hobbyist in the ornamental fish trade (Mandal *et al*., 2010). The indigenous ornamental fish *Colisa lalia* already well established ornamental fish worldwide (Saha *et al.,* 2013). From the commercial point of view, the bright and natural colouration is of very important in case of ornamental fish. Like other animals, fish also cannot synthesize carotenoids, and they should provide them through a feed (Sommer *et al*., 1992). So, supplementation of carotenoids is essential to enhance the colour performance in case of ornamental fish. In controlled experiments, use of different carotenoid sources in different concentration has a significant effect on body colouration of fishes (Sommer *et al*., 1991; No and Storebakken, 1992; Smith *et al*., 1992; Storebakken and No, 1992; Meyers, 1994; Hatlen *et al*., 1995, 1997; Diler *et al*., 2005; Ingle de la Mora *et al*., 2006; Yanar *et al*., 2007). The effect of carotenoids in addition to the diets of ornamental fish have also shown good performance in case of Goldfish and Koi carp (Gouveia and Rema, 2005), Neon Serpae Tetra (Wang *et al*., 2006), and Guppies (Grether *et al*., 1999). Fish size and age is an important factor in order to carotenoid deposition (Hatlen *et al*., 1995). By different experiment, it is proved that carotenoids were better assimilated at the time of sexual maturity. Body colour patterns are important for animals because they can function in inter- and intraspecies communication and provide camouflage, thermoregulation and protection against solar radiation. In many taxa, colour patterns are caused by large star-shaped pigment containing cells, chromatophores, which are located in the skin. The chromatophores are grouped into subclasses based on the colour of their pigment containing organelles: xanthophores (yellow), erythrophores (red/orange), iridophores (reflective/iridescent), leucophores (white), melanophores (black/brown) and the more rare

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cyanophores (blue). Ornamental aquaculture is the most popular industry worldwide. The colour intensity of ornamental fish makes them more attractive to the hobbyist (Rezende *et al*., 2012). Among the same species and lineages, the most colourful fish get preference and more attractive to the consumer. This is one of the main factors that determine the price. The multiple colour patterns found in the fish depend on multiple interactions between the pigments in the integumentary cells, known as chromatophores, and it is the result of the combination between the different types of chromatophores (Odiorne, 1957; Fujii, 2000). Literature review indicated that ornamental fish require between 50 and 400mg/L of synthetic or natural carotenoids (e.g., red pepper and marigold extracts) in their diet to develop colour similar to those of fish eating live foods (Boonyaratpalin and Lovell, 1977; Fey and Meyers, 1980; Lovell, 1992). Although the ornamental fish industry is one of the most valuable agricultural commodities in the country, there is little published information on feeding practices. Ornamental fish in captivity need to utilize their dietary protein with the utmost efficiency, as the breakdown products of protein metabolism (mainly ammonia) will directly pollute their living environment (Pannevis, 1993; Ng *et al*., 1993; Earle, 1995; Pannevis and Earle, 1995). As fish cannot synthesize these pigments, they rely on dietary supply of carotenoids to achieve their natural skin pigmentation, one of the most important quality criteria informing the market value of ornamental fish (Paripatananont *et al.*, 1999; Lovell, 2000; Gouveia *et al.*, 2003). The conspicuousness of the carotenoid-based colouration is considered as a reliable indicator of the foraging ability of individuals for carotenoid-rich foods. The present paper tries to communicate the efficacy of different commercially available feed and a live feed for better growth and colouration.

2. Materials and Methods

For the present experiment, *Colisa lalia* was chosen as sample specimen. The samples were more or less uniform size (2.5cm in length and 194mg in Weight) of 30 days age. The fishes were collected from an ornamental fish farm. Before the beginning of the experiment, the sample specimens were being acclimatized in the well maintained aquaria for 10 days. Aquaria were labelled as 1, 2, 3 and 4 respectively and each of which contained 20 fishes. The fish were fed with Living Tubifex, Dried Tubifex, Dried Daphnia and commercial food were given as twice a day. The experiment was conducted for a period of 120 days. At the end of the experiment, the total carotenoids were estimated. The caudal fin and muscle of the specimen fish (*Colisa lalia*) was collected to carry out before the start of the experiment and after 120 days of the experiment (BioAstin/ Naturose^{TM} Technical Bulletin #020, 2001). This procedure carotenoid and astaxanthin quantity was measured from the different types of feed used in the experiment. To calculate the growth pattern, SGR (specific growth rate) of each of the fishes measured at the end of the treatment. The specific growth rate (SGR) of the fish was calculated using the formula:

$$\mathbf{SGR = (\ln Wf - \ln Wi)/T \times 100}$$

Where, Wf = final average weight, Wi = initial average weight, and T = time in days.

3. Result and Discussion

There are four types of fish feeds used in the present study. It was observed that the food preference and food consumption was in the following order of the aquarium number 1> 3> 2>4. It was also observed that the better growth in terms of body length and weight was also found in the above order at the end of the experiment. It was also found that the SGR of the fish that fed living Tubifex was significantly higher than the fishes of the other aquaria. The Specific growth rate (SGR) of the fish (*Colisa lalia*) also followed the same order *i.e*. 1>3>2>4. To determine the colour intensity, it is essential to measure approximate astaxanthin value. Result showed the approximate astaxanthin value in the aquarium 1 than the aquarium 3 than the aquarium 2 and 4. Samples were collected from the muscle and caudal fin of the fish to measure approximate astaxanthin value (Mandal *et al*., 2010). During the estimation of approximate astaxanthin of the fish feeds, living Tubifex showed the maximum value comparable to the other feeds. The order of the approximate astaxanthin content of the other fish feeds was commercial food > Dried Tubifex > Dried Daphnia. Fish metabolizes carotenoids before depositing them on natural receptors in the skin (Miki *et al.*, 1985; Matsuno *et al.*, 1985; Katsuyama *et al.*, 1987; Katsuyama and Matsuno, 1988). The maximum amount of astaxanthin in the caudal fin and the muscle of the *Colisa lalia* was observed that fed living Tubifex.

Table 1. Mean total length and weight of *Colisa lalia* fed with different types of feed.

Tank	Length (±) (cm)	% increase in length	Weight (±) (mg)	% increase in weight	SGR
Initial	2.45 ± 0.071	-	0.189 ± 0.018	-	-
Living Tubifex	3.21 ± 0.157	31.02	0.286 ± 0.018	47.61	0.011
Dried Tubifex	2.67 ± 0.138	8.97	0.227 ± 0.0163	20.10	0.042
Dried Daphnia	2.59 ± 0.141	5.71	0.219 ± 0.014	15.87	0.033
Commercial food	3.03 ± 0.247	23.67	0.233 ± 0.0186	22.75	0.488

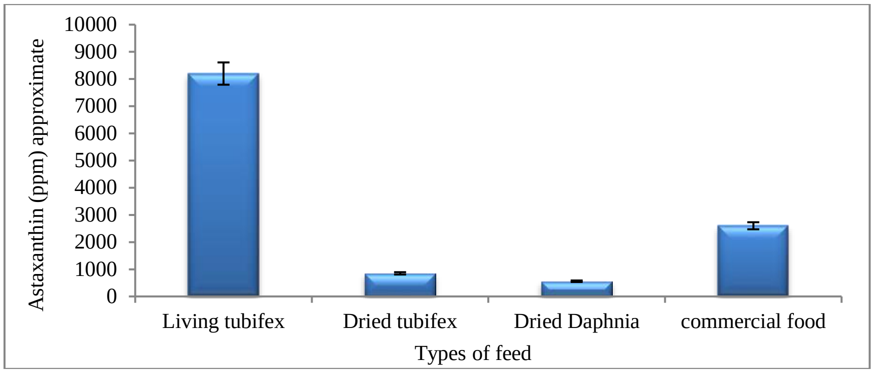

Fig. 1. Amount of approximate astaxanthin present in different type of fed.

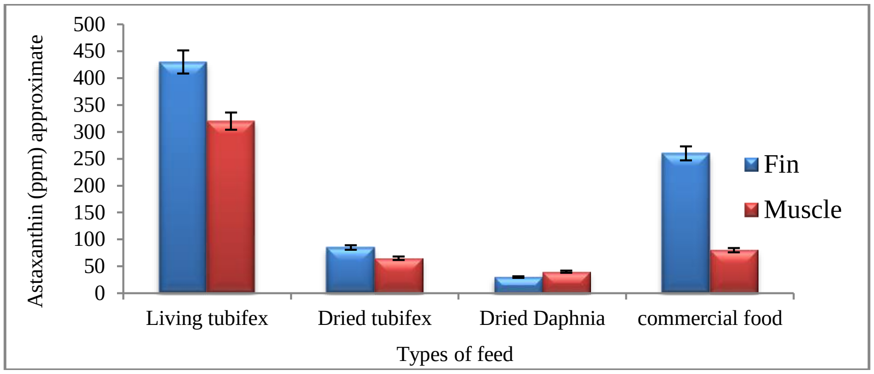

Fig. 2. Amount of approximate astaxanthin present in Fin and muscle of *Colisa lalia* after the end of experiment.

4. Conclusion

As colour is one of the main factors in determining the value of fish, it becomes necessary to develop a process to evaluate the effects of different sources of pigments and the effects of various levels of dietary supplements on the colour intensity of the ornamental fish skin. Knowledge of ornamental fish nutritional requirements has evolved primarily from the experiences of individual farmers (Socolof, 1980). Various live organisms have been used for rearing larval fish. *Chironomus larvae* are an excellent food source for various fish species, particularly the carnivorous aquarium fishes such as the Siamese fighting fish, Oscar, Discus and Cichlids (Shim, 1986). Tubifex has long been known to enhance growth and reproduction in some aquarium fishes (Shim, 1986). In freshwater ornamental fish culture, Moina used to be the most common live feed organism for feeding young fish in the industry (Lim *et al.*, 2001). So, from the above study, it may conclude that the living Tubifex has an excellent growth and colour formation effect on indigenous ornamental fish *Colisa lalia* (Hamilton, 1822). The present work may increase the interest and selling trade of common ornamental fish farmers.

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