Influence of Astaxanthin and β-carotene on Kissing Gourami (*Helostoma temminckii*) Colouring

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Abstract
This study evaluated the role of carotenoids in regulate the skin color of Kissing Gourami (*Helostoma temminckii*). 40 fishes were randomly selected into 2 groups (20 each group). Control group was fed with standard flake feed. Astaxanthin (12mg/kg) and β-carotene (157 mg/kg) were added to the standard diet for experimental group. Fish skin colour was compare with colour scale. Colour change was recorded weekly for the 12 weeks of experiment. First colour change was record in 5 th week in control group. No other change of colour was determinate. In experimental group was first colour change in 3rd week and the maximal influence of carotenoids was recorded in 8th week. No other colour change was record in experimental group to the end of experiment.

Keywords: Astaxanthin, β-carotene, colour scale, Kissing Gourami

1. Introduction

Carotenoids are biosynthesized by plants, algae, and certain yeast and bacteria [1]. Carotenoids are responsible for the red, orange, and yellow colors of fish and crustaceans [2]. Pigment cell distribution may be patterned by long-range signaling influences. One popular class of such models is based on reaction-diffusion mechanisms [3]. Generation of diffusible activator and inhibitor molecules from a localized source may result in the formation of a striped or spotted pattern of activator concentration, with the precise pattern regulated by, for instance, size of the developmental field and diffusion coefficients of the activator and inhibitor molecules [4, 5]. Pigment cells are proposed to respond to the local levels of activation, giving a visible readout of the activation pattern. Pigment cells might be patterned by interaction with local tissues, i.e. environmental cues [6, 7]. Dietary carotenoids play an important role in regulating fish color because fish, like other animals, are unable to synthesize carotenoids and their skin color is highly dependent on carotenoids from the diet [8]. Farmed fish have no access to carotenoids from natural food, necessary carotenoids must be obtained from their diet to maintain their bright coloration [9]. The focus of this study were to manipulate the type of carotenoids (astaxanthin, β-carotene) and their doses in the diet of Kissing gourami (*Helostoma temminckii*) and to examine if fish color expression is related to pigment intake.

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2. Materials and methods

Fish, feed and rearing conditions

Trial was undertaken with Kissing Gourami (*Helostoma temminckii*) in 8 weeks age for period 12 weeks. 40 homogenous fishes were randomly distributed in 2 tanks. First tank (control group)

fishes were fed standard flake feed and second tank (experimental groups) fishes were fed standard flake feed with astaxanthin and β-carotene (Table 1).

Table 1. Composition of the control and experimental diets

Composition	Control group	Experimental group
Crude protein	48%	48%
Crude fat	7%	7%
Ash	8%	8%
Astaxanthin	-	120 mg/kg
β-carotene	-	157 mg/kg

In both groups, fishes were fed by hand *ad libitum* three times a day (6:00 am, 2:00 pm and 10 pm). The water condition of tanks is shown in Table 2. Natural photoperiod was used during the experiment.

Table 2. Water condition in control and experimental group

Water temperature	24 °C
pH	6.5
NO_2	max. 0.1 mg/l
water hardness	15°dGH

Colour determination

Fish skin colour was compare with us designed scale shown in Figure 1.

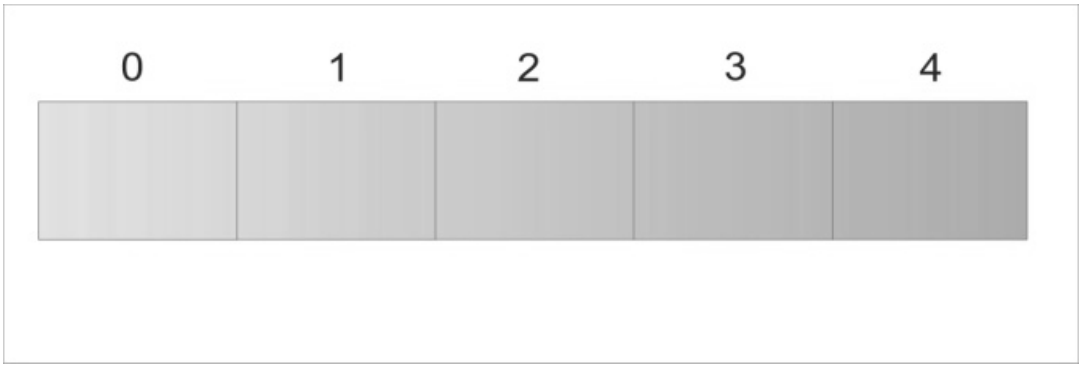

Figure 1. Colour scale

The compare were performed on both sides of the dorsal fish skin weekly and colour changes was recorded. Colour scale present 5 colour described by degree (Table 3).

Table 3. Colour scale

Degree	Colour
0	silver (unchanged)
1	light pink
2	pink
3	light red
4	red

3. Results and discussion

Table 4 present chronological colour changes in both tanks (control and experimental) during 12 weeks.

Table 4 Colour change in control and experimental group

Weeks	Colour scale			
	Control group		Experimental group	
	degree	colour	degree	colour
1.	0	silver (unchanged)	0	silver (unchanged)
2.	0	silver (unchanged)	0	silver (unchanged)
3.	0	silver (unchanged)	1	light pink
4.	0	silver (unchanged)	1	light pink
5.	1	light pink	2	pink
6.	1	light pink	2	pink
7.	1	light pink	2	pink
8.	1	light pink	3	light red
9.	1	light pink	3	light red
10.	1	light pink	3	light red
11.	1	light pink	3	light red
12.	1	light pink	3	light red

In control group fed with standard flake feed from begin of experiment to 4 weeks was not record colour change. First colour change was determinate in 5th week of experiment. From 5th week to end of experiment was not record other colour change and the colour of fishes was similar with 1 degree of colour scale. During 2 weeks of experiment was not record colour change in experimental group. In the 3 rd week was record colour change equal with 1 degree of colour scale. The colour of fishes was similar with 2 degree of scale in 5th week during 7th week of experiment. In 8th week was colour of fishes compare with 3 degree of scale. No other colour change was record to end of experiment. Maximal colouring of fishes was compare with 3 degree of scale caused by Astaxanthin and β-carotene.

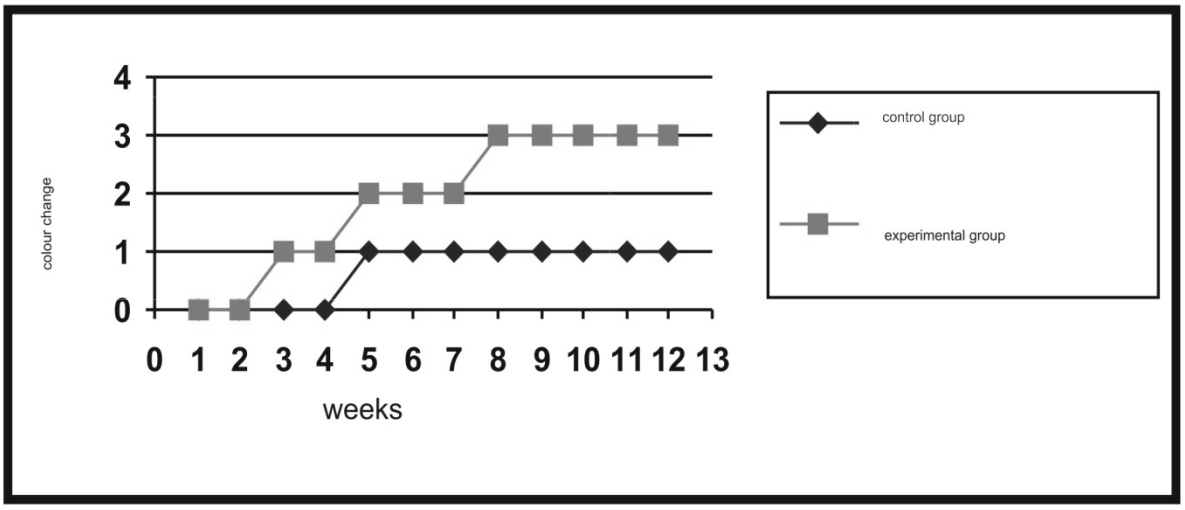

Figure 2. Schematic colour change in control and experimental group

4. Conclusions

First colour change was record in 5th week in control group. No other change of colour was determinate. In experimental group was first colour change in 3rd week and the maximal influence of carotenoids was recorded in 8th week. No other colour change was record in experimental group to the end of experiment. Astaxanthin and β-carotene added to standard feed can regulate fish color.

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