ISSN No:-2456-2165

Effect of *Delonix regia* (Gulmohar) on Colouration of Gold Fish *Carassius auratus*

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Abstract:- Skin colour is one of the most significant factors in determining the attractiveness and, thus, the commercial value of ornamental fish. In the present study, an attempt has been made to assess the effect of *Delonix regia* (Gulmohar) on the colouration of goldfish (*Carassius auratus).* Experimental fish species *(Carassius auratus)* were cultured for 90 days. The experiments were carried out in glass aquariums. The experimental diets were prepared with *Delonix regia* powder as a carotenoid source. One set of control and three sets of experimental groups were maintained. Three different experimental diets and one control feed were given twice a day to all the fish. *Delonix regia* powder concentration at levels of 5%, 10%, and 20% in experimental feed at the end of the experiment, the carotenoid concentration was found to be lowest in control group 0.56±0.01 µg/g with wavelength 620nm and 0.56±0.01 with wavelength 680 nm. Pigmentation was the highest in the treatment 3, 5.69±0.01 µg/g with wavelength 620nm and 5.09±0.01 µg/g with wavelength 680 nm. The results of the experiment, which recorded colour values, clearly showed that fish-fed diets containing added pigment have better colour.

Keywords:- *Delonix regia, β-carotene, Colour, Enhancement, Ornamental Fish, Market Demand, Carotenoids.*

I. INTRODUCTION

Aquaculture sector represent a major and rapidly expanding industry that produces goods and services that are vital to the country's food supply, nutrition, socioeconomic advancement, and ability to support a sizable portion of the population. Fish that are decorative are valued commercially based on their attractive coloration. Fish skin coloring is primarily derived from carotenoids. Fish consume aquatic plants or get their carotenoid needs from their food chains when they are in their natural habitat. In the global aquarium fish market, color is one of the main determinants of pricing. India's rapidly expanding ornamental aquaculture industry requires true innovation and cutting-edge application to advance and compete on the global stage. Fish with brilliant colors are highly valued in the ornamental fish trade. Ornamental fish are distinguished by a wide range of colors and color patterns. Apart from its role in color development, carotenoids are important for growth, metabolism, and reproduction. Anthocyanins are responsible for the colour of fish. Red, purple, and blue plants get their rich color from pigments called anthocyanins, which have antioxidant properties. The goldfish must be colored to have an orange-red hue in order to elicit customer approval and a decent market price. *Delonix regia* commonly known as gulmohar in Hindi. It is also rich in carotenoids. Plants and flowers have been used for health and colour of enhancement of fish. *Deonix regia* flower is mainly display of red- orange bloom.

The red, orange, and yellow colors of fruits, flowers, and plant legumes are caused by carotenoids. Supplemental natural pigments that intensify ornamental fish colors should be included in diets designed to improve color.

II. MATERIALS AND METHODS

This study aimed to investigate the different concentrations of diets based on *Delonix regia* flower powder meal influenced the colour enhancement of *Carassius auratus.*

- *Fish and their acclimatization*

The experimental fish, *Carassius auratus*, were obtained from ornamental traders and acclimated to laboratory conditions in the FRP tank. They were transferred to the wet laboratory in double layer plastic bags with proper aeration. They were carefully transferred to a FRP tank and left undisturbed for the whole night. In order to ameliorate the handling stress, the fish were given a mild salt treatment the next day. The stock was acclimatized for two weeks under aerated conditions to equalize their body carotenoid content. The fish were fed a control diet with no carotenoid sources added. About 20 percent of the water exchange was done daily during the acclimatization period. The uneaten feed and faecal matter were also removed to maintain good water quality. Twelve glass aquariums were used, and ten fish were placed in each tank.

- *Experimental design*

Delonnix regia flower powder served as a test component, and the test diets were created with different levels of substitution. The aquarium tanks used for the experiments were 2x1x1 feet in size. Twelve aquariums were set up in the wet laboratory. Aquariums are located in a secure place with no direct sunlight, and all windows are covered with a green sheet to prevent algal growth in the tank. Ten fish

were stocked in each aquarium, and triplicates were maintained.

➢ *Processing of Delonix regia meal*

Delonix regia flowers had been obtained from the College of Fishery Science, Jabalpur. The flowers had been dried under shade and then subjected to grinding. They had been converted into a fine powder by the grinder, and they had been stored at room temperature.

➢ *Experimental feed preparation*

The experimental feeds were prepared with basic ingredients such as rice bran, wheat bran, fish meal, vitamin mineral premix, mustard oil cake, and fish oil obtained from the market. *Delonix regia* flower powder was used as a carotenoid source. An electric grinder was used to reduce the basic, moisture-free elements of the experimental diet to a powder. The powdered ingredients were sieved through a fine-meshed sieve (No. 36). The powdered ingredient mixture was mixed completely with a small amount of water to prepare the dough and cooked in a pressure cooker for 10–15 minutes. One paste was kept as a control feed. The other parts of dough were used for mixing the colour enhancing ingredient at three different concentrations. The hand-operated pressing machine used to make noodles has pores that are 2.0 mm in size. After the noodles were made, they were dried in the sun and stored in airtight bottle.

Table 1: Formulation and composition of experimental diets, (gm/100gm)

Ingredients	Control diet	Treatment 1	Treatment 2	Treatment 3
Rice bran	35	30	30	25
Wheat bran	20	20	15	10
Mustard oil cake	15	15	15	15
Fish meal	15	15	15	15
Vitamin mineral premix	10	10	10	10
Fish oil	05	05	05	05
Delonix regia	-	05	10	20
Total	**100**	**100**	**100**	**100**

➢ *Feeding procedure*

Carassius auratus were given diets containing 5% of their body weight. The experimental fish were fed experimental feed (with colour enhancers), and a control diet (without colour enhancers) was given to the control group of fish. Each aquarium's experimental fish were fed twice a day, in the morning and the evening, with an approximate 10 grams each day.

➢ *Spectrophotometric analysis*

Skin samples of fish were taken from a regular spot between the ventral and dorsal regions on the left side of the animal, and the fat layer was then removed. One gram of goldfish *(Carassius auratus)* body skin was removed. The 10-ml pre-weighed glass vials held these samples. After being refrigerated for three days, the samples were extracted three or four times until no color was left. Weighing the skin samples, acetone was used to remove the carotenoid until no color was observed. Acetone was used to make extractions up to 10 ml in volume, and for five minutes, the fluid was centrifuged at 5,000 rpm. After that, the sample was put into 5-ml glass vials that were sealed. For comparison, a blank has been made in a similar manner. The results were interpreted using the optical density values at the wavelength of maximum absorption. The carotenoid content was expressed in µg per tissue's net weight. The computation made use of the wavelength at which maximum absorption was observed.

➢ *Statistical analysis*

The investigation used a complete randomized design with three replications for each of the treatments. One-way ANOVA with the factorial CRD. The 0.05 level of significance was used. The statistical analysis and ANOVA was carried out using OPSTAT. The results were presented as the mean ± standard error (Mean±S.D.) for the relevant effect. The statistical significance was determined at $p<0.05$.

III. RESULTS

Delonix regia powder concentration at levels of 5%, 10%, and 20% in experimental feed. Notably, a level of significance ($P<0.05$) was observed. The carotenoid content of the fish was determined at the conclusion of the experiment. Skin samples were used for the quantification of the total carotenoids. Fish given control diets showed a lower carotenoid concentration than those fish fed meals supplemented with increased pigment levels. The lowest value was recorded in the control group (0.56±0.01) with the wavelengths of 620 nm and 680 nm. The highest value was recorded in T3 with the wavelengths of 620 nm (5.69 ± 0.01) and 680 nm (5.09 ± 0.01).

Table 2: Total carotenoid content (**µ**g/g) with wavelength of 620nm and 680nm

Treatments	Total carotenoid content (µg/g) with 620 wavelength nm	Total carotenoid content (µg/g) with 680 wavelength nm
Control	0.56±0.01	0.56±0.01
Treatment-1	0.72±0.01	0.73±0.01
Treatment-2	1.97±0.01	1.69±0.01
Treatment-3	5.69±0.01	5.09±0.01

IV. DISCUSSION

The current study showed that the total carotenoid concentration in goldfish was highest in treatment 3, 5.69±0.01 µg/g with wavelength 620nm and 5.09±0.01 µg/g with wavelength 680 nm, higher than the control group, and minimum at 0.56±0.01 µg/g with wavelength 620nm and 0.56±0.01 with wavelength 680 nm in the control group.

Fish pigmentation is influenced by both the amount of supplementation in the basal formulation and the concentration of dietary pigments. The use of different carotenoid sources at different levels significantly affects the body colour of fish. In the present study the Feed was supplemented with *Delonix regia* meal at three different concentrations: 5, 10, and 20%. Among three concentrations used, *Delonix regia* at 20% yielded the best result with regard to the colour of goldfish. According to the results, carotenoids play an important role in the colouring of goldfish. Carotenoid diets are very effective for goldfish pigmentation and are useful in order to enhance colour. Carotenoid is an essential nutrient for all ornamental fishes.

V. CONCLUSION

The study found that feeding *Delonix regia* to goldfish *(Carrassius auratus)* improves its color pattern and makes it a good source of carotenoids. The fish fed with 20% *Delonix regia* in feed had the highest total carotenoid level. The diet incorporated with *Delonix regia* powder was acceptable to the ornamental goldfish. *Delonix regia* is an effective colour enhancer.

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