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# Carrot Waste and Beetroot Waste Supplemented Diet Promoting Carotenoid Changes in Freshwater Goldfish *C.Auratus*

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***Abstract:*** **An attempt has been made to assess the efficiency of carrot waste and beetroot waste added diets on variation in biochemical constituents and total carotenoids in skin and muscle tissue of Goldfish *C.auratus*. For this isonitrous (37% protein) diets (CWD and BWD) supplemented with carrot waste 5% and beetroot waste 5% were prepared individually and offered to the candidate fish in 5% body weight at *ad libitum* for a period of 40 days. Simultaneously a control diet (CD) with 37% protein but devoid of neither carrot waste nor beetroot waste also prepared and used for experimentation. The results indicated that in the skin and muscle tissue of candidate fish, the protein, carbohydrate and lipid contents were found to varied between diets and also during various time intervals of experimental period. In carrot waste supplemented diet fed fishes, the skin and muscle protein content varied from 4.32±0.38 to 6.49±0.16 mg/100mg wet tissue and from 7.05±0.49 to 9.30±0.01mg/100mg wet tissue respectively. Likewise,in beetroot waste fed fishes, the skin and muscle protein content varied from 4.32±0.38 to 6.66±0.09mg/100mg wet tissue and from 7.05±0.49 to 9.47±0.30mg/100mg wet tissue respectively, But in control diet fed fishes, the skin and muscle protein content recorded was less when compared to experimental diets (CWD and BWD) fed groups and here the values registered were 4.32±0.38 to 6.16±0.05mg/100mg wet tissues and 7.05±0.49 to 8.55±0.27mg/100mg wet tissues. More or less a similar trend was noticed for the skin and muscle carbohydrate and lipid contents of experimental fishes, which received CWD and BWD diets. The dietary addition of carrot waste and beetroot waste has also influenced the total carotenoid content in the skin and muscle tissues *of C.auratus*.**

***Keywords:*** **Carrot, Beetroot, Carotenoid, *Carassiusauratus*.**

## 1. INTRODUCTION

Ornamental fishes are rapidly gaining importance now a days because of their aesthetic and immense commercial value in the export trade world over. Ornamental fishes are characterized by a wide diversity of colours. Colour patterns and success in the ornamental fish trade is very much dependent on the bouncy colour of the fish. Colour is one of the major factors which determinesthe price of aquarium fish in the world market (*Saxena*, 1994). Attractive colouration determines the commercial value of ornamental fishes. Pigmentation in the skin is responsible for the colouration in the fish. Carotenoids are the primary source of the pigmentation on the skin of fishes. In natural environment, the fishes meet their carotenoid requirements by ingesting aquatic plants or through their food chains.

Colouration and hence, pigmentation plays an important role in both ornamental and food fishes such as gold fish, koi, salmon, trout, sea bream and prawns. Normally, the 'quality' of the fish is based on the pigmentation. The colour of fish might also bring some other meanings for certain people. For example, red-coloured fishes such as koi and gold fish will be more attractive and higher priced as the Chinese, Taiwanese and Japanese consider them more auspicious.

People involved in the trade of ornamental fish are constantly exploring methods of enhancing skin colouration. In addition to enhancing colouration of the fish different pigments used in the diets are also reported to give better results of growth (*Ezhilet al., 2008).*

Fish are coloured in nature often show faded colouration under intensive culture conditions. Fish, like other animals do not synthesize carotenoid and depend on dietary carotenoid content for the colouration. Hence, a direct relationship between dietary carotenoids and pigmentation exists in them (*Haltenet al.*, 1997). The most used synthetic colouring matters are astaxanthin and canthaxanthin (*Yesilayer et al.*, 2008).

## 2. MATERIALS AND METHODS

**Collection and maintenance of experimental fish:**

For the present experiment, goldfish *Carassiusauratus*, a red variety obtained from a local commercial aquarium centre was kept under quarantine conditions for two weeks and then acclimatized to the experimental conditions. During this period, the fish were fed with control diet (Basal diet) at 5% of their body weight. The fishes with same colour and initial weight of 3.0±0.5g were selected. The fishes were starved for two days before taking the initial weight in order to evacuate their gut contents.

**Feed preparation:**

In the present study, three diets (CD,CWD,BWD) were prepared. The ingredients such as fish meal (30.28%), chicken intestine (30.28%), rice bran (19.72%), maida (18.72%) and vitamin mix (1%) were used for the basal diets. The control diet (CD) was prepared with the above mentioned basal feed ingredients and it was devoid of carotenoid supplement. The experimental diets (CWD and BWD) were prepared by the addition of carotenoid feed supplement such as powered Carrot and Beetroot at 5% level and were added separately in the basal diet. The dried dietery ingredients were weighed according to the formulation and mixed well by adding sufficient quantity of water and made into dough. The dough was steamed in a pressure cooker for 20 minutes. After steaming, the dough was taken out and then vitamin and mineral mixture and the carotenoid supplementation were added (Carrot waste and Beetroot waste) and remixed. Then it was extruded through the pelletizer having a diameter of 1.5mm die. The control as well as the experimental diets were dried in room temperature to avoid the carotenoid loss. The dried pellets were stored individually in a air-tight plastic container for further use.

**Experimentation:**

To test the efficiency of Carrot waste and Beetroot waste supplemented diets on *C.auratus* indoor culture experiment was carried out for a period of 40 days. During this experimentation, fishes were cultured in 200l plastic trough at the rate of 10 fish per trough and were collected and 5% body weight. Everyday morning unfed remains were collected and 50% water exchange was made. The water quality parameters such as dissolved oxygen > 5.8mg/l, pH (7.6), temperature (28.7ºC), ammonia (0.2mg/l) were maintained at the optimum level and continuous aeration was also provided. During experimentation, fishes were withdrawn at frequent intervals (10,20,30 and 40 days), sacrified and the muscle and skin tissues were dissected out in aseptic condition and were used for further analysis.

**Chemical analysis:**

Biochemical constituents such as protein (Lowry*etal., 1951*), carbohydrate (Seifter *etal*., 1950) and lipid (Folch*et al*., 1959) contents of the muscle and skin tissues of control and experimental diets fed fishes were measured individually by following the standared methods. Quantitative estimation of carotenoid was also made in the respective tissue samples using spectrophotometer.

**Carotenoid analysis:**

The carotenoid content of skin and muscle were extracted following the method of Torrissen and Naevdal (1984). Muscle and skin (500mg) samples were ground in acetone and methanol solvent system separately with a homogenizer. In each solvent system, the extraction was done repeatedly to get all the carotenoids. The total extracts were pooled individually for acetone and methanol, centrifuged at 5000rpm for 15 minutes and then optical density was measured in a spectrophotometer at 444 nm.

**Statistical analysis:**

The results obtained in the present study were subjected to statistical analysis (Mean ± SD, ANOVA and Regression) following the standard methods described in Zar (1974).

## 3. RESULTS

Table 1 provides the data on biochemical constituents in the skin and muscle tissues of *C.auratus* fed with CWD and BWD supplemented diets for different duration i.e., 10,20,30 and 40 days. The tested biochemical constituents (protein, carbohydrate and lipid) showed much variation between control, CWD and BWD supplemented diet fed groups. In CWD supplemented diets fed groups, the initial (0day) protein content in the skin tissue was 4.32±0.38mg/100mg wet weight. In the experimental period, it was high and varied much from 4.84±0.17 to 6.49±0.16mg/100mg wet weight respectively in 10 to 40 days fed fishes(Table 1). The skin carbohydrate content of C.auratus was 2.42±0.33mg/100mg wet weight on 0 day and it ranged from 2.80±0.02 to 3.89±0.21mg/100mg wet weight for 10 to 40 days fed experimental fishes (Table 2). The initial (0day) skin lipid content was 1.95±0.33mg/100mgwet weight and during experimental period it ranged from 2.16±0.05 to 3.52±0.11mg/100mg wet weight (Table 3).

Likewise, the muscle protein, carbohydrate and lipid contents of CWD supplemented diets fed fishes also showed much variation. The initial (0day) protein content of muscle tissue was 7.05±0.49 and during experimental period it ranged from 7.86±0.05 (10 days) to 9.30±0.01mg/100mg wet weight (40days). More or less a similar variation was also noticed for skin carbohydrate and lipid contents (Table1)

In beetroot supplemented diet, the protein content registered in the skin tissue of experimental fish were (Table 1); 4.94±0.07(10days), 5.57±0.08 (20days), 6.10±0.09 (30days) and 6.66±0.09mg/100mg wet weight (40days); whereas at the initial period, it was 4.32±0.38mg/100mg wet weight. The skin carbohydrate content ranged from 2.42±0.33 during 0 day to 3.94±0.02mg/100mg wet weight in 40 days experimental groups (Table 2). Likewise, the skin lipid content of initial and experimental fishes was ranged from1.95±0.33mg/100mg wet weight to 3.60±0.01mg wet weight respectively for initial and 40 days fed fishes (Table 3).

The protein, carbohydrate and lipid content of muscle tissue of C.auratus fed with beetroot supplemented diet also showed much variation. The initial (0day) muscle protein content recorded was 7.05±0.49mg/100mg wet weight and in experimental group it ranged from 7.92±0.06 to 9.47±0.30mg/100mg wet weight (Table 1). The carbohydrate content also varied from 4.75±0.61mg/100mg wet weight (0 day) to 6.62±0.14mg/100mg wet weight (40days)(Table 2). Likewise the lipid content during initial period (0day) was 1.11±0.07mg/100mg wet weight and in experimental group, it ranged from 1.71±0.04 (10days) to 2.83±0.19mg/100mg wet weight (40days) (Table 3).

Compared to that of those fishes fed on experimental diets, the changes in tissue biochemical constituents was not much obvious in control diet fed groups. For instance, the skin protein content was fluctuated between 4.32±0.38 to 6.16±0.05mg/100mg wet tissue during initial and 40$^{th}$ day of the experiment (Table 1). Similarly, the muscle protein content was ranged between 7.05±0.49 and 8.55±0.27mg/100mg wet tissue respectively during 0 and 40$^{th}$ day of the experiment (Table 1). The trend noticed for the changes in skin and muscle carbohydrate and lipid contents was similar to that of noticed for protein content.

**Total carotenoid content in the skin tissue:**

The total carotenoid content in the acetone extract of skin tissue of *C.auratus* fed with CWD supplemented diet was high when compared to methanol extracted skin tissues. Further among the tested diets, the total carotenoid content was more or less same in CWD and BWD supplemented diet fed fishes, and it was less in control diets fed groups. For instance, the total carotenoid content in the acetone extracted skin of *C.auratus* fed with CWD supplemented diets varied from 1.40±0.41 (0day) to 2.55±0.043µg/g wet tissue (40$^{th}$ days of experiment). In the skin of same diets fed fishes, but extracted with methanol, the total carotenoid content varied from 0.45±0.20 (0 day) to 1.15±0.097µg/g wet tissue (40$^{th}$ day) .On the other hand, In control diet fed group, the initial and final skin carotenoid content varied from 1.40±0.41 to 1.97±0.10µg/g and from 0.45±0.20 to 0.72±0.03µg/g wet tissues respectively in acetone and methanol extracts (Table 4).

Similarly in the acetone extracted skin of *C.auratus* fed with BWD diet, the total carotenoid varied from 1.40±0.41µg/g wet tissue (0day) to 2.13±0.018µg/g wet tissue (40 days of experiment). In the methanol extracted skin of *C.auratus* fed on same group of experimental diets, the total carotenoid content varied from 0.45±0.20µg/g wet tissue (0day) to 0.84±0.037µg/g wet tissue (table 4).

**Total carotenoid in the muscle tissue:**

The total carotenoid content in the muscle tissue of *C.auratus* extracted with acetone and methanol but fed with carrot waste and beetroot waste supplemented diets are shown in (Table 5). The results indicated that the total carotenoid content in the muscle tissue of *C.auratus* extracted with acetone was obviously more when compared to methanol extract. Also,

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the total carotenoid content was more or less same in carrot waste and beetroot waste supplemented diets and less in control diets fed fishes. For example, in the muscle tissue of carrot waste supplemented diets fed *C.auratus* extracted with acetone , the total carotanoid content varied from 0.76±0.20 µg/g wet tissus (0day) to 1.89±0.075µg/g wet tissue (40$^{th}$ days of experiment).In the methanol extracted muscle tissue of *C.auratus* fed with same experimental diets, it ranged from 0.49±0.17µg/g wet tissue (0day) to 1.11±0.067µg/g wet tissue (40$^{th}$ days of experiment).Likewise, the total carotenoid content in the muscle tissue of *C.auratus* fed with Beetroot added diets but extracted with acetone varied between 0.76±0.20µg/g wet tissue on 0 day to 2.01±0.041µg/g wet tissue on 40$^{th}$ day of experiment. But in the muscle tissue of *C.auratus* extracted with methanol, the total carotenoid content ranged from 0.49±0.17µg/g wet tissue on 0day to 1.12±0.079µg/g wet tissue on 40$^{th}$ day of experiment. In control diet fed fishes, the initial (0day) and final muscle carotenoid content were less when compared to experimental fishes (Table5).

**Table 1. Changes in the biochemical constituent (protein) in the skin and muscle tissue of gold fish (*C. auratus*) fed with carrot waste and beetroot supplemented diet. Each value is the mean (X ± SD) of five individual estimates**

| Feed | Experimental duration (Days) | Protein content (mg/100 mg wet tissue) | | | |
|---|---|---|---|---|---|
| | | Control diet (CD) | | Experimental diet(CWD) | |
| | | skin | Muscle | Skin | Muscle |
| *CWD* | 0 | 4.32 ± 0.38 | 7.05 ± 0.49 | 4.32 ± 0.38 | 7.05 ± 0.49 |
| | 10 | 4.65 ± 0.16 | 7.41 ± 0.28 | 4.84 ± 0.17 | 7.86 ± 0.05 |
| | 20 | 5.42 ± 0.38 | 7.78 ± 0.09 | 5.55 ± 0.37 | 8.60 ± 0.31 |
| | 30 | 5.71 ± 0.37 | 8.17 ± 0.19 | 6.02 ± 0.15 | 8.91 ± 0.06 |
| | 40 | 6.16 ± 0.05 | 8.55 ± 0.27 | 6.49 ± 0.16 | 9.30 ± 0.01 |
| *BWD* | 0 | 4.32 ± 0.38 | 7.05 ± 0.49 | 4.32 ± 0.38 | 7.05 ± 0.49 |
| | 10 | 4.65 ± 0.16 | 7.41 ± 0.28 | 4.94 ± 0.07 | 7.92 ± 0.06 |
| | 20 | 5.09 ± 0.42 | 7.78 ± 0.09 | 5.57 ± 0.08 | 8.61 ± 0.29 |
| | 30 | 5.71 ± 0.37 | 8.17 ± 0.19 | 6.10 ± 0.09 | 8.96 ± 0.07 |
| | 40 | 6.16 ± 0.05 | 8.55 ± 0.27 | 6.66 ± 0.09 | 9.47 ± 0.30 |

**Table 2. Changes in the biochemical constituent (carbohydrate) in the skin and muscle tissue of gold fish (*C. auratus*) fed with carrot waste and beetroot supplemented diet. Each value is the mean (X ± SD) of five individual estimates**

| Feed | Experimental duration (Days) | Carbohydrate content (mg/100 mg wet tissue) | | | |
|---|---|---|---|---|---|
| | | Control diet (CD) | | Experimental diet(CWD) | |
| | | skin | Muscle | Skin | Muscle |
| *CWD* | 0 | 2.42 ± 0.33 | 4.75 ± 0.61 | 2.42 ± 0.33 | 4.75 ± 0.61 |
| | 10 | 2.65 ± 0.08 | 4.97 ± 0.17 | 2.80 ± 0.02 | 5.25 ± 0.11 |
| | 20 | 3.07 ± 0.10 | 5.32 ± 0.39 | 3.48 ± 0.34 | 6.14 ± 0.05 |
| | 30 | 3.55 ± 0.49 | 5.70 ± 0.02 | 3.66 ± 0.09 | 6.28 ± 0.15 |
| | 40 | 3.72 ± | 6.12 ± | 3.89 ± | 6.59 ± 0.16 |

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| | | | | | |
|---|---|---|---|---|---|
| | | 0.86 | 0.14 | 0.21 | |
| *BWD* | 0 | 2.42 ± 0.33 | 4.75 ± 0.61 | 2.42 ± 0.33 | 4.75 ± 0.61 |
| | 10 | 2.65 ± 0.08 | 4.97 ± 0.17 | 2.89 ± 0.07 | 5.40 ± 0.10 |
| | 20 | 3.07 ± 0.10 | 5.32 ± 0.39 | 3.39 ± 0.18 | 6.19 ± 0.08 |
| | 30 | 3.55 ± 0.49 | 5.70 ± 0.02 | 3.69 ± 0.81 | 6.30 ± 0.37 |
| | 40 | 3.72 ± 0.86 | 6.12 ± 0.14 | 3.94 ± 0.02 | 6.62 ± 0.14 |

**Table 3. Changes in the biochemical constituent (lipid) in the skin and muscle tissue of gold fish (*C. auratus*) fed with carrot waste and beetroot supplemented diet. Each value is the mean (X ± SD) of five individual estimates**

| Feed | Experimental duration (Days) | Lipid content (mg/100 mg wet tissue) | | | |
|---|---|---|---|---|---|
| | | Control diet (CD) | | Experimental diets(CWD,BWD) | |
| | | Skin | Muscle | Skin | Muscle |
| *CWD* | 0 | 1.95 ± 0.33 | 1.11 ± 0.07 | 1.95 ± 0.33 | 1.11 ± 0.07 |
| | 10 | 2.03 ± 0.05 | 1.26 ± 0.04 | 2.16 ± 0.05 | 1.63 ± 0.054 |
| | 20 | 2.42 ± 0.07 | 1.51 ± 0.07 | 2.87 ± 0.17 | 1.98 ± 0.017 |
| | 30 | 2.81 ± 0.09 | 1.96 ± 0.06 | 3.12 ± 0.11 | 2.54 ± 0.073 |
| | 40 | 3.25 ± 0.13 | 2.35 ± 0.07 | 3.52 ± 0.11 | 2.78 ± 0.069 |
| *BWD* | 0 | 1.95 ± 0.33 | 1.11 ± 0.07 | 1.95 ± 0.33 | 1.11 ± 0.07 |
| | 10 | 2.03 ± 0.05 | 1.26 ± 0.04 | 2.41 ± 0.05 | 1.71 ± 0.04 |
| | 20 | 2.42 ± 0.07 | 1.51 ± 0.07 | 2.95 ± 0.07 | 2.12 ± 0.45 |
| | 30 | 2.81 ± 0.09 | 1.96 ± 0.06 | 3.22 ± 0.06 | 2.56 ± 0.06 |
| | 40 | 3.25 ± 0.13 | 2.35 ± 0.07 | 3.60 ± 0.01 | 2.83 ± 0.19 |

**Table 4. Total carotenoid content in the skin tissue of gold fish (*C.auratus*) fed with carrot, beetroot supplemented diet for different days and extracted in acetone and methanol solvent system. Each value is the mean of five individual estimates**

| Experimental animal | Solvent system | Experimental duration (Days) | Total carotenoid content mg/g wet tissue) | | |
|---|---|---|---|---|---|
| | | | Control | Carrot waste | Beetroot waste |
| *C.auratus* | Acetone | Initial (0) | 1.40 ± 0.41 | 1.40 ± 0.41 | 1.40 ± 0.41 |
| | | 10 | 1.54± 0.04 | 1.71 ± 0.038 | 1.50 ± 0.038 |
| | | 20 | 1.78 ± 0.08 | 1.99 ± 0.034 | 1.59 ± 0.041 |
| | | 30 | 1.85 ± 0.09 | 2.44 ± 0.037 | 1.97 ± 0.055 |
| | | 40 | 1.97 ± 0.10 | 2.55 ± 0.043 | 2.13 ± 0.018 |
| | Methanol | Initial (0) | 0.45 ± 0.20 | 0.45 ± 0.20 | 0.45 ± 0.20 |
| | | 10 | 0.47 ± 0.001 | 0.74 ± 0.052 | 0.52 ± 0.004 |
| | | 20 | 0.60 ± 0.018 | 0.88 ± 0.025 | 0.76 ± 0.008 |
| | | 30 | 0.70 ± 0.015 | 1.05 ± 0.087 | 0.91 ± 0.052 |
| | | 40 | 0.72 ± 0.03 | 1.15 ± 0.097 | 0.84 ± 0.037 |

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**Table 5. Total carotenoid content in the muscle tissue of gold fish (*C.auratus*) fed with carrot and beetroot supplemented diet for different days and extracted in acetone and methanol solvent system. Each value is the mean of five individual estimates**

| Experimental animal | Solvent system | Experimental duration (Days) | Total carotenoid content □g/g wet tissue) | | |
|---|---|---|---|---|---|
| | | | Control | Carrot waste | Beetroot waste |
| *C.auratus* | Acetone | Initial (0) | 0.76 ± 0.20 | 0.76 ± 0.20 | 0.76 ± 0.20 |
| | | 10 | 0.77 ± 0.039 | 1.22 ± 0.053 | 0.98 ± 0.052 |
| | | 20 | 0.92 ± 0.05 | 1.38 ± 0.049 | 1.42 ± 0.071 |
| | | 30 | 1.03 ± 0.07 | 1.70 ± 0.072 | 1.98 ± 0.092 |
| | | 40 | 1.18 ± 0.072 | 1.89 ± 0.075 | 2.01 ± 0.041 |
| | Methanol | Initial (0) | 0.49 ± 0.17 | 0.49 ± 0.17 | 0.49 ± 0.17 |
| | | 10 | 0.58 ± 0.029 | 0.64 ± 0.034 | 0.70 ± 0.041 |
| | | 20 | 0.67 ± 0.018 | 0.87 ± 0.059 | 0.78 ± 0.058 |
| | | 30 | 0.71 ± 0.02 | 1.02 ± 0.077 | 0.89 ± 0.064 |
| | | 40 | 0.83 ± 0.03 | 1.11 ± 0.067 | 1.12 ± 0.079 |

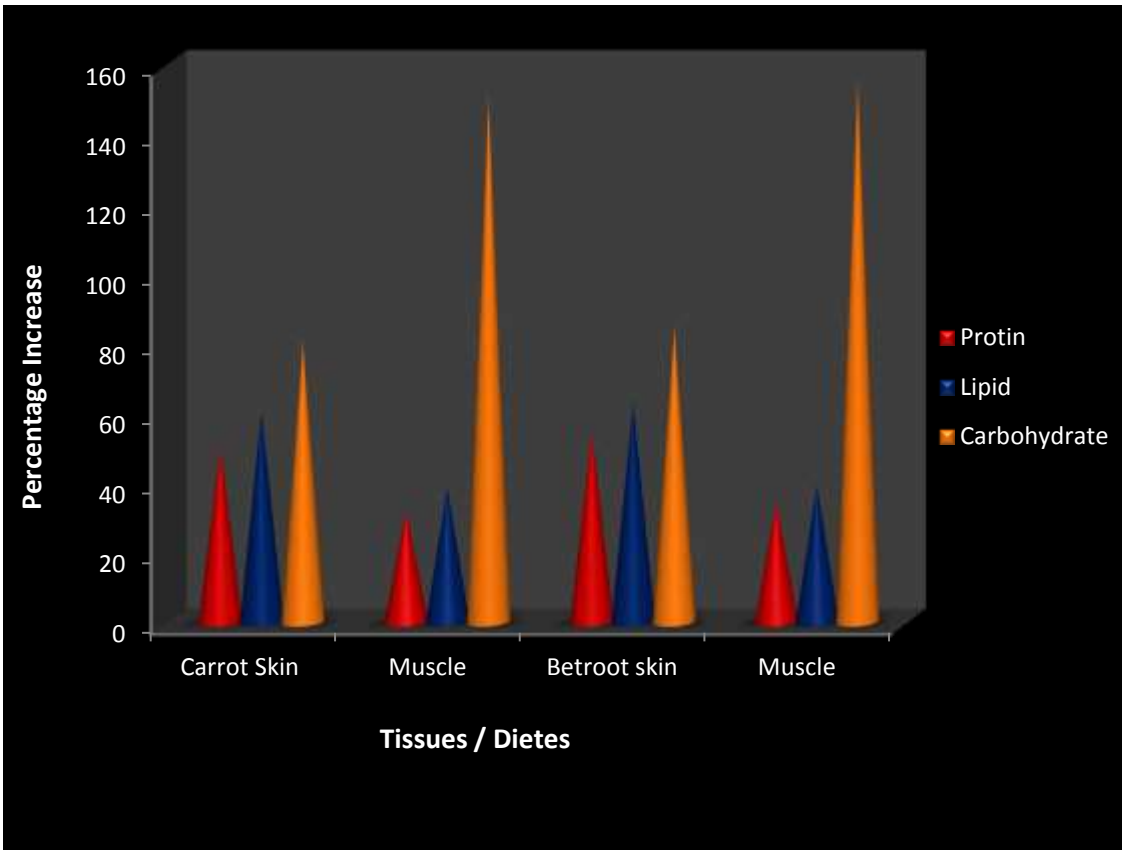


**Fig. 1 Percentage increase in biochemical constituents in the skin and muscle tissue of C.auratus fed with carrot waste and Beetroot waste supplemental diets**

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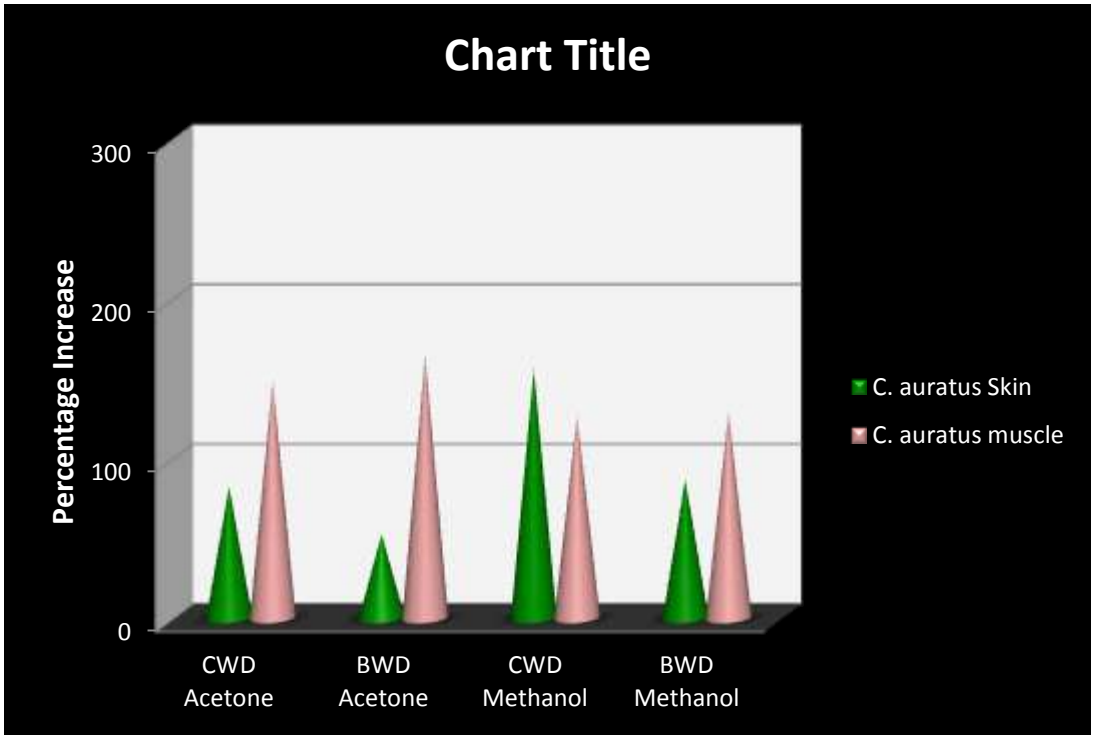


**Fig. 2 Percentage increase in total carotenoidcontent in the skin and muscle tissue of C.auratus fed with carrot waste and Beetroot waste supplemental diets extracted in acetone and methanol.**

## 4. DISCUSSION

Carotenoids are important natural pigments principally produced by photosynthetic organisms and accumulated by many animals through their diet (Goodwin, 1986). Astaxanthin (3, 3'-dihydroxy-4,4'- diketo-β-β -carotene) and Canthaxanthin (4-4'-diketo – -β-β - carotene) are widely used as dietary supplements in diets for salmonids as a method for inducing the typical pink colourof their flesh (Torrissen, 1995; Choubert and Storebakken, 1989 ; Skrede*et al.*, 1990).

In the present study, control and experimental diets supplemented diets carrot waste (CWD) and beetroot waste (BWD) as carotenoid additives yielded note worthy information, the biochemical constituents (protein, carbohydrate and lipid) of skin and muscle tissues of *C.auratus* showed an enhancing trend with the advancement of experimentation. This experiment was much more obvious for both carrot and beetroot diets fed fishes, when compared to those fishes received control diets. In the skin tissue of *c.auratus* fed with carrot waste supplemented diets 50.20%, 60.67% and 80.51% were observed respectively for protein carbohydrate and lipid content. In the muscle tissue, the increase was 31.91%, 38.74%, 150.45% over the initial value (0day). More or less, a similar variation was noticed in beetroot diets fed fishes. In these groups, the increase in skin protein, carbohydrate and lipid content was 54.17%,62.81%, and 84.62% over the initial value (0 day). Likewise in the muscle tissue, the enhancement noticed was 34.38% (protein),39.37% (carbohydrate), 154.95% (lipid) over the initial value (Fig). These results inferred that the test diets not only alter the survival and growth of candidate species but also supported to the synthesis of essential macro and micro nutrients..It was postulated that, the carotenoids pigments ingested from the feed of the fish such as different algae, crustaceans are absorbed by the intestinal epithelium and are transported to the different parts of the body and accumulate in muscles, scales, fins, liver and further transported The skin and muscle biochemical composition of test fishes fed with experimental diets CWD and BWD) was high when compared with control (CD) diet fed fishes. The better feed intake in CWD and BWDmay be due to the increased fish appetite resulting in a higher feed intake and therefore improved growth. On the other hand, changes in protein and lipids contents in fish body could be linked with changes in their synthesis, deposition rate in muscle and or different growth rate (Smith, 1981; Fauconneau, 1984 ;Soivio*et al.*, 1989 ; Abdel Tawwab*et al.*, 2006). It was postulated that, the carotenoids pigments ingested from the feed of the fish such as different algae, crustaceans are absorbed by the intestinal epithelium and are transported to the different parts of the body and accumulate in muscles, scales, fins, liver and further transported to the gonads (Parker, 1996 ; Christine *et al.*, 2006 ; Corner *et al.*, 2007 ; Goswami, 2011).

People involved in the trade of ornamental fish are constantly exploring methods of enhancing skin colouration. In addition to enhancing colouration of the fish different pigments used in the diets are also reported to give better results of growth (Ezhil*et al*., 2008). In the present study, the total carotenoid content of skin and muscle tissues of *C.auratus* showed dietery dependent variation. It was also noticed that, the total carotenoid in the tested tissues of *C.auratus* was more or less same in carrot and beetroot waste supplemented diet fed groups. The total carotenoid skin tissue of *C.auratus* fed with carrot waste supplemented diets showed an increase of 82.14% (Acetone), 155.56% (Methanol) over the initial value. On the other hand, in the same tissue of *C.auratus* fed with beetroot swaste supplemented diets, the increase in total carotenoid was 52.14% (Acetone) and 86.67% (Methanol) when compared to initial value (0) day. More or less, a similar trend was noted in the carotenoid content of muscle tissue of *C.auratus* fed with Carrot waste and beetroot waste supplemented diets. In this tissue, the increase in total carotenoid content was 148.68% (Acetone) and 126.53% (Methanol) in carrot waste diets fed groups when compared to initial value. By the same way, the increase noticed in the beetroot diet fed group was 164.47% (Acetone) and 128.57% (Methanol) over the initial value (Fig). In control diet fed fishes, the range of variation in total carotenoid content of skin and muscle tissues during initial (0 day) and at end of the experiment was very less when compared to those fishes fed with experimental diets. This study demonstrated that carrot and beetroot supplemented diet supported the carotenoid accumulation in the skin and muscle tissues of *C.auratus*.

## 5. CONCLUSION

Further, it could be interred that, in the present study, addition of CWD and BWD dietary carotenoid source obviously enhanced the total carotenoid content in C.aurates. Also it could be added with other carotenoid sources as added additives to enhance pigmentation in freshwater ornamental fish C.auratus

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