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Impact of Different Concentration of Feed Enriched with *Musa Acuminata*, *Vitis Amurensis* and *Mangifera Indica* Powder on Growth Performance and Survival Rate of *Carassius Auratus* (Linnaeus, 1758) and Its Phytochemical Profiling

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Abstract

In the present study *Carassius auratus* fishe was exposed in the various concentrations and their impact on pigmentation was assayed in the laboratory. The feed was determined against *Carassius auratus* fishe to various concentrations. Four types of feed was prepared by adding Red Banana (RB-10, RB-20, RB-30, RB-40 and RB-50%), Grapes (G-10, G-20, G-30, G-40 and G-50%), Mango (M-10, M-20, M-30, M-40 and M-50%) and mixed diet 1:1:1 (Red Banana+Grapes+Mango) ratio which replaced of the feed ingredients. The impacts of feed on pigmentation were assessed 60 days. After 60 days, the feeding habits and color change in treated and control were recorded. The four different feed formulations tested were found to be most significant. From the result, it can be concluded the feed formulation of Mango added formulated feed is an excellent potential for controlling pigmentation. Fish length and weight was significantly enhanced by the dietary supplements. The qualitatative phytocompounds of *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* may be used as a reference for taxonomic and pharmaceutical studies to cure many dread full diseases because of its strong presence of phytoconstiuents such as carbohydrates, phenols, saponins, flavonoids, quinones, glycosides, triterpenoids and saponins.

Keywords

Musa acuminata, *Vitis amurensis*, *Mangifera indica*, mixed diets, carotenoid and qualitatative phytocompounds.

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INTRODUCTION

About 7.2 million houses in the USA and 3.2 million in the European Union have an aquarium (Ghosh *et al*. 2003) and the number is increasing day by day throughout the world. The fact is that USA, Europe and Japan are the largest markets for ornamental fish but more than 65% of the exports come from Asia. It is encouraging news for developing countries that more than 60% of the total world trade goes to their economics. An estimate carried out by Marine Products Export Development Authority of India shows that there are one million hobbyists in India (Ghosh *et al*. 2003). Ornamental fish farming has not taken off in India despite a huge export waiting to be tapped in South Asian countries due to lack of awareness of marketing techniques among farmers and leading fisheries experts. The internal trade is estimated to above U.S. $ 3.26 million and the export trade is in the vicinity of U.S. $ 0.38 million (Yadav *et al*. 2007). A rich diversity of species and favorable climate, cheap labor and easy distribution make India suitable for ornamental fish culture. About 90% Indian exports go from Kolkata followed by 8% from Mumbai and 2% from Chennai. By rough estimates, there are 150 fulltime and 1500 part time breeders. MPEDA is planning to set up ornamental fish parks in Kochi and Chennai in collaboration with Kerala and Tamil Nadu governments and the Singapore governments' Agri- Veterinary authority and a private party. India alone has 230 varieties of exotic fish but it is an industry that is still largely untapped. The total number of tropical marine fish traded each year is estimated to be greater than 10 million fish.

Since Darwin's time we have known that throughout the animal kingdom, the flashiest males have the best chances of finding a mate. But it was only recently that researchers discovered why this is so. Males that can afford to use carotenoids, as ornaments are healthier and stronger. One reason why females are not usually highly colored is that they need to pass on their caroteniods to their offspring (Ronneberg *et al*. 1979). Caroteniods have been shown to improve survival and growth of young fish (Wang *et al*. 2006). Researchers are now pretty sure that caroteniods play a major role in evolution. Carotenoids stimulate the immune system as well as detoxification processes (Boonyaratpalin *et al*. 2001). Animals that are more susceptible to disease and parasites have to use their carotenoids to defend themselves. Genetically resistant males use fewer carotenoids for fighting disease and so can make a better show. Healthier females have more carotenoids for their young. Embryos with adequate store of carotenoids have a better chance of survival. Carotenoid pigmentation of fishes is an important natural indicator of biological superiority. The bright color of skin, flesh and eggs are reliable signs of good health in fishes (Fox, 1979).

Carotenoid pigments are responsible for the broad variety of colors in nature; most notable are the brilliant yellow, orange and red colors of fruits, leaves and aquatic animals. Among all of the numerous classes of natural colors, the carotenoids are the most widespread and structurally diverse pigmenting agents. Although plants, algae, fungal and bacterial species synthesize carotenoids, animals cannot produce them *denovo*. Carotenoids are absorbed in animal diets, sometimes transformed into other careteniods and incorporated into various tissues (D'Abramo, 1997).

There are four main groups of pigments that can be used to provide color: melanins, carotenoids, peteridines and purines. Melanins are responsible for the dark coloration seen in fishes. Carotenoids are lipid-soluble compounds and dominate in giving the yellow to red colors. Pteridines are water–soluble compounds and result in bright coloration like the carotenoids. Pteridines play a small role in coloration when compared to carotenoids. In the purine compounds, guanine predominates and large amounts of guanine can be found in the silvery belly skin of most species of fish (Ronneberg *et al.* 1979). These basic compounds can be combined with other components like proteins to produce the blue, violet and green color ranges seen in fishes. In the flesh, the carotenoids are the predominant pigment. Carotenoids are the major pigmenting compounds and cannot typically be synthesized by fish. In contrast Fox (1979) studied that most other pigmenting compounds can be made by the fish. Carotenoids commonly occurring in freshwater fish include carotene, lutein, taraxanthin, astaxanthin, tunaxanthin, doradexanthins and zeaxanthin. Lutein is also widely found in many marine species. Lutein gives greenish-yellow; tunaxanthin gives yellow; β-carotene gives orange; doradexanthin gives yellow; zeaxanthin gives orange; canthaxanthin gives orange–red; astaxanthin gives red; eichinenone gives red (D'Abramo, 1997). Plants produce diverse phytochemicals or secondary metabolites which are medicinally important compounds and have therapeutic values either synergistically or alone. Today's modern medicine was evaluated from the herbalism and the phytochemicals were backbone for the new drug molecules with disease cure abilities. The demand for these plant-based medicines, health products, food supplement; cosmetics etc. are increasing in both developing and developed countries (Vandebroek *et al*., 2004). Recently, the researchers identified and isolated plants based compounds such as keampferol, quercetin, curcumin, genistein, digoxin artemisinin taxol, quinine, morphine, vinblastine, vincristine and butein *etc*. which have capacities to cure diseases (Yu-Jie *et al*., 2015). Around 1,39,000 phytocompounds have been isolated and large proportions are still need to identify for evaluation of their medicinal properties (Boopathy and Kathiresan, 2010). Thus, search for plant based new drugs are important for the curative of diseases such as cardio vascular diseases, diabetes, cancer and infectious diseases *etc*. There is no enough study about the effect of natural pigments in the color of *Carassius auratus* fish. So this research was carried on the effect of natural pigment and growth performances of the Red Banana, Grapes and Mango powder adding Red Banana (10%) Grapes (10%) and Mango (10%) in 1:1:1 ratio which replaced 30% of the fish meal of the control diet and also to identify the phytoconstiuents present in the *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* aqueous extract.

METHODOLOGY

Study area

Live ornamental fish species of *Carassius auratus* (Fig.1) were procured from Kolathur, Chennai, Tamil Nadu, India. The fishes were transported to the laboratory in plastic buckets provided with an aerator, with an utmost care and an ambient environment was provided by acclumatizing the fish in the laboratory conditions. During the acclimatization period about 20% of the water exchange was done daily. The uneaten feed and feacal matter were also removed in order to maintain a good water quality.

Water quality parameters

The water quality parameters like temperature, dissolved oxygen, ammonia, nitrite, and pH were estimated by the standard procedures. Water quality parameters recorded during the experiment are given in table1.

Water exchange

The water exchange was done regularly at the rate of 20% per day and the uneaten feed and fecal matter were removed daily to maintain optimum water quality.

Feeding trail

The experimental juveniles of *Carassius auratus* were acclimatized for 10 days in the plastic round tank (40 lit.). Before acclimatization, the prophylactic treatment was given for about 10-20 seconds with potassium permanganate. The juveniles were fed with a control feed. During the acclimatization period about 20% of the water exchange was done daily. The uneaten feed and fecal matter were also removed in order to maintain a good water quality. The fishes were recruited from the stock and dived into five batches, each batch was divided into 3 sets, each containing 5 test individual and introduced to each round plastic tank with aerators. The first group of fish were fed with control feed. The second group of fish was fed with red banana feed (RB1 to RB5), the third group with grapes feed (G1 to G5) and the fourth group with mango feed (M1 to M5) respectively, whereas the fifth group were fed with mixed diet. Triplicate set was maintained for each feeding experiment. The duration of the experiment was 60 days. During this period the fish were fed with 3% of its body weight twice a day (5 AM to 3 PM).

Preparation of feed

Preparation of control and experimental feeds were done by using the common ingredients such as, fish meal, groundnut oil cake, sesame oil cake, wheat bran, tapioca flour and vitamins and mineral mixture which where procured from the local market in Chennai. All the ingredients including the natural colour carotenoids like red banana, grapes and mango were shade dried for 30 days and powdered and passed through 250µ sieve for uniformity. The sieved ingredients were mixed with water and it is cooked in a pressure cooker for 10-15 minutes. Then the cooked dough was divided in to thirteen equal parts by weight. In that twelve parts of dough were used for mixing the colour enhancer (β-carotene) at five different concentrations and another one part was kept as control. After that, the dough's were pelletized using a die having 2 mm pore size. The pelleted feed was dried under the sun and stored in air tight plastic containers for further use. Experimental feed was made into small crumbles and fed to the juvenile fishes. The control diet was given to control group of fishes. The feed was given twice a day *viz*. morning and evening.

Sampling

Sampling was carried out once in a 15 days and the growth parameters (weight) were measured and recorded. Photos were taken initially and after completion of the experiment to study the survival rate and then weighted to estimate body weight gained by them. At the end of the experiment, all the fishes were starved for one day to take the final wet weight.

Bioenergetics analysis

Average growth rate, weight increment, specific growth rate, survival rate and food conversion ratio was done according to the method of Barclay *et al*. (2006).

Fruit material

Fresh Fruits of *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* were collected from Koyambedu fruit market, Chennai, Tamil Nadu and authenticated by a taxonomist from Prof. P. Jayaraman. Fresh Fruits of *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* were washed well using tap water and twice using distilled water and the endocarp region was dried in shade for a period of 30 days, at an ambient temperature of 25˚C. After drying the fruits peel were separated by cutting them into small pieces. The dried samples were grinded properly using a mortar and pestle and later using a grinder, to obtain the powdered.

Aqueous extract preparation

20 gm of sample of *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* the peel was suspended in 200 ml of distilled water and well stir by using a magnetic stirrer for several hours. Extraction was done at 70˚C for 30 minutes, followed by filtering of the extracts using Whatman filter paper No.1. Extracts were then evaporated at 45˚C for 72 hours to form a paste, and further transferred into sterile bottles and refrigerated until use.

Phytochemical profiling

Qualitative phytochemical profiling (Table.2) of natural carotenoid feed (Red banana, grapes and mango) was done according to the method of Ajuru *et al*. (2017).

RESULTS AND DISCUSSION

Different formulated feed (R-1, R-2, R-3, R4, R-5), (M-1, M-2, M-3, M-4, M-5), (G-1, G-2, G-3, G-4, G-5) and mixed diet were given to the experimental fish, *Carassius auratus*. Remarkable variations were observed in the length of the fish fed with different formulated feed. It was observed that remarkable variation in length gain was observed during 60 days of the experimental period. The increasing trend of length gain was noticed in *Carassius auratus* as an R-30 % (53.16) > mixed (39.24) >R-20% (37.85) > R-40% (36.53) > R-50% (36.032) > and R-10% (26.31% coc). As well as data pertaining to the experiment clearly revealed that experimental fish *Carassius auratus* fed with R-30% formulated feed gained the remarkable weight gain in Table 3.

Similarly, in Mango formulated feed diet showed the variation in length gain was observed during 60 days of the experimental period. The increasing trend of length gain was noticed in *Carassius auratus* as M-20% (63.13) > M-30% (44.52) > M-50% (43.67) > mixed (40.17) >M-40% (37.48) >and M-10% (32.07% coc). The maximum weight gain was noticed in M-20% Mango formulated feed diet fed by *Carassius auratus* during 60 days of the experimental period Table 4.

Although it was observed that the Grapes formulated feed showed the remarkable length gain in the end of the experimental period. The increasing trend of length gain was noticed in *Carassius auratus* as G-50% (28.26) > G-10% (26.30) > G-40% (25.49) > mixed feed (24.60) > G-20% (20.81) > G-30% (17.26% coc) >and The maximum weight gain was noticed in G50 Grapes formulated diet fed by *Carassius auratus* during 60 days of the experimental period (table 5).

The perusal of the data pertaining to the above experiment clearly indicated that the Average Growth Rate of Red banana treated group was found in the increased in the R-30 % (3.88±0.02) followed by a R- 20 % (1.92±0.005) and the least AGR were observed in R-10% (1.25±0.048). Whereas in Mango treated group was founded in the increased in M-20% (3.22±0.007) followed by M-30% (1.98±0.033) and the least AGR was observed in M-40% (1.503±0.457) (Table: 5.7). Similarly, in Grapes group were found in the increased in G-40% (1.153±0.0127) followed by G-50% (1.047±0.532) and the least AGR was observed in G-20% (0.78±0.034).

Fish, like other animals such as birds, absorb dietary carotenoids through the intestinal mucosa (Furr and Clark, 1997), transport them through the blood via serum lipoproteins (Katayama *et al*., 1973), metabolically oxidize them to other forms (Chatzifotis *et al*., 2005) and deposit them into specialized skin cells called chromatophores (Aravindan *et al*., 2001). Goldfish and Koi carp can convert the carotenoids lutein and zeaxanthin to astaxanthin.

Mango to a greater extent influenced the weight of the fish. Perusal of the data pertaining to the present investigations revealed that the weight was apparently increased among the different formulated feed with different ratio in *Carassius auratus*. The characteristic color and weight of the fish is mostly due to the presence of carotenoids in mango, with the exception of some red anthocyanins present in the mango skin. The term carotenoid summarizes a class of structurally related 40-carbon compounds made of eight repeating isoprene units. Mangos contain both provitamin A carotenoids (carotenes) such as α-carotene, β-carotene, and γ-carotene; and oxygenated carotenoids (xanthophylls) such as β-cryptoxanthin, lutein, zeaxanthin, violaxanthin, antheraxanthin, auroxanthin and neoxanthin (Ben-Amotz and Fishler 1998, Cano and Ancos 1994, John *et al*. 1970). Carotenoids have a diverse role in the biological functioning of living organisms, including provitamin A activity, antioxidant activity, modulation of detoxifying enzymes, regulating gene expression, cell communication, immune function enhancement, UV skin protection, and visible color (Clevidence *et al*. 2000).

Similarly fish fed with 20% mango formulated feed were shown the maximum growth parameters apparently increased in the following trend *Carassius auratus* . Our findings are in agreeing with the earlier findings of (Okada *et al*., 1991); *Poecilia reticulata*, (James *et al*., 2009); (*Xiphophorus maculates*) and (Dahlgren, 1979); (Gold fish) (James and Sampath, 2004).

The coloration of decorative fishes offers the market value of the fish. Several of the brilliantly coloured fishes showed attenuation in coloration thanks to varied factors like exposure to daylight, chlorine, starvation, pH, hardness of water, murkiness of water, stress, toxicants and pollutants in water, low quality of water, poor husbandry techniques, poor quality feeds, nutrient-deficient live feeds etc. The resultant ornamental fishes have faded market rates when put next to the brilliantly coloured ones. an effort was created on supplementation of microbial cell mass (rich in carotenoids) incorporated feed to the fishes which were affected either biologically or with chemicals and the recoveries of coloration of the fishes were studied.

In our study Mango fed fish showed the exceptional selection compare to different feed ingredients. This result well-tried that fishes fed with carotenoid enriched feed showed quicker recovery of carotenoids in comparison to those given solely the control feed. The most reason for the colour recovery in stressed fishes may well be attributed to the presence of the carotenoids within the freeze-dried soured broth (Ako *et al*., 2008). Colour enhancement through the employment of carotenoids in feed has been employed in this work for survival and growth functions was because of the high pigmentation earned with this concentration (Gouveia *et al*., 2003).

Qualitative phytochemical analysis of *Musa acuminata* revealed the presence of Carbohydrates, Flavonoids, Glycosides, Phenols, Quinones and Triterpenoids, *Vitis amurensis* revealed the presence of Carbohydrates, Flavonoids, Glycosides, Phenols, Saponins and Triterpenoids and *Mangifera indica* revealed the presence of Carbohydrates, Flavonoids, Glycosides, Phenols and Triterpenoids as shown in the Table 1. The present study has shown the usefulness of the extraction methodologies adopted for efficient extraction, processing and utilization of these fruit peel and also to characterize the phytochemicals of *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* (Mathur *et al*., 2011). Our studies have demonstrated the occurrence of significant amount of secondary metabolites such as Carbohydrates, Flavonoids, Glycosides, Phenols, Quinones and Triterpenoids and high content of all secondary metabolites from the aqueous extracts and other secondary metabolites such as tannins and alkaloids were absent in all the fruit extracts. These phytochemicals are well known to contain non-nutritive plant chemicals that possess varying degrees of disease-preventive antimicrobial and antioxidant molecules. The current study has shown valuable newer sources of raw materials for both traditional and orthodox medicine. Phytochemicals are known to display their health protective effects in diverse ways. They can act as antioxidants and protect cells against free radical damage, e.g. polyphenols, carotenoids *etc* (Omoregie and Osagie, 2012), or in reducing risk for cancer by inhibiting tumor production (Devasagayam *et al*., 2004) or antibacterial activity and hormonal stimulation (Mathew *et al*., 2012). The citrus peels are rich in nutrients and contain many phytochemicals with strong potential for use in drug production or as food supplements (Chede, 2013).

Plant secondary metabolites or natural products play many important roles in plants' interaction with their environment. Many natural products function as phytoalexins or phytoanticipins and are involved in plants' resistance to disease. The distribution of natural products is characteristic of biological groups such as families and genera. In the order Zingiberales, the families Zingiberaceae and Musaceae are economically important because they include medicinal plants (Zingiberaceae) and food crops (Musaceae). Diarylheptanoids and phenylphenalenones are characteristic natural products from these families (Dixon, 2001). Phenols are also believed to show therapeutic effect against some diseases and classified as active antimicrobial compounds. Recently, it has been reported that flavonoids possess many pharmacological properties like antifungal, antioxidant, antiallergenic, anti-inflammatory, antithrombic, anticarcenogenic and hepatoprotective that narrows researcher interest to work on this secondary metabolites. Since ancient times, flavonoids have been used as anti-inflammatory and for cosmetic purposes in the Chinese traditions. The inconsistent in the results obtained in the antimicrobial activities could be due to the absence of other active compounds like anthraquinones and alkaloids. Antraquinones is believed to possess antiparasitic and antimicrobial properties. This compound is used to treat herpes simplex and skin diseases in the folkloric community (Peteros and UY, 2010). Flavonoids represent a wide spread and common grape of natural polyphenol produced by the phenyl propanoid pathway (Harborne and Williams, 2000). Grapes flavonoids are primary located in the epidermal layer of the berry skin and the seeds (Conde et al., 2007). Grape seed extracts have also exhibited anti-tumor properties. Promising results have been shown by several studies performed in human colorectal carcinoma (Kaur et al., 2006), head and neck squamous cell carcinoma (Sun et al., 2011) and prostate cancer cells (Park et al., 2011). Therefore, it is suggested that the supplementation of grape seed extracts might be an effective anti-tumor agent in clinical settings. The biological functions of flavonoids include protection against allergies, inflammation, free radical scavenging, platelets aggregation, microbes, ulcers, hepatoxins, viruses and tumors. Mangiferin, catechin and epicatechin are the major phyto-constituents of Mangifera indica (Oliver-Baver, 1986).

Table 1. Water quality parameters

Parameters	Range
Dissolved oxygen (mg/l)	3.3-5.5
Temperature (˚C)	26.3-27
pH	7.23-8.34
Ammonia (ppm)	0-0.25

Table 2. Qualitative phytochemical analysis of *Musa acuminata*, *Vitis amurensis* and *Mangifera indica* aqueous extract

Phytochemicals	*Musa acuminata*	*Vitis amurensis*	*Mangifera indica*
Alkaloids	-	-	-
Anthraquinones	-	-	-
Carbohydrates	+	+	+
Flavonoids	+	+	+
Glycosides	+	+	+
Phenols	+	+	+
Quinones	+	-	-
Saponins	-	+	-
Tannins	-	-	-
Triterpenoids	+	+	+
Steroids	-	-	-
Phytosteroids	-	-	-

+: Presence of phytochemicals
-: Absence of phytochemicals

Table: 3. Length and weight gained by fish *Carassius auratus* fed by different concentrations of Red banana enriched feed

No. of days	Length of the fish (cm)						
	Control	R-10%	R-20%	R-30%	R-40%	R-50%	Mixed*
Initial	3.534±0.161	4.033±0.032	3.846±0.015	5.073±0.005	3.076±0.015	2.946±0.049	3.466±0.032
15 days	3.766 ±0.023* (6.564)	4.173±0.020* (3.471)	4.136±0.110* (7.538)	5.473333±0.170* (7.884)	3.26±0.180* (5.958)	3.176±0.011* (7.805)	3.756±0.117* (8.365)
30 days	4.124±0.097* (15.666)	4.426±0.056* (9.424)	4.466±0.05* (14.987)	6.19±0.02* (20.401)	3.506±0.189* (13.190)	3.45±0.072* (15.844)	3.983±0.064* (13.753)
45 days	4.544±0.338* (24.490)	4.75±0.230* (16.189)	5.09±0.02* (27.835)	7.31±0.314* (36.133)	3.886±0.087* (23.098)	3.74±0.055* (23.188)	4.493±0.1955* (25.774)
60 days	5.236±0.424* (37.455)	5.283±0.080* (26.315)	5.773±0.020* (37.852)	8.96±0.026* (53.169)	4.496±0.557* (36.535)	4.296±0.083* (36.032)	5.23±0.242* (39.243)
Weight of the fish (g)							
Initial	0.442±0.025	0.642±0.019	0.958±0.021	0.48±0.0122	0.548±0.022	0.376±0.021	0.334±0.049
15 days	0.542±0.026* (22.624)	0.742±0.031* (15.576)	1.172±0.057* (22.338)	0.62±0.057* (29.166)	0.652±0.021* (18.978)	0.48±0.035* (27.659)	0.39±0.033* (16.766)
30 days	0.67±0.023* (51.583)	0.916±0.037* (42.679)	1.39±0.047* (45.093)	0.75±0.056* (56.25)	0.808±0.050* (47.445)	0.54±0.030* (43.617)	0.54±0.030* (61.676)
45 days	0.812±0.031* (83.710)	0.984±0.008* (53.271)	1.558±0.023* (62.630)	0.846±0.032* (76.25)	0.91±0.023* (66.058)	0.598±0.031* (59.042)	0.598±0.031* (79.041)
60 days	0.912±0.025* (106.334)	1.084±0.015* (68.847)	1.838±0.031* (91.858)	1.018±0.057* (112.083)	1.044±0.033* (90.510)	0.688±0.044* (82.978)	0.688±0.044* (105.988)

All the values determined mean ± S.D. Means followed by the different alphabet in column differs statistically significantly (p<0.01%) LSD. Values in parentheses holds percentage change over control. COC =T-C/C*100 (T= Treated Value, C= Control Value). R1- Red Banana 10%, R2- Red Banana 20%, R3- Red Banana 30%, R4- Red Banana 40%, R5- Red Banana 50%, mixed=Red Banana 10%+ Mango 10%+ Grapes 10%.

Table: 4. Length and weight gained by fish *Carassius auratus* fed by different concentrations of Mango enriched feed

No. of days	Length of the fish (cm)						
	Control	M-10%	M-20%	M-30%	M-40%	M-50%	Mixed*
Initial	4.106±0.011	3.843±0.145	3.25±0.060	3.243±0.047	3.06±0.043	3.173±0.097	4.106±0.270
15 days	4.37±0.02 (6.412)	4.006±0.095 (4.249)	3.703±0.030 (13.948)	3.526±0.047 (8.735)	3.29±0.144 (7.5163)	3.45±0.065 (8.718)	4.433±0.045 (7.954)
30 days	4.77±0.19 (15.179)	4.333±0.063 (12.229)	4.356±0.140 (29.882)	3.926±0.040 (19.376)	3.533±0.051 (14.387)	3.956±0.041 (22.705)	4.833±0.150 (16.390)
45 days	5.326±0.047 (25.576)	4.75±0.230 (20.923)	5.1±0.085 (42.463)	4.446±0.1823 (30.645)	4.01±0.02 (26.886)	4.456±0.061 (32.434)	5.393±0.015 (26.620)
60 days	6.02±0.01 (30.976)	5.366±0.485 (32.070)	6.91±19.41 (63.137)	5.31±15.67 (44.527)	5.14±13.69 (37.489)	5.12±15.36 (43.679)	6.28±18.82 (40.173)
Weight of the fish (g)							
Initial	0.568±0.019	0.336±0.036	0.362±0.094	0.286±0.00	0.332±0.020	0.438±0.030	0.536±0.023
15 days	0.668±0.022 (17.605)	0.448±0.023 (33.333)	0.478±0.039 (32.044)	0.358±0.019 (25.174)	0.432±0.019 (30.120)	0.540±0.028 (23.379)	0.63±0.014 (17.537)
30 days	0.77±0.018 (35.563)	0.52±0.058 (54.761)	0.614±0.018 (69.613)	0.428±0.024 (49.650)	0.504±0.013 (51.807)	0.636±0.024 (45.205)	0.724±0.039 (35.074)

45 days	0.866±0.015 (52.464)	0.626±0.051 (86.309)	0.71±0.078 (96.132)	0.5±0.0141 (74.825)	0.624±0.011 (87.951)	0.744±0.028 (69.863)	0.852±0.025 (58.955)
60 days	1.04±0.05 (83.098)	0.708±0.086 (110.714)	0.848±0.075 (134.254)	0.636±0.028 (122.377)	0.748±0.021 (125.301)	0.846±0.008 (93.150)	1.036±0.040 (93.283)

All the values determined mean ± S.D. Means followed by the different alphabet in column differs statistically significantly (p<0.01%) LSD. Values in parentheses holds percentage change over control. COC =T-C/C*100 (T= Treated Value, C= Control Value). R1- Red Banana 10%, R2- Red Banana 20%, R3- Red Banana 30%, R4- Red Banana 40%, R5- Red Banana 50%, mixed=Red Banana 10%+ Mango 10%+ Grapes 10%.

Table: 5. Length and weight gained by fish *Carassius auratus* fed by different concentrations of Grapes enriched feed

No. of days	**Control**	**G-10%**	**G-20%**	**G-30%**	**G-40%**	**G-50%**	**Mixed***
Length of the fish (cm)							
Initial	3.593±0.161	2.693±0.025	3.173±0.020	5.0733±0.0057	3.723±0.047	3.083±0.075	3.206±0.225
15 days	3.776±0.023 (5.102)	2.81±0.07 (4.331)	3.276±0.015 (3.256)	5.283±0.023 (4.139)	3.93±0.045 (5.550)	3.29±0.105 (6.702)	3.336±0.068 (4.054)
30 days	4.096±0.097 (13.327)	3.033±0.032 (12.099)	3.47±0.02 (9.053)	5.43±0.02 (6.750)	4.28±0.060 (14.164)	3.55±0.124 (14.184)	3.576±0.089 (11.088)
45 days	4.596±0.338 (24.491)	3.193±0.015 (16.483)	3.746±0.040 (16.522)	5.773±0.040 (12.891)	4.523±0.081 (18.691)	3.703±0.020 (17.464)	3.806±0.015 (16.775)
60 days	5.373±0.424 (38.723)	3.533±0.025 (26.304)	3.953±0.055 (20.818)	6.07±0.121 (17.263)	4.876±0.037 (25.497)	4.13±0.225 (28.262)	4.143±0.109 (24.605)
Weight of the fish (g)							
Initial	0.37±0.02	0.248±0.008367	0.454±0.018166	0.726±0.045056	0.342±0.031145	0.292±0.010954	0.344±0.015166
15 days	0.44±0.067 (20.0)	0.314±0.018 (26.612)	0.542±0.035 (19.383)	0.86±0.041 (18.457)	0.428±0.025 (25.146)	0.36±0.04 (23.287)	0.418±0.113 (21.511)
30 days	0.53±0.026 (43.243)	0.396±0.018 (59.677)	0.62±0.021 (36.563)	1.046±0.061 (44.077)	0.506±0.020 (47.953)	0.46±0.047 (57.534)	0.508±0.074 (47.674)
45 days	0.606±0.042 (63.783)	0.444±0.039 (79.032)	0.714±0.079 (57.268)	1.15±0.015 (58.402)	0.636±0.020 (85.964)	0.55±0.03 (88.356)	0.586±0.020 (70.348)
60 days	0.716±0.021 (93.513)	0.502±0.065 (102.419)	0.872±0.073 (92.070)	1.406±0.038 (93.663)	0.706±0.043 (106.432)	0.658±0.047 (125.342)	0.69±0.012 (100.581)

All the values determined mean ± S.D. Means followed by the different alphabet in column differs statistically significantly (p<0.01%) LSD. Values in parentheses holds percentage change over control. COC =T-C/C*100 (T= Treated Value, C= Control Value). R1- Red Banana 10%, R2- Red Banana 20%, R3- Red Banana 30%, R4- Red Banana 40%, R5- Red Banana 50%, mixed=Red Banana 10%+ Mango 10%+ Grapes 10%.

Figure.1. *Carassius auratus* aquarium fish selected for the study

CONCLUSION

Carotenoids are absorbed in animal diets, sometimes transformed into other carotenoids, and incorporated into various tissues. Fishes in the wild obtain the food of the quality required for proper growth, pigmentation, and nutrient profile red banana, grapes and mango powder, can be smoothly incorporate as feed ingredients. red banana, grapes and mango powder not only useful in pigmentation in fishes but also enhanced growth efficiency in fishes and red banana, grapes and mango powder incorporated diets may be recommended in commercial culture to enhance the growth and pigmentation in *Carassius auratus.* Results had indicated that the presence of many health promoting nutraceuticals, are present in the tested fruits. Also, these fruit record a good biomedical application through our everyday life. It is also possible to prospect on these fruit species and identify the active secondary metabolites in it to be used for curing many dread full diseases of mankind.

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