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Effect of Unripe Banana Peel Powder Supplemented Diet on Growth of *Labeo rohita* (Hamilton 1822) Fingerlings

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ABSTRACT

The present experiment was conducted for 60 days to assess the effect of unripe banana peel powder supplemented diet on growth of *Labeo rohita* (Hamilton 1822) fingerlings. Dietary supplementation of banana peel powder at five different inclusion levels of 0% - T_0 (without banana peel powder), 2% (T_1), 4% (T_2), 6% (T_3) and 8% (T_4) respectively were used to feed the fishes. The fishes were fed @ 3 % of body weight once in a day. During the whole experimental period, there was no awful impact of banana peel powder supplemented diet can be seen on water quality parameters, as the values of water quality parameters show only narrow variation in different treatments. Although, the effect of banana peel powder supplemented diet was clearly specify the improved weight gain in different treatment. After supplementations of banana peel powder diet, the maximum weight gain, per cent weight gain, SGR and, GCE, 60.173±0.098, 74.446±0.104, 0.927±0.000, 0.339±0.000 was found in treatment T_2. While, the best feed utilization in terms of minimum FCR (2.950±0.005) was also found in treatment T_2 and maximum (4.250±0.040) was found in control T_0. Hence, it can be concluded from the above results that the addition of banana peel powder supplemented diet at the inclusion level of 4 % in fish diet can be recommended to increase the fish growth.

Keywords Banana peel powder, FCR, Diet, Supplemented.

INTRODUCTION

The worldwide fish production in 2018 reached 179 million tonnes. In 2018, 156 MT of the overall fish production was used for human consumption. Aquaculture contributes 46 % of the total fish production in 2018. Finfish denotes 85 % of total marine capture production. Global aquaculture fish production in 2018 reached 82.1 MT. In Asian fish production (excluding China), the share of aquaculture was 42 % in 2018. Asia dominates the fish farming by 89 % of the total world in terms of volume in the last 20 years. People engaged in primary production of fisheries and aquaculture were estimated to be about 59.51 million and most of them were from developing countries,

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14 % of them were women. Asia represented the highest no. of workers i.e., 85 % of the total world. About 67 MT of fish were marketed internationally in 2018 (FAO 2020).

The fisheries sector of India is immensely contributing to the economy of the country. It provides valuable foreign exchange, food, nutritional security and generating employment to millions of people. At the initial level, the fisheries sector maintained livelihood of about 2.8 crores fishers and fish farmers. The fish production of India in 2018-19 was 13.57 million metric tonnes which get increases by 14.16 MMT in 2019- 20 and the total value of fisheries export was Rs 46,662.85 crore in 2019-20. Government of India has recently launched a scheme Pradhan Mantri Matsya Sampada Yojana (PMMSY) by considering the crucial role of fisheries sector. The emphasis of scheme was on doubling the fisher's income. In India, the fisheries sector contributes to 1.24 % of the GDP and 7.28 % of the agriculture GDP (Handbook on Fisheries Statistics 2020).

Labeo rohita is commonly known as ''rohu" and is one of the most preferred species among all the IMC's. It constitutes approximately 35 % of the Indian major carp's production (FAO 2000). In carp polyculture practice, *Labeo rohita* (rohu) is the most desirable Indian major carp species. Rohu is the water column feeder and feeds mainly on plankton. In fingerling stage, it prefers zooplankton with phytoplankton as subsidiary food under natural condition. Rohu is one the better approved and tasty freshwater fish cultured in India, Bangladesh and other neighbouring countries. Rohu is the chief nutritional source of protein and omega 3 fatty acids (Memon *et al*. 2010). It provides the excessive per cent of proteins among all IMC's (Ahmed *et al*. 2012).

In the production of banana, India ranks are 1st in the world. Bananas are one of the oldest and world's most grown fruit and they are widely cultivated in tropical countries. Bananas are beneficial fruit and are known as nutritious gold mine. They are important source of fiber. They are rich in vitamin B6 and potassium (Vincy 2016). Banana peel represents 40 % of the fruit and is usually under utilized, ending up as a waste product (Anhwange *et al*. 2008). Banana peel is used as a feed in the nutrition of livestock around the world (Adeniji *et al*. 2007, Anhwange *et al*. 2008).

Banana peel can be used as a feed additive in aquaculture to improve fish growth and disease resistance (Giri *et al*. 2016). Fish feed records almost 60-70 % of the running expenditure of farm, so it needs to be taken care in production of feed (Gabriel *et al*. 2007). It is essential to reduce the continuous increase of feeding prices by producing low cost, admirable and energetic diet is most important (Aderolu *et al*. 2011). In aquaculture protein being the most expensive diet of fish feeds accounts the highest operational cost (Munguti *et al*. 2012). Banana peels are one of agricultural solid wastes produced anywhere the banana processing presents. In tropical countries such as India and Indonesia, the banana peels are present in abundant quantity. *C. gariepinus* showed better nutrient utilization and growth performance with ripe banana peel compared to unripe banana peel this could be as a result of the anti-nutritional factors that are higher in unripe banana peel (Lawal *et al*. 2014).The amount of carbohydrate present in banana peels make it effective for the production of many substances, including feed. However, there is a great need of feed in fish farming practices as this could help farmers to obtain substantial profit (Fatmawati *et al*. 2018). This carbohydrate-rich and low protein content agriculture wastes can be low cost fish energy source. However, carbohydrate amylolytic activity in carnivorous fish is lower than herbivorous fish (Hidalgo *et al*. 1999). Therefore, adding amylase activities on the carbohydrate feed will be advantageous. The banana peels are rich in carbohydrate and were most favorable energy sources (Fatmawati *et al*. 2018). Plant extracts are known to promote growth, stimulate appetite, and enhance toxicity and immune stimulation. Moreover, plant extracts facilitate maturation of cultured species and possess stress reduction, sexual stimulation and anti-pathogenic properties in fish (Reverter *et al*. 2014).

MATERIALS AND METHODS

Experimental fish and design

For the experimental study, the fingerlings of *Labeo*

rohita were selected. Fish were procured from Fish Seed Production Unit, DOR, MPUAT, Udaipur.

Experimental design

The experiment was carried out for 60 days at the Department of Aquaculture, College of Fisheries, Udaipur, Rajasthan. 15 plastic tanks of 225 l capacity were used for the experiment. Total numbers of 150 healthy and disease free fingerlings of rohu were acclimatized for a week in a 500 l capacity circular FRP tanks. During acclimatization, adequate oxygen was supplied with an aerator and fingerlings were fed on a basal diet. After the acclimatization period, the fingerlings of *Labeo rohita* with an average body weight (gm) were randomly distributed at the rate of 10 fishes per tank. All the tanks were disinfected using $KMnO_4$ and washed properly before introducing fishes. Bore well water was used during the whole experimental period and filled the tanks up to 200 l. All 15 tanks were covered with nylon nets to prevent jumping out of fish. Fingerlings were fed once in a day @ 3 % of their body weight in the form of pellets. The fishes in each tank were collected with the help of hand net into the container. For the study of growth parameters, measurements were taken at the 15 days interval. Sampling of water quality was monitored on initial day and subsequently on 15 days. At the end of the experiment after 60 days the samples were analyzed for growth performance, survival and digestive enzymes activity.

Feed preparation

Feed ingredients

The experimental basal diet was prepared by using groundnut oil cake, rice bran, wheat flour (40:40:18), 2 % vitamin and mineral mixture. The unripe banana peel powder was supplemented at five different graded levels i.e. T_0 - control (0% banana peel powder) and treatments: T_1 (2%), T_2 (4%), T_3 (6%), T_4 (8%) replacing with equal amount of basal diet. The experimental diet was prepared by mixing the unripe banana peel powder in basal diet and, shown in Table 1. The fruit unripe "banana" (*Musa acuminate*) peel was collected from the local market chips manufactures in Udaipur. The peels were clean and dried in shade at room temperature for 2-3 weeks in college. The peels were grinded in an electronic mixer grinder after that the powder was sieved by (80 µ diameter) pore size sieve. Then the collected powder of unripe banana peel was stored in sealed plastic container at room temperature until it is used. All the dry ingredients are mixed properly and made dough was placed in autoclave at 15 lbs pressure for 30 minutes. Hand pelletizer was used to prepare feed pellets then air dried and stored in air tied containers.

Growth parameters

During the experimental period, the fish growth parameters i.e. weight gain (WG), per cent weight gain, specific growth rate (SGR), feed conversion ratio (FCR) and gross conversion efficiency (GCE) were monitored at 15 days interval. For calculating the growth parameters following formulas were used as given below:

Weight gain (WG) formula

$$\text{Weight gain (WG)} = Wi - Wo$$

Where,

Table 1. The details of experimental diet and treatments are given below.

Sl. No.	Parameters	Treatments				
		T_0	T_1	T_2	T_3	T_4
1.0	Basal diet (%)	100	98	96	94	92
2.0	Banana peel powder (%)	0	2	4	6	8
3.0	Proximate composition					
A	Moisture (%)	$8.10^{a}\pm0.05$	$21.31^{a}\pm0.02$	$5.71^{a}\pm0.29$	$6.4^{a}\pm0.05$	$58.46^{b}\pm0.43$
B	Crude protein (%)	$8.10^{a}\pm0.05$	$21.46^{a}\pm0.25$	$6.15^{ab}\pm0.03$	$6.51^{ab}\pm0.15$	$57.76^{b}\pm0.37$
C	Fat (%)	$8.15^{a}\pm0.08$	$22.70^{c}\pm0.02$	$6.40^{b}\pm0.4$	$6.81^{b}\pm0.05$	$55.90^{a}\pm0.40$
D	Ash (%)	$8.27^{ab}\pm0.15$	$22.15^{b}\pm0.20$	$6.59^{b}\pm0.16$	$6.77^{b}\pm0.05$	$56.20^{a}\pm0.46$
E	Carbohydrate (%)	$8.4^{b}\pm0.06$	$21.96^{b}\pm0.03$	$6.66^{b}\pm0.10$	$6.67^{ab}\pm0.12$	$56.23^{a}\pm0.26$

W_i = Final weight of live fish (g)
W_o = Initial weight of live fish (g)

Per cent weight gain

$$\text{Par cent weight gain} = \frac{\text{Final weight (g) - Initial weight (g)}}{\text{Initial weight (g)}} \times 100$$

Specific growth rate (SGR) equation

$$\text{SGR\%} = \frac{\text{(Ln wt - Ln wo)}}{\text{D}} \times 100$$

Where,
W_0= Initial weight of live fish (g)
W_t = Final weight of live fish (g)
D = Duration of feeding (days)
Ln = log

Feed conversion ratio (FCR) formula

$$\text{FCR} = \frac{\text{Weight of food given (g)}}{\text{Weight gain of fish (g)}}$$

Gross conversion efficiency (GCE)

$$\text{GCE} = \frac{\text{Weight gained (g)}}{\text{Food given (g)}}$$

Water quality analysis

To maintain the congenial environment of the experimental tanks for the fish, the water of the experimental units was partially replaced every alternate day using bore well water. Water quality parameters such as Temperature, pH, DO, Electrical conductivity, Total alkalinity and Total hardness were analyzed on every 15th day interval. For analyzing water quality parameters stated above, standard methods of APHA (2005) were followed.

Statistical analysis

To analyze the data, standard statistical methods were used to draw meaningful conclusion. The data was analyzed using SPSS software (Version 16.0). One way ANOVA and Duncan's multiple range tests were used for determine the significant dissimilarities between the groups. All data is presented as mean ± SD with a statistical significance level of $P< 0.05$.

RESULTS AND DISCUSSION

In the present study, the growth parameters were found significantly ($P< 0.05$) high with net weight gain (60.173 ±0.098), per cent weight gain (74.446±0.104) and specific growth rate (0.927±0.000) respectively. While, the minimum (best) value of FCR was noticed in T_2 (2.950±0.005) when compare with other treatments and nutritionally it was good FCR. The gross conversion efficiency was also noticed high in treatment T_2 (0.339±0.000) and, all the growth parameters are shown in Table 2 and Fig. 1. Silva *et al*. (2020) demonstrated the effects of whole banana meal inclusion and found the range of growth as SGR (2.49 ± 0.15) in % day-1 by using 8 % WBM in tambaqui juveniles. Giri *et al*. (2016) evaluated the effect of banana peel flour on growth of *Labeo rohita* fingerlings and revealed that at 5 % of banana peel flour (BPF) exhibit the high growth rate (83.61 ± 1.52). Sreeja *et al*. (2013) reported the value of FCR (2.3 to 3.5) in the diet of *E. suratensis* fed with different probiont supplemented diet mix with banana peel powder. Ojha *et al*. (2014) have observed improved activities in *Labeo rohita* fed with leaf extract of *Mucuna Pruriens*. Bishnoi *et al*. (2017) have evaluated that *Aloe vera* @ 400 g\kg diet had significant role in improving rohu growth and metabolism. Shabana *et al*.

Table 2. Summary data on growth performanceof *L. rohitafingerlings* fed with banana peel powder supplemented diet. Data expressed as mean ± SE (n=3). Mean value in the same column sharing different superscripts are significantly different (P<0.05).

Sl. No.		Parameters				
		Net weight gain (g)	Per cent weight gain	SGR	FCR	GCE
1.	T_0 (Control)	38.393^{a} ±0.294	47.570^{a} ±0.401	0.648^{a} ±0.004	4.250^{e} ±0.040	0.235^{a} ±0.002
2.	T_1	41.480^{b} ±0.519	51.076^{b} ±0.819	0.687^{b} ±0.008	3.983^{d} ±0.037	0.251^{b} ±0.002
3.	T_2	60.173^{e} ±0.098	74.446^{e} ±0.104	0.927^{e} ±0.000	2.950^{a} ±0.005	0.339^{e} ±0.000
4.	T_3	54.780^{d} ±0.000	68.200^{d} ±0.098	0.866^{d} ±0.000	3.140^{b} ±0.001	0.319^{d} ±0.001
5.	T_4	50.120^{c} ±0.069	62.046^{c} ±0.216	0.804^{c} ±0.002	3.360^{c} ±0.005	0.297^{c} ±0.000

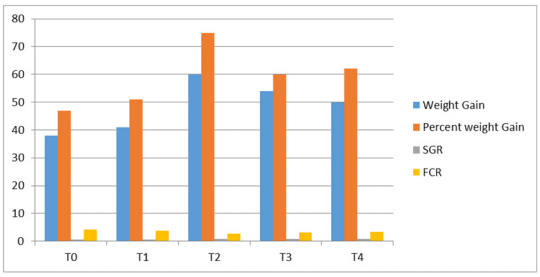

Fig. 1. Growth of rohu parameters.

(2019), have demonstrated that dietary incorporation of 2-6 g\kg^{-1} *Citrus sinensis* peel extract significantly improved the survival, growth performance.

CONCLUSION

From the result and undergone discussions, it is depicted that the supplementation of banana peel powder in fish diet has positive impact on fish. The graded levels of banana peel powder in experimental fish diet showed a clear impact on growth parameters without affecting water quality. As such the growth parameters like, weight gain, per cent weight gain, SGR, FCR and, GCE were seen best in T_2 (4%) as compared to T_1 (2%), T_3 (6%) and T_4 (8%). Thus, from the results of the present study it is suggested that the supplementation of banana peel powder @ 4 % in fish diet is compatible for acquiring good production of *Labeo rohita* fingerlings.

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