INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 12, No. 2, p. 193-197, 2018

RESEARCH PAPER OPEN ACCESS

Effect of supplementation of selected plant leaves as growth promoters of *Labeo rohita*

Sidra Nazeer*, Ehsan Mahmood Bhatti, Imtiaz Begum

Fisheries Research and Training Institute Manawan, Lahore, Pakistan

Key words: *Azadirachta indica, Polyalthia longifolia, Labeo rohita,* Growth, SGR

http://dx.doi.org/10.12692/ijb/12.2.193-197 Article published on February 26, 2018

Abstract

The aim of the present study was to check the importance of plant based supplemented feed on the growth of fish. Plants are natural products with no chemical additive in it, eco-friendly, cheap and have no deleterious effect on the health of fish. This study was conducted at Fisheries Research and Training Institute, Manawan Lahore to check the effect of plants (*Azadirachta indica, Mentha arvensis, Carica papaya, Ricinus communis* and *Polyalthia longifolia*) on growth parameters of *Labeo rohita*. Four hundred *Labeo rohita* of size 1 gm were procured from Central Fish Seed Hatchery, Manawan Lahore. The fish were acclimatized for two weeks in order to regulate in laboratory stipulation. Fresh leaves of all plants were collected, washed, and crushed into powder form. A commercially available feed (with 30% protein) at the rate of 3% body weight was used as a basal diet for the experimental fish. Five experimental feeds were prepared by adding 5gm of each plant powder in 95 gm of commercially available feed to make 100 gm of experimental feed. The weight after three month has been noted and the %age increase was high in *Azadirachta indica* (3.9%) followed by *Polyalthia longifolia* (3.8%), *Ricinus communis* (3.6%), *Carica papaya* (3.2), *Mentha arvensis* (2.9%) as compared to control (2.7%). SGR was found to be higher in *Azadirachta indica* (2.3%, 2.6%, 3.2%) after 30, 60 and 90 days. It was concluded that *Azadirachta indica* was proved to be the best enhancer of growth in fish as it has anti-bacterial properties as well.

* **Corresponding Author:** Sidra Nazeer ✉ Sidra666@gmail.com

Introduction

Fish is an essential part of diet for a large number of the people existing in the developing world. Fish food embodies the chief source of animal protein for a million of people in the 58 countries globally (FAO, 2007). The world trend has been changed regarding improvement of food and its security; to use natural products instead of antibiotics as well as growth promoters which are being chemically synthesized and have hazardous effects on fish health. In order to substitute the harmful effects of chemicals and for the healthy growth of fish natural solutions have been used like medicinal plants, plant extracts, plant powder and aromatic plants (Metwally, 2009).

There are great numbers of feed additives accessible to improve growth performance of fish. A variety of these additives applied in feed mill are chemical products especially antibiotics and hormones, can cause inauspicious side effects (Bello, 2012).

Plants are natural sources of cheaper and safer chemicals. Plant products have been used to uphold different activities like as tonic, growth promotion, anti-stress, immunostimulation, anti-microbial, appetite stimulation in aquaculture practices (Citarasu, 2002).

Azadirachta indica (Neem tree) is a tall evergreen tree with aromatic leaves and edible fruits. A mature tree can produce 350 kg of leaves a year. It has been used globally in traditional medicine for different therapeutic purposes, anti-fungal, anti-viral, anti-bacterial, and anti-fertility properties (Jegede and Fagbenro, 2007).

Carica papaya is known to be a tropical herbaceous plant. It bears fruits which might be yellowish green, orange or yellow in color when mature. It contains substantial amount of micro and macro nutrients like carbohydrates, minerals, protein, vitamins and fats which are necessary for the growth and development of fish (FAO, 2001).

Mentha arvensis (Mint) is an aromatic herb which is utilized to impart flavors in food preparations and also used as an ingredient of traditional medicine as well as aromatherapy.

Mint plant can best grow in humid and shaded conditions where temperature ranges from 15.5-21.1°C. It contains various helpful nutrients required for fish growth (Estim and Mustafa, 2010).

Polyalthia longifolia is a tall evergreen tree and can grow about 30 feet height. It has been used to cure various skin diseases, helminthiasis in fish. Menthol extract of *Polyalthia longifolia* is very effective for anti-bacterial activity against fish. Over the years aquaculture production has been escalating by the use of various plants which have antibacterial activity and *Polyalthia longifolia* is one of the foremost plants for the use of fish (Malairajan *et al.*, 2008).

Ricinus communis (Castor oil plant) is a member of the *Euphorbiaceae* family. This plant has large variety of uses especially it is the major source of castor oil.

Its seeds have been used for treatment of various diseases and it has been observed that *Ricinus communis* is very effective for growth of fish as well as shrimp (Oyeleye, 2003). In this regard, the present study was conducted to check the individual effect of *Azadirachta indica, Mentha arvensis, Carica papaya, Ricinus communis* and *Polyalthia longifolia* on growth performance of *Labeo rohita*.

Materials and methods

The present study was carried out at Fisheries Research and Training Institute, Manawan Lahore to check the effect of different plants (powder) in the diet of *Labeo rohita*.

Collection and Acclimatization of Labeo rohita

Four hundred *Labeo rohita* of size 1 gm were procured from Central Fish Seed Hatchery, Manawan Lahore. Prior to the experiment, the fish were acclimatized for two weeks in order to adjust in laboratory condition. During the acclimatization period, the fish were fed to control diet i.e. (commercially available feed with 30% protein) in glass aquaria. Care was taken to evade contamination.

Collection of Plants

Fresh leaves of *Azadirachta indica, Mentha arvensis, Carica papaya, Ricinus communis* and *Polyalthia longifolia* were collected.

Preparation of Plant Powder

Fresh leaves of selected plants were collected and washed for the removal of any dust particles. After washing, the leaves were shed dried and crushed into fine powder so that it can mix with the commercially available feed easily to make different feed formulations.

Preparation of experimental feed

A commercially available feed (with 30% protein) at the rate of 3% body weight was used as a basal diet for the experimental fish. Fish were fed twice daily for 90 days. Five experimental feeds were prepared by adding 5gm of each plant powder in 95 gm of commercially available feed to make 100 gm of experimental feed. The feed which was without plant powder was considered as control diet.

Total eighteen glass aquaria with 50L capacity of water were used for the experiment. Each treatment was in the form of three replicates. Twenty *Labeo rohita* were stocked in each aquarium. The growth rate of fish for each of the five experimental diets was checked after 30, 60 and 90 days, and the feeding rate in each aquarium was adjusted according to the new body weight gain by the fish. The water in all aquaria was changed daily in order to remove all the unconsumed wastes and faecal matter.

Water quality analysis

Imperative water quality parameter such as temperature dissolved oxygen and pH were observed daily and kept within the range during the experimental period (Table 1).

Growth parameters

The specific growth rate of *Labeo rohita* for different plants additive feed was checked by applying formula:

$$SGR = Final\ \ weight - Initial\ weight\ /\ No.\ of\ \ days\ X\ 100$$

Results and discussion

Water Quality

Water quality parameter such as dissolved oxygen, temperature and pH was monitored with their minimum and maximum range for the survival and growth of *Labeo rohita* (Table 1). Faecal matter was removed by siphoning method.

Table 1. Range of selected water quality parameters.

Sr. No	pH	Temperature ºC	Dissolved oxygen (ppm)
Minimum	7.15	18.3	5.3
Maximum	8.0	30.8	6.5

Growth performance

The result of this trail has been checked after 30, 60 and 90 days, which included average increase in weight as well as specific growth rate and was compared with the control. The data of five different plants showed highly significant results in comparison with control. After 30th, 60th and 90th day of observation, *Azadirachta indica* supplemented feed showed maximum increase in weight (1.7%, 2.6%, 3.9%) and followed by *Polyalthia longifolia* (1.8%, 2.8%, 3.8%) respectively. There was a minimum difference of growth rate between these two plants but when compared to control it was maximum i.e. (1.5%, 2.2%, 2.7%) (Table: 2). As far as specific growth rate is concerned, *Azadirachta indica* also showed significant results again i.e. 2.3%, 2.6% and 3.2% after 30th, 60th and 90th day. SGR was found to be higher after completion of three months (Table: 3).

In the present study, the growth of *Labeo rohita* was checked by using plant powder like *Azadirachta indica, Mentha arvensis, Carica papaya, Ricinus communis* and *Polyalthia longifolia*. Specific growth rate of fish in case of *Azadirachta indica* was found to be high 3.2% as compared to control i.e. 2.6% (Table 3).The results of the data revealed highly significant between the control and different treatments. In another study, these five plants were checked *Sesbania grandiflora, Moringa oleifera, Coleus aromaticus, Ocimum basilicum and Solanum*

verbascifolium for the enhancement of growth of *Oreochromis mossambicus*. The study revealed maximum growth rate (length and weight) in case of *Moringa oleifera,* as this was proved to be the alternative source of protein for fish. The increase in weight was found to be 0.96%, 1.33%, 1.78%) as compared to control (Richter *et al*., 2003).

Table 2. Weight gain of fish in 30, 60 and 90 days after supplementation of different plants.

Treatments	Feed supplemented (%)	Initial weight (gm)	Weight after 30 days (gm)	Weight after 60 days (gm)	Weight after 90 days (gm)
Control	0.0	1.0	1.5	2.2	2.7
Azadirachta indica	5.0	1.0	1.7	2.6	3.9
Polyalthia longifolia	5.0	1.0	1.8	2.8	3.8
Ricinus communis	5.0	1.0	1.7	2.6	3.6
Carica papaya	5.0	1.0	1.6	2.8	3.2
Mentha arvensis	5.0	1.0	1.5	2.2	2.9

In this study, *Azadirachta indica* (5%) in the diet of fish was found to be better plant for the growth of *Labeo rohita* but in another study, where only 1% of neem powder was used, it showed minimum effect other than thyme and fenugreek in case of Tilapia (Mostafa *et al*., 2009). *Polyalthia longifolia* showed second highest results when fed to fish. The average weight gain was 1.8%, 2.8% and 3.8% after 30th, 60th and 90th day of experiment. The SGR was also high i.e. 2.6%, 3.0% and 3.1% (Table 3).

Table 3. Specific growth rate of fish in 30, 60 and 90 days after supplementation of different plants.

Treatments	Initial weight (gm)	30 days (%)	60 days (%)	90 days (%)
Control	1.0	1.6	2.2	2.6
Azadirachta indica	1.0	2.3	2.6	3.2
Polyalthia longifolia	1.0	2.6	3.0	3.1
Ricinus communis	1.0	2.3	2.6	2.8
Carica papaya	1.0	2.0	3.0	2.4
Mentha arvensis	1.0	1.6	2.0	2.1

As *Polyalthia longifolia* contained 10% protein, 5% ash, 0.26% lipid, 19% fibre, 9% moisture and 57% carbohydrates, all these ingredients were essential for the significant growth of fish especially, carbohydrates and protein.

In this study, three other plants showed great importance in case of fish diet and its growth. *Ricinus communis* (castor oil plant) was proved to be very effective as its SGR was found to be 2.3%, 2.6% and 2.8% in comparison with *Mentha arvensis* and *Carica papaya* (Table 3).

In another study by Anoliefo and Edegbai, 2000; *Ricinus communis* was used in diet of fish (1%) along with *Capsicum annum, Solanum lycopersicon, Abelmosclus esculentum* and *Solanum incanum*.

This study indicated that castor oil plant showed highest growth of *Labeo rohita*. This was also used as medicinal plant to treat different diseases in fish. *Carica papaya* is a rich source of vitamin K, vitamin B-12, vitamin C, riboflavin, thiamin and also some micro and macro nutrients like Na, Mg, Ca, Zn, Cu, Fe. In this study, this was proved to be very beneficial for growth of fish. The average increase in weight was found to be 1.6%, 2.8% and 3.2 as compared to *Mentha arvensis* which showed minimum growth in this experiment i.e. 1.5%, 2.2% and 2.9% (Table 2).

Conclusion

The results of current study showed the beneficial role of selected plant leaves i.e. *Azadirachta indica, Mentha arvensis, Carica papaya, Ricinus communis*

and *Polyalthia longifolia* as growth promoters of *Labeo rohita*. The overall study indicates that *Azadirachta indica* at concentration of 5% was proved to be very effective for the growth parameters of fish that is %age increase in weight as well as SGR, compared to control. This study highly recommends the use of plants in fish farming because plants are safe & environment friendly, no hazardous effects on the health of fish.

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