IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 7, June 2026
Impact Factor: 8.2

Innovative Fish Fed Formulation Using Brassica nigra (L.) W.D.J. Koch for Optimizing Growth of Indian Major Carp, Cirrhinus mrigala (Ham. 1822)

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Abstract: *Fish farming plays an important role in socio- economic status of country by enhancing food security, high quality proteins, strengthening both local nutrition and economic development. Fish farmers facing the problems related to fish feed is high cost, poor nutritional formulation leading to retardation in growth rates. To reduce cost of fish feed there is need to use locally available ingredients such as agricultural by products and plant proteins included in diet for partial or total replacement of the expensive protein source. In present studies attempts have been made to evaluate the fish meal formulated with leaf powder of Brassica nigra (L.) W.D.J. Koch for Cirrhinus mrigala (Ham. 1822). The result showed that, increase in fish body weight and fish muscle protein content up to 50% inclusion level. The present findings concluded that, Brassica nigra (L.) W.D.J. Koch is promising source of plant protein used for partial replacement of fish meal in the formulated diet.*

Keywords: Fish feed formulation, protein source- Brassica nigra,

I. INTRODUCTION

Aquaculture is a powerful livelihood for a large section of economically under- privileged population in India. Aquaculture is environmentally responsible source of food and commercial product. In fish farming, nutrition is critical because feed represents 40-50% of the production costs. According to food and agriculture (FAO) , aquaculture is understood to mean the farming of aquatic organisms including fish, molluscans, crustaceans and aquatic plant . Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators etc. Reported output from global aquaculture operation in 2014 supplies over one lakh of fish and fish shell is directly consumed by humans.

The development of new species-specific diet formulation supports the aquaculture industry as it expands to satisfy increasing demand for affordable, safe and high quality and safe food products. Fish meal gives a quality nutritional source of dietary protein and lipid for humans. Eating fish is associated with the health benefits of lowering triglycerides, blood pressure, inflammation, macular degradation and reducing the risk of heart disease and stroke. It also provides a lean source of omega-3 fatty acids, proteins and minerals. Omega-3 is good fats to our body.

Over several decades, fish institutes have evaluated alternative source of plant origin in fish diets as a partial or total fishmeal replacement. Continuous efforts are being made by the nutritionist to reduce the food cost as a strategy to sustainable aquaculture. Economic value of fish depends on the protein source as well as on the expected returns from fish growth. Over the years, it has been documented that carefully formulated and well-presented fish diet plays a very significant role in fish culture.

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For commercial culture of fish, the formulation of low-cost balanced diet using locally available agro industry byproducts is needed.

Brassica nigra (L.) W.D.J. Kochmustard seed mainly cultivated in Europe, China, North Africa, Argentina, Australia, India and some part of United States. Seed of mustard are use in spice. Edible leaves can be eaten as mustard greens. Mustard leaves are associated with lower cholesterol, healthy skin, hair and boosted immunity, thanks to their high levels of vitamin K and C. *Brassica nigra* (L.) W.D.J. Koch leaves are packed with energy boosting, heart healthy, disease fighting nutrients. These are delicious source of calcium, magnesium, folic acid and vitamin k, important for bone health. The present study was undertaken to assess the partial replacement of fish meal protein with plant source, *Brassica nigra*(L.) W.D.J. Koch for selected fish species, *Cirrhinus mrigala.* (Ham. 1822).

II. METHODOLOGY

- Experimental fish species : ***Cirrhinus mrigala* (Ham. 1822)**
- Experimental plant species : ***Brassica nigra* (L.) W.D.J. Koch**
- **Classification of *Brassica nigra* :**

Kingdom : Plantae
Subkingdom : Tracheobionta
Division : Magnoliophyta
Class : Magnoliopsida
Order : Capparales
Family : Brassicaceae
Genus : *Brassica*
Species : *nigra*

Sample Collection and Food Preparation

Seeds of *Brassica nigra* were sowed and allowed to grow for 1 week. After a week the seedlings were cut, washed thoroughly, proper drained and sun dried. Cotton seed oilcake, rice bran, mineral-vitamin tablets and dried plant leaves were grinded separately using kitchen mixer. Mixture of these ingredients was formulated for fish meal. (Table 1). With the help of mincer, the 0.8 mm pelleted feed were prepared, which were sun dried. After the drying the pellets were broken into convenient size and stored into refrigerator. A diet of rice bran, cotton seed oilcake, gaur gum and mineral vitamin powder fish meal was served as control diet.

Ingredients	Control	30%	40%	50%
Rice Bran	52	20	17	15
Cotton seed oilcake	37	40	34	26
Gaur gum binder	10	09	08	08
Mineral Vitamin powder	01	01	01	01
Plant powder	00	30	40	50

Table No. 1 : Percentage of ingredients used in formulated pelleted fish meal (per 100 gm)

EXPERIMENTAL ARRANGEMENT AND FISH

Fingerlings of experimental fish *Cirrihinus mrigala* (Ham. 1822) weighing 0.5 g to 1 g were kept in glass tank for 15 days to examine for acclimatization. These were divided into 4 buckets of 20 liters. Continuous aeration was provided.

The feeding experiment was conducted in aquarium of 12-inch height and 12 inch of circumference. Experiment was conducted for 60 days. Each aquarium was stocked with 15 uniform sized weighted fingerlings. Food was given to fish daily at the rate of 5% of their body weight in two equal ratios. After every 15 days a fish from each tank was sacrifices and used as sample to record the growth. Fishes were sacrificed muscle tissues were dissected out as quickly as possible and stored to analyse total protein and total lipid contents. These tissued were weighted and used for the

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estimation of biochemical. Components like protein **(Lowry et. al., 1951)** and lipid **(Barnes & Blackstock, 1973).** Results were recorded for diet performance evaluation.

Growth performance of experimental fish were determined in terms of final individual fish weight (gm), survival (%), specific growth rate (SGR, % per day), food intake on % of body weight basis, feed conservation ratio (FCR), protein efficiency ratio (PER). These growth responses were calculated as follows:

- **Weight gain (%)** = 100 (Final body weight – initial body weight / initial body weight)
- **SGR** (% per day) = 100 ($\log_e$) final body weight ± $\log_e$ initial body weight / time (days)
- **FCR** = [Dry weight pf feed fed (g)] / [fish weig

1. Collection of fish

2. Experimental fish- *Cirrhinus mrigala*

3. Growing leaves of *Brassica nigra*

4. Dried leaves of *Brassica nigra*

5. Mixing of ingredients

6. Preparation of food

DOI: 10.48175/IJARSCT-36872

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7. Pelleted food

III. RESULTS

Growth Achievement:

The growth, gain in weights, feed conversion efficiency, specific growth rate, protein efficiency ratio of fish fed with various test diets containing different levels of *Brassica nigra* plant leaf powder meal is summarized in following figures.

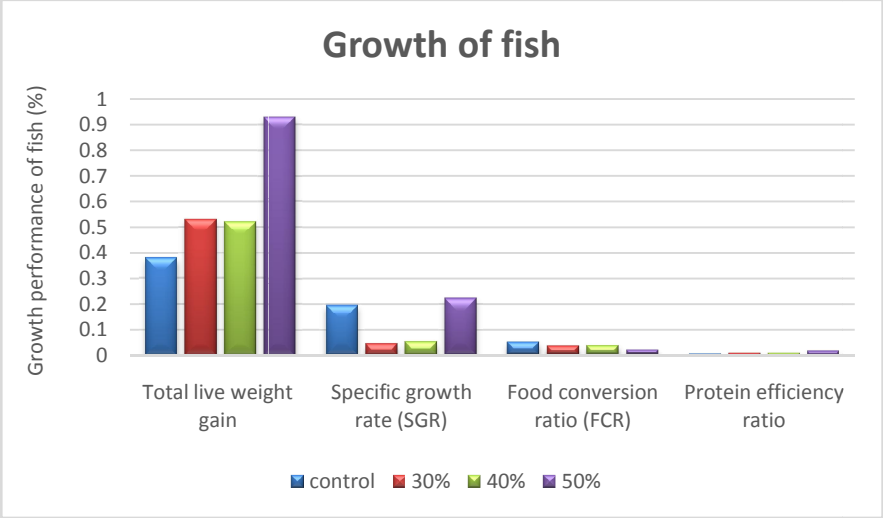

Fig. 1. Growth of fish with different experimental diets

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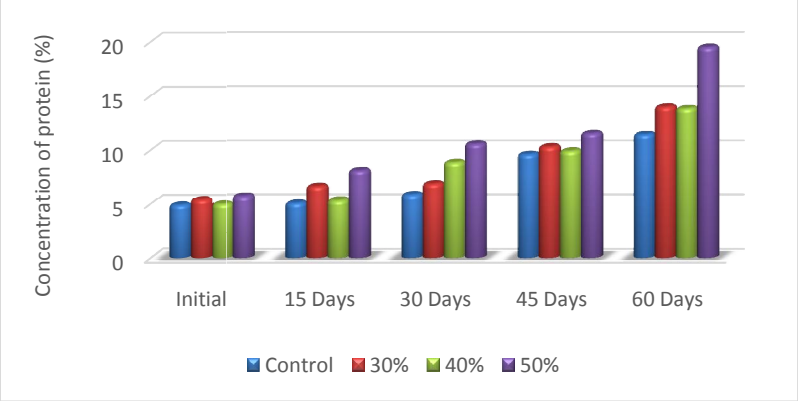

Fig. 2. Comparison of Protein Alteration from Muscle *C. mrigala*

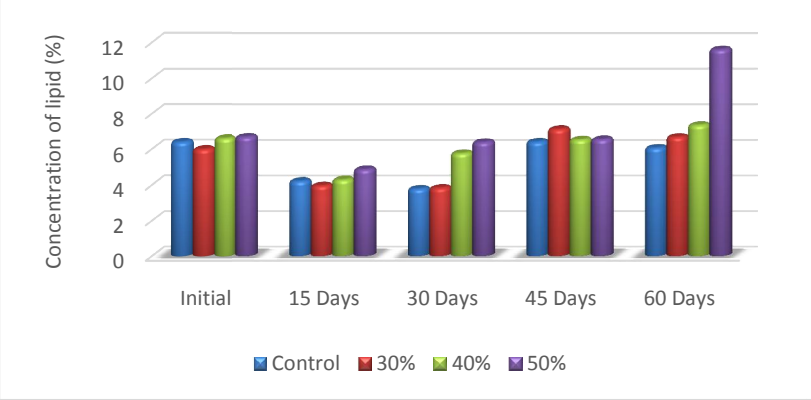

Fig. 3. Comparison of Lipid Alteration from Muscle *C. mrigala*

IV. DISCUSSION

In the present study, it is observed that, the growth of fish was increased up to a certain limit depending upon the incorporation of plant protein in the feed. Above the optimum level of inclusion of plant proteins, the regarded growth was observed.

In the present study, the experimental fish, *C. mrigala* (Ham. 1822) showed good and increased growth up to 50% inclusion level and suddenly shows decreased growth for control food. Among all diet groups 50% feed showed highest growth and protein content, whereas control feed showed comparatively low growth and protein content. The growth of fish depends upon the ingredients and its percentage in the formulated feed**. (Glencross et al.., 2007)**

The digestibility of a particular feed ingredient reflects in growth of fish. Digestibility depends upon various factors like a nature , dietary component, type of nutrients and level of inclusion.**(De.Silva et al..,1990),** reported a decreasing trend in digestibility of protein with increasing level of a incorporation of a plant ingredient in *Oreochromisaureus.*

A progressive decline in in the PER vales with an increasing level of ***Brassica nigra***(L.) W.D.J. Koch meal in diet was recorded in the present investigation. Feeding trials, under laboratory conditions on *C. mrigala* (Ham. 1822) have revealed that weight gain and biochemical alteration was significantly high in the fish groups fed on leaf meal as compared with the fish groups fed on control.

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V. CONCLUSION

The present study confirmed that *Cirrhinus mrigala* (Ham. 1822) is able to utilize plant based formulated diet. An inclusion level up to 50% in the practical diet for *C. mrigala* (Ham. 1822)fingerlings had no adverse effect on growth, feed utilization efficiencies or body composition of the fish. The growth of fish is seen higher in 50% than control food. It may be due to decreased level of anti-nutritional factors in control good died because of absence of plant leaf powder in it.

From the present work it is concluded that, *Brassica nigra*(L.) W.D.J. Koch may be promising source of plant protein; used for partial replacement of fishmeal in the formulated diet. It will definitely help to small scale fish farmers to overcome expenditure on traditional fish feed.

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