JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A STUDY OF FISH FED WITH FISH OFFAL AND ITS BIOCHEMICAL EFFECT IN CATLA (*CATLA CATLA*)

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Abstract: In certain parts of the globe, the fish processing plant by-products are used and transformed into low-market value products such as animal feed, fishmeal, and fertilizer (Chalamaiah et al., (2012),. However, in recent years, more studies are done on transforming the by-products into more valuable products called fish protein hydrolysates. This finding has created more attention to develop this product into human health supplements because of its high protein content with good organic compound balance and bioactive peptides (Chalamaiah et al., 2012). In certain European countries such as Norway, 97% of by-products from Norwegian aquaculture are being utilized. Consisting of discarded parts (head, bones, and internal organs) that are not fit for human consumption. This by-product, rather than being wasted and dumped, will be utilized to provide fish feed and indirectly helps towards a greener environment.

Keywords: Fish offal, Fed to Fishes, Bio-Chemical effect, Survival, and Growth.

1. INTRODUCTION

Aquaculture in India is predominantly a rural activity. Its benefit towards increasing domestic economy through diversification of income and food provisions hardly needs any emphasis. Due to the growing scarcity of arable land for food production, fish fanning through aquaculture has gained importance as a priority production system.

In India, aquaculture is based mainly on freshwater cyprinids comprising three species of carps: Rohu (*Labeo rohita*), Catla (*Catla catla*), and Mrigal (*Cirrhinus mrigala*). The intensive and semi-intensive culture of these three indigenous carps has been maintaining a sustained growth of over 6% and is expected to account for the shortfall in fish production resulting from the projected population increase by 2020 AD. The share of aquaculture in fisheries production is increasing every year (Lowther 2005) and efforts are being made to develop techniques, inputs, and management to increase aquaculture production. It has been revealed that the increase in aquaculture production must be supported by a corresponding increase in the production of suitable diets since the sustainability of commercial aquaculture operations depends largely on diets, which make up over 60% of the total operation cost. Unfortunately, procurement of a balanced diet to maximize production is a constraint for fish farmers, particularly the small and medium-scale fish farmers, who contribute most of the aquaculture production in India.

A preliminary study was completed in MARDI to spot the proximate composition of the fish offal meal. The nutrient content of FOM as utilized in this study, nevertheless, was high and like the standard local organic. (Farahiyah et al., 2015). The digestibility value of FOM was also high where protein and aminoalkanoic acid digestibility were above 95% with a digestible energy (DE) value of 17.69 MJ/kg. Measurement of digestibility is important to evaluate the nutritive value of a feed or an ingredient for formulating the diets (Bureau and Cho, 1990). However, the nutritional value of the FOM may vary from batch to batch counting on the source of fabric and its quality. This study was conducted to determine the effects of substituting fishmeal with fermented fish offal meal in the aquaculture feed on the growth performance of *Catla catla* and *Labeo rohita*.

2. AIM OF THE STUDY

This squarely brings spherical to prioritize the analysis to explore low value, nutritionally wealthy, and eco-friendly ingredients for diet formulation.

3. OBJECTIVE OF THE STUDY

To achieve the target to judge the nutritionary quality of carp fish offal collected within the retail fish market around Chennai, Develop Techniques to method it and to evaluate the processed fish – organs as a viable different of fishmeal within the formulation of a value-effective diet for carps.

4. METHODOLOGY

To work out the most proportion of fish-offal meal that would be used for fermentation and diet formulation many batches of trial fermentation were applied with totally different proportions of fish-offal meal ranging from 20% and by increasing the proportion by 20% in every batch. The fish-offal meal was sourced from native retail fish markets and consisted of the intestines of large carps (*Labeo rohita* and *Catla catla*). The portion of guts contained within the organs was carefully uncoiled, cut open, and also the gut contents were removed from exploitation clean water. Always fresh samples of the fish-offal meal were used for fermentation. The fish-offal meal was mixed in needed proportion with a mix of groundnut oil cake and rice bran mixture (1:1) and also the mixture was then added to the microbial Suspension (EM™-Maple Orgtech Pvt. Ltd., Kolkata, India), molasses, and water (2.5 mL: 2.5 g: a 100 mL) and fermented anaerobically for 12 or 22 days relying upon the proportion of fish-offal. The fermentation mixture was packed in a black polyethylene packet and sealed airtight. This packet was additionally placed in a polyethylene packet and was kept in a dark place for fermentation to take place

Finally, two experimental diets were prepared:

- Reference diet (S1) containing 40% fishmeal and
- One test diet (S2) containing 20% fishmeal and 78% fermented FO meal (Table 1).

The proportion of FO in the S2 diet was 20% respectively, with the S2 diet replacing 50% of fishmeal and in respect of the reference diet S1.

Table.1 Formulation and Proximate Composition of the Experimental Diets

S.No.	Ingredients	Diet (%)	
		S1®	S2
1	Fermented fish-offal meal	0	78%
2	Fish meal	40%	20%
3	Rice bran and Groundnut cake (1:1)	57%	-
4	Vitamin and Mineral mix	2%	2%
Proximate composition (% dry matter basis)			
5	Crude protein	32.52%	**30.18%**
6	Crude lipid	4.50%	**12.03%**
7	Crude fiber	12.4%	**4.2%**
8	Dry matter	92.80%	**91.03%**
9	Ash	15.26%	**12.07%**
10	*Gross energy (kJ.g−1)	15.74%	**19.42%**

Note - **Gross energy was calculated based on the methodology of Brafield (1985)*.

R- Reference diet

The meals were crushed, blended, and pelleted with a binder of 0.5 percent Carboxymethyl cellulose, then sun-dried for a few days before usage. a separate set of diets was prepared to test the protein digestibility of the diet, which additionally contained 1% chromic oxide (Cr2O3) as a non-absorbent reference substance.

Two separate tests were conducted:

1)Digestibility test carried out in 60-L glass aquaria to evaluate feed consumption rate, apparent protein digestibility, and changes in Physico-chemical parameters of water (dissolved oxygen and ammonia) during feeding; and,

2) Growth test was carried out in Plastic tubs to evaluate the growth of fish on the experimental diets. Deep tube-well (400 ft) water stored in an overhead tank in the college was used in all the trials.

Result and Discussion

Survival and Growth rate

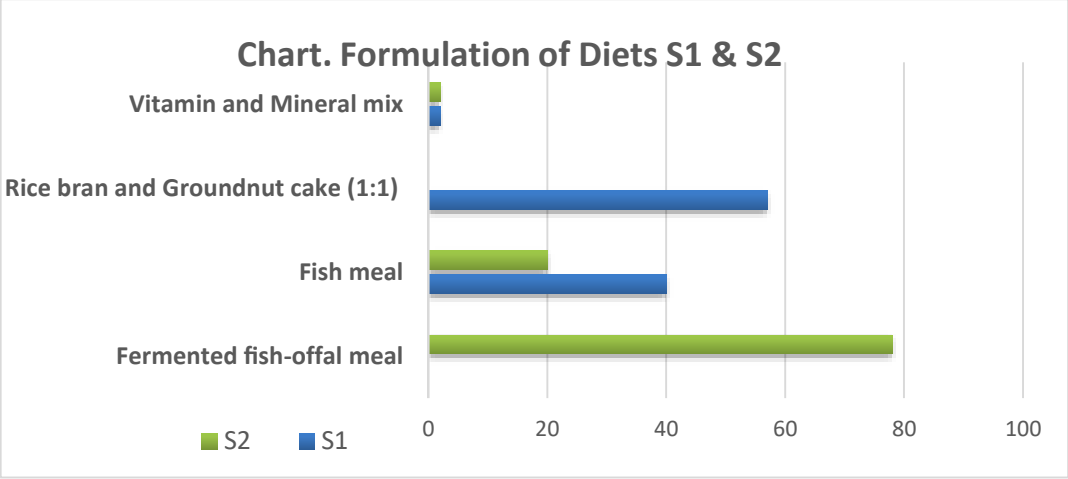
The survival rate of Carp *Catla catla* fingerlings during the test period ranged from90% to 92% and hence showed no significant variation among dietary treatments. Growth of the fingerlings was significantly higher in fermented FO meal-supplemented diets (S2) than in the reference diet (S1). Maximum growth rate and weight have been observed in the S2 diet followed by the S1 diet.

Table.2 Showing the feed intake and growth of *Catla catla* fingerlings fed with the experimental diets

Sl.No.	**Parameters**	**S1®**	**S2**
1	The initial weight of fish in grams (Average)	4.5 gm	4.5gm
2	The final weight of fish	8.5gm	**9.5gm**
3	Weight gained after 60 days	4.0gm	5.0gm
4	Feed intake: weight gain (FCR)	1.2gm	1.95gm

R- Reference diet

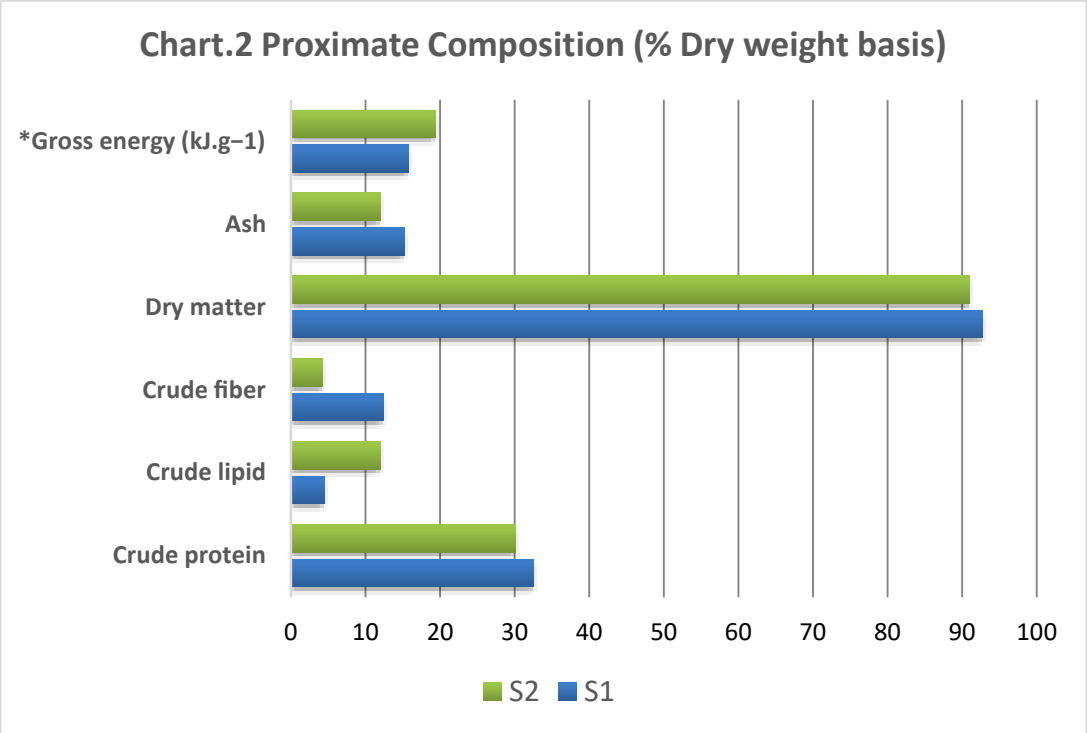
Chart.1 showing Biochemical Analysis of Fish subjected after 60 days



Fish from each tub were sampled at the top of the 60-day trial; the length and weight of the fish were recorded and five fish samples from each tank were analyzed for biochemical analyses to work out the moisture, crude protein, lipid, and ash content of the fish. Percent increase in weight, specific rate of growth (SGR), feed conversion ratio (FCR), were calculated. The results derived are tabulated. this study indicated that a diet containing fermented FO was accepted well by *C. catla.*

The present study indicates that organic is often replaced by fermented FO within the formulation of a diet for *C. catla*. Viscera of Indian major carps (IMC), discarded as offal, contain 31.5-38.9% CP and 40.6- 43.8% lipid (Mondal et al . 2006). These nutrients mostly remain intact after fermentation and function as a superb source of energy, prompting increased growth of *C.catla.*

Chart.2 showing Proximate Composition (% Dry weight basis)



Digestibility test

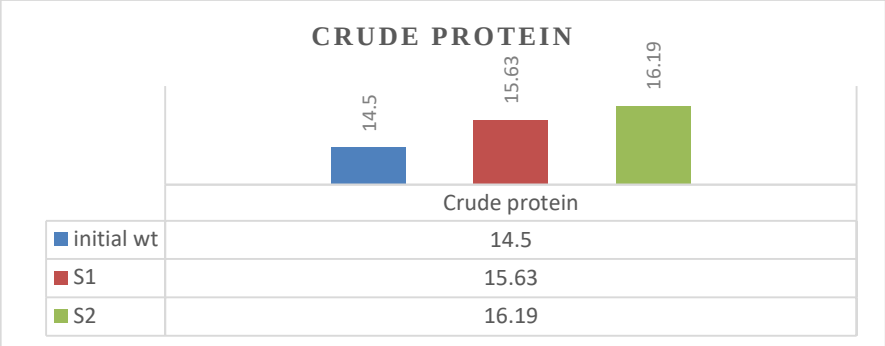
The current study also specifies that supplementation with a fermented fish-offal meal increases the protein digestibility of diets. Bairagi et al. (2002). noted that 89% apparent protein digestibility (APD) of a 40% Fish meal reference diet fed to fingerlings of *C. catla.*

Table.3 showing the Body composition of fish *Catla catla* fed with Diets S1 & S2 after 60 days

Sl.No.	Parameters	Initial Values	After 60 days	
			S1	S2
1	Crude protein	14.50	15.63±0.15	***16.19±0.40***
2	Crude lipid	3.84	4.52± 0.63	***6.75±0.25***
3	Ash	4.12	5.16±0.18	***6.78±0.42***
4	Moisture	75.25	70.92 ± 0.28	70.10± 0.87

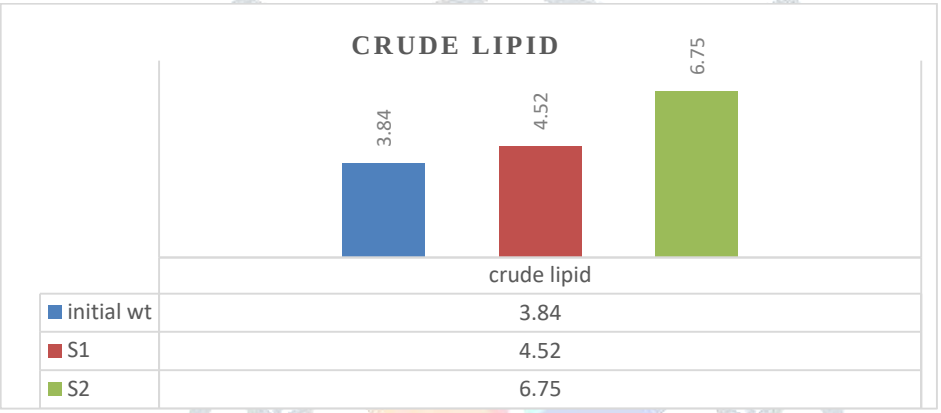
In the present study the reference diet (S1), also containing 40% FM, showed an APD value of 89%, which increased to 91% within the S2 and diet after fishmeal has been replaced by a fermented fish-offal meal at 37.5%and 50%, respectively.

Chart: 3 showing the biochemical composition-Crude Protein of fish *Catla catla* fed with Diets S1 & S2 for 60 days.



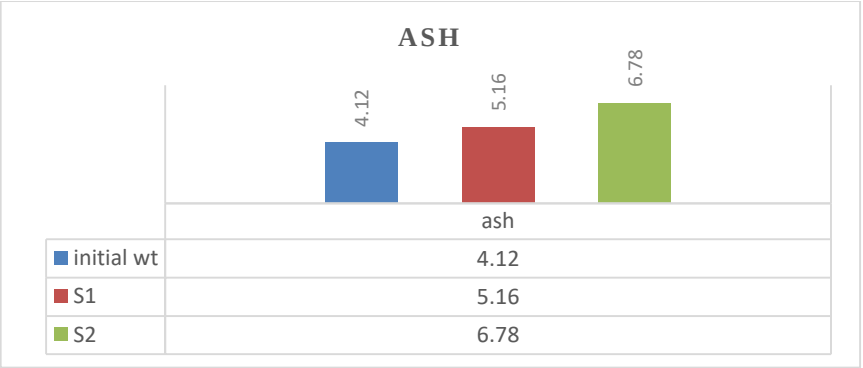
The biochemical composition of crude protein (chart no.3) The initial value of the crude protein is 14.50 and after 60 days the S1 shows 15.63, S2 shows 16.19 and is found to be higher than the S2.

Chart: 4 showing the biochemical composition- crude lipid of fish *Catla catla* fed with Diets S1 & S2 for 60 days.



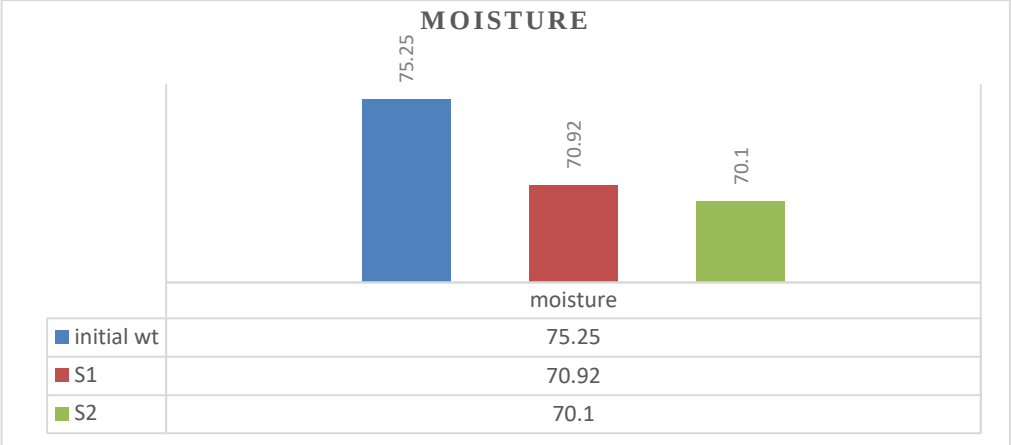
The biochemical composition of crude lipid (chart no.4) The initial value of the crude lipid is 3.84 and after 60 days the S1 shows 4.52, S2 shows is 6.75, and is found to be higher than the S1.

Chart: 5 showing the biochemical composition - ash of fish *Catla catla* fed with Diets S1 & S2 for 60 days.



The biochemical composition of Ash (chart no.5) the initial value of the ash is 4.12 and after 60 days the S1 shows 5.16, S2 shows 6.78 hence, it was found to be S2 higher than the S1.

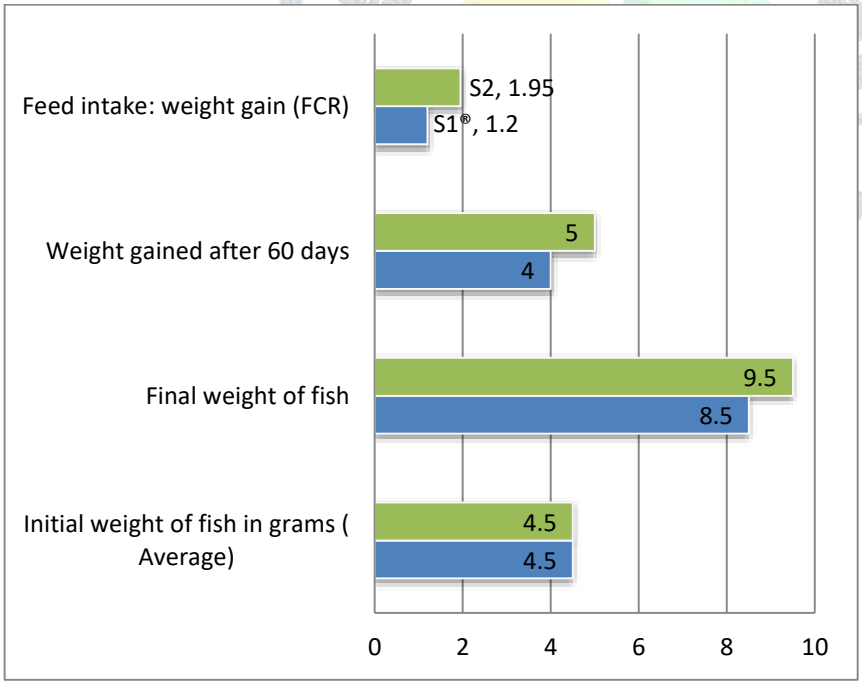
Chart: 6 showing the biochemical composition- moisture of fish *Catla catla* fed with Diets S1 & S2 for 60 days.



The biochemical composition of moisture (chart no.6) the initial value of the moisture is 75.25 and after 60 days the S1 shows 70.92, S2 shows 70.1, and **S2** is higher than S1.

Typically, the growth of fish will increase within the extent of dietary protein up to optimum (Das, Mohanty, & Sarkar 1991).

Chart 7 Showing the feed intake and growth of fingerlings fed the experimental diets for 60 days



Despite the fact that protein digestibility increases with protein quantity (Ali & Jauncey 2004), the results of this study reveal that APD increases in diets containing fish-offal meal for *Catla catla* and *Labeo rohita* despite having lower crude protein levels than the reference diet. Fermentation reduces anti-nutritional factors of the plant ingredients within the diets (Mukhopadhyay & Ray 2005) and improves aminoalkanoic acid content of animal products (Bertsch & Coello 2005), which in turn will increase the edibility of protein. Therefore, a diet containing hard products could even be an ideal diet for rearing carp fish.

FO of IMC could be fermented to the most level of 30% with the microbial suspension utilized within the current study(Mondal et al .2007). Using the same diet, served higher growth of *C.catla* fingerlings fed the diets containing fermented FO as compared with those fed only the feed diet (Mondal et al .2007)

Similar growth has additionally been reported for carps ate up fermented Neethiselvan, Jagatheeshan & Sundarsanam 1992). carp fed a diet containing fermented silage of FO also showed higher conversion potency than the diet containing organic feed only (Rao et al .1996).

Acknowledgment

The authors are thankful to ***TANSCHE (Tamilnadu State Council for Higher Education,)*** Chennai. For funding under ***the Student Mini Project Scheme***. Authors are also thankful to The Principal & Head of the Dept of Zoology, Govt Arts College for Men, Annasalai, Nandanam, Chennai – 600 035 for kind cooperation and permitting to do the work at the Department.

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