ISSN: 2347-5129
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.352
IJFAS 2015; 3(2): 324-330

www.fisheriesjournal.com
Received: 01-09-2015
Accepted: 03-10-2015

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Protein requirement of IR- Jayanti (*Labeo rohita*) fingerlings

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Abstract
A sixty days growth study was conducted on feeding 15, 20, 25 30% crude protein (CP) containing diets to Jayanti rohu fingerlings to quantify their protein requirement. Fingerlings of 8.39 ± 0.10 were stocked in triplicate ferro-cemented tanks fed *ad libitum* twice daily. Performances of fish were evaluated on the basis of weight gain, whole body proximate composition, FCR, SGR, PER, PRE, LRE, ERE etc. Results indicated that fish fed on 25% CP containing diet grew the best or almost same or comparable with 30% CP diet, carcass crude protein (70.01% ± 0.02) Crude Lipid (14.12 ± 0.39%) is also highest than other diet group. The mean final body weight of different groups was 8.40 ± 0.16, 10.02 ± 0.13, 14.19 ± 0.11 14.50 ± 10 g when fed diet containing 15, 20, 25 30% CP respectively. The growth performance of fish fed on 25 and 30% protein containing diets were significantly higher that of other two dietary treatments. Maximum specific growth rate (SGR) was found 4.15 ± 0.14 4.22 in the case of 4.22 ± 0.023 in the case of 25 30% protein respectively. The fish fed on 25 and 30% protein containing diets had the significantly lower carcass moisture, highest carcass protein and lipid as well as energy concentration. Feeding lower levels of protein resulted in deposition of significantly higher levels of whole body ash content. Maximum protein retention (PRE) (44.61 ± 0.003) energy retention of efficiency (ERE) – (124.37 ± 0.64), protein efficiency ratio (PER) (2.04 ± 0.01) was observed in fish fed on 25% protein diet best FCR (1.91 ± 0.008) was achieved on 25% protein diet. So we can conclude this study that 25% protein diet is best for protein diet in the best for growth of Jayanti rohu fingerling.

Keywords: Protein Level, Jayanti rohu, Growth Performances, Body Composition.

1. Introduction
Knowledge of optimum protein level is a prerequisite to formulate a nutritionally balanced low cost diet for feeding fish [1]. As protein represents the most expensive component in fish feed, it is important to determine the optimal requirement level for growth survival [2]. A significant reduction in feed cost can be achieved if diets with low protein could be fed to fish without compromising growth health [3]. However, inadequate protein in the diet results in reduction or cessation of growth. On the other hand, if too much protein is supplied in the diet, only part of it will be used to make new protein the remains will be converted to energy [4]. Besides these, inclusion of dietary protein levels beyond the optimum level results in high level of ammonia production, which affects the voluntary feed intake growth of fish [5]. But the utilisation of dietary protein by an organisation depends on the types of diet, digestility of dietary protein is amino acid profile, the ratio of energy to protein in diet the amount of protein supplied. Other factors that affect protein utilisation are animal size, sex, gene type environmental conditions [6].

Indian major carps (IMC) such as *Catla catla, Labeo rohita Cirrhina mrigala* are the main stay of Indian fresh water aquaculture. From the consumer's point of view rohu is the most preferred fish among the three IMCs Jayanti rohu (*Labeo rohita*) is genetically improved variety of Indian major carps having 17.0% growth advantage over normal rohu, the culture of which is growing importance over the normal rohu due to its high growth rate and consumers preference.

The knowledge of nutrient requirement is essential to minimize the feed cost. Protein is one of the major dietary nutrients affecting growth performance of fish feed cost [7]. The quantity and quality of protein consumed has a marked effect on growth rate feed efficiency [9]. There is no available information about the protein requirement of Jayanti rohu. The present study conducted to evaluate the dietary protein requirement for the species by the studying growth, feed utilisation body composition.

2. Materials and Methods

2.1 Preparation of test diets

Four practical test diets containing 15, 20, 25 30% Crude Protein were formulated using Person Square Methods. Before preparing of practical test diets, the ingredients were procured as mentioned in Table – 2, Proximate composition were analysed (Table – 3). The individual finely powdered sieved ingredients were weighed accurately in a mono pan balance (Adir Data Co. Ltd., Kolkata) mixed together thoroughly. The required quantity of vitamin- mineral mixture was added to this again mixed together. The commercial sup Livet M (manufactured by M/S Sup Livet, Saravi Zydus, Vadodara, India) – Mineral Premix Contains (quantities / Kg Premix) – Vitamin A, 20,000 i.e., Vitamin K – 0.2g, Calcium – Pantothenate – 0.5g, Nicotinamide – 30g, Vitamin B_{12} – 2.4mg, Calcium Chloride – 30g, Calcium – 150g, Manganese – 5.5g, Iodine – 0.2g, Iron – 1.5g, Zinc – 3.0g, Copper – 0.6g, Cobalt – 0.09g. In the above feed mixture about 300-400 ml/kg luke warm water was added, mixed properly then with the help of h palletize 1.0 mm pallet was drawn. The feed pellets were the sun dried for two days (about 48 hours). The properly dried feed pellets were stored in an air –tight container kept in refrigerator. Detailed test formulation, ingredients composition proximate composition of feeds are presented in Table 1-3.

Table 1: Proximate composition (% DM) of Ingredients used in the experimental diets containing varying level of protein.

Ingredients	Dry matter	Crude protein	Ether extract	Crude fibre	Ash	NFE	Gross energy Kcal / g
Groundnut oil cake (G.O.C)	89.0	40.03	8.00	7.28	9.62	36.10	447.56
Soyabean meal	90.02	44.00	1.50	8.42	6.66	39.42	425.76
Fish meal	87.01	50.08	10.78	--	39.22	--	384.08
Rice Bran	89.27	10.45	8.08	19.48	11.47	50.52	341.27

Table 2: Ingredients used for Practical diets for protein requirement experiment.

Ingredients	D-I (15% cp)	D-2 (20% cp)	D-3 (25% cp)	D-4 (30% cp)
Ground nut oil cake (G.O.C)	7.0	17.0	29.0	37.0
Soyabean meal	5.0	10.0	15.0	21.0
Rice Bran	81.0	66.0	49.0	35.0
Fish meal	5.0	5.0	5.0	5.0
Vitamin & Mineral mixture	2.0	2.0	2.0	2.0

Table 3: Proximate composition of practical diets fed IR – Jayanti Rohu fingerlings

Parameters	D-I (15% cp)	D-2 (20% cp)	D-3 (25% cp)	D-4 (30% cp)
Dry matter	95.99	96.21	96.33	96.02
C. Protein	15.12	20.53	25.33	30.29
Ether Extract	7.72	7.88	7.89	7.996 or 8.0
C. Fiber	16.81	15.05	13.15	11.21
Total ash	9.62	11.56	10.96	10.79
NFE	50.64	44.98	42.66	39.71
Protein energy (Kcal/g)	0.61	0.82	1.01	1.21
Non- Protein energy (Kcal/g)	2.72	2.50	2.41	2.30
Gross energy (Kcal /g)	3.33	3.32	3.42	3.51

2.2 Experimental facilities

Ferro – cemented rectangular tanks of 60 x 60 x42 cm of 100 ltrs. capacity were used for the experiment. Each of the tanks was attached with flow through system with a flow rate of 0.5 lit/min. The photo period was natural cycle of 12h light 12 h dark. Water source was from an open well nearby to experimental yard for rearing the experimental fishes.

2.3 Experimental design and fish maintenance

Two hundred fifty no. of IR – Jayanti rohu fingerlings (average weight 8.39 ± 0.10g or say 8.4g) were procured from Genetics division of CIFA farm, Bhubaneswar (longitude: 21° 15' N, latitude: 85° 15' E), India. After 15 days of acclimatization, a group of 15 fish (average weight 8.39 ± 0.10g) were stocked romly into triplicate tanks for each dietary treatment following a completely romized design. All groups of fish were fed ad libitum. Fishes were batch weighed at every 15 days interval to know the weight health status of the fish. The experiment was run for a period of 60 days. Before commencement of the feeding trial, 50 fish were romly sacrificed with over dose of MS.222- solution pooled samples were taken for determining the initial whole body composition gross energy. At the end of growth experiment of 60 days, fish were batch weighed to know final weigh recorded. From each batch six no. of fish were used for proximate carcass analysis three for muscle DNA RNA analysis, three for batch for get enzymes profile study three for hepatosomatic index (HSI) Viscerosomatic index (VSI) determination.

2.4 Chemical analysis

The proximate composition of experimental diets whole body was analysed in triplicate [10]. Dry matter was estimated by over drying the samples at 105 ^{0}C till a constant weight achieved crude protein was calculated by estimating nitrogen content by micro – kjeldahl method multiplying with a factor 6.25. Ether extract was determined by solvent extraction with petroleum ether (boiling point 60 – 80 ^{0}C). Total ash concert determined by incinerating the sample at 650 ^{0}C for a hrs crude fibre by acid digestion (1.25%) followed by alkali digestion (1.25%). Nitrogen fire extract of NFE was calculated by difference – NFE = 100 – (crude protein + % crude Lipid + % crude fibre + % Total ash). Gross energy in diets fish body was calculated by using Bomb Calorimeter (Parr, model 134), Parr Instrument Company, Moline, 11, USA.

2.5 DNA RNA analysis
The muscle DNA analysis was evaluated according to Ceriotti [11] RNA by Burton [12] the modified methods of Jayaram [13]. For DNA RNA study, muscle sample from each treatment was collected 12h after last feeding stored – 20 ^{0}C [14].

2.6 Digestive enzyme assay
The protease activity measured following the methods of Moore Stein [15] using Serum albumin as substrate specific activity of protease was expressed as kg of Lucien liberated /mg tissue protein/ hr at 37 ^{0}C. The lipase activity was measured by Seligman Nachlas [16] method expressed as α – naphthol reduced/mg tissue protein/n at 37 ^{0}C. The α-amylase activity quantitatively determined using Soluble Starch as Substrate [17] expressed as mg of maltose liberated/mg tissue protein/n 37 ^{0}C.
The tissue protein content was determined following Lowry *et al.* [18].

2.7 Water analysis
Water analysis parameters of the experimental tanks were analysed at every 15 days [19] recorded as follows : temperature, 22.5 – 29.6 ^{0}C, PH, 7.2 – 7.4, dissolved – oxygen, 5.8 – 7.4 mg L – 1, total alkalinity, 110 – 165 mg $CaCo_3L^{-1}$, total hardness 105 – 118 mg $CaCo_3L^{-1}$, ammonia nitrogen (NH_3N) 0.05 – 0.20 mg L^{-1}, Nitrate nitrogen (NO_3 -1 N) 11.4 – 17.5 mg L^{-1}, nitrate nitrite nitrogen (NO_2 -1 N) 0.08 – 0.13 mg L^{-1} phosphate (P_2O_5) 0.04 – 0.06 mg L^{-1}. The value was found to be normal range of carp rearing [20].

2.8 Calculation in nutritional indices
The different nutritional indices were determined as follows:-
Specific growth rate :- (SGR)

$$= \frac{In\ final\ weight - In\ initial\ weight}{Experimental\ duration\ (days)} \times 100$$

Feed conversion ratio :- (FCR)

$$= \frac{Total\ feed\ intake\ (dry\ weight)}{Total\ live\ weight\ gain}$$

Protein efficiency ratio (PER):-

$$= \frac{Total\ live\ weigth\ gain}{Total\ protein\ intake}$$

Nutrient (Protein Lipid) energy Productive values (PRE, LRE ERE):-

$$= \frac{\frac{Nutrients}{energy}\ gain\ in\ bosy}{\frac{Nutrients}{Energy}\ intake} \times 100$$

HSI:-

$$HSI = \frac{Liver\ weight}{Body\ weight}$$

VSI:-

$$VSI = \frac{Weight\ of\ the\ whole\ digestive\ tract}{Body\ weight} \times 100$$

3. Results and Discussion
From the study we understand that D_3 (25% cp) D-4 (30% cp) demonstrated linear increasing body weight excepting D – I and II (15% cp 20% cp) as the rearing period progressed. After feeding of 15 days a clear demarcation of growth was observed between the average body weight of experimental fish fed on 25% 30% cp diet (D-3 D-4) rather 15% 20% cp diet (D-1 D-2) fed groups which became more distinct as the experiment period progress. The data on growth indices, diet nutrient utilization of the fish received various protein diets presented in table 4 2. As observed from the table 4 and Fig. 1 and 2 the experimental fish fed D-4 achieved an average weight of 14.79 while D_3 fed fish group attend 14.19g of average weight which is closely related with D-4 fed fish group. Total weight gained in the fed D-3 D-4 group is 88.66g ± 0.12 89.01g ± 0.046 respectively they are relatively comparable.

Table 4: Growth nutrient utilization in IR- Jayanti rohu fingerlings fed diets containing varying levels of protein.

Parameters	D-I (15% cp)	D-2 (20% cp)	D-3 (25% cp)	D-4 (30% cp)
Initial wt.(g)	8.39 ± 0.07	8.12 ± 0.099	8.28 ± 0.101	8.87 ± 0.141
Final wt.(g)	8.39 ± 0.155	10.02 ± 0.132	14.195 ± 0.113	14.79 ± 0.173
Weight gain (g)	0.120 ± 0.105	1.897 ± 0.049	5.92 ± 0.012	5.92 ± 0.046
SGR (% / day)	0.03 ± 0.003	3.45 ± 0.025	4.15 ± 0.015	4.23 ± 0.023
DFI(mg feed/fish/day)	190.30 ± 1.72	153.54 ± 3.92	189.53 ± 1.282	197.03 ± 4.82
DPI (mg protein/ fish/day)	28.77 ± 0.262	33.69 ± 0.805	48.30 ± 0.331	59.81 ± 1.857
FCR	103.07 ± 17.298	5.05 ± 0.095	1.92 ± 0.0.008	2.00 ± 0.061
PER	0.07 ± 0.01	0.97 ± 0.018	2.04 ± 0.012	1.85 ± 0.053
PRE	29.34 ± 0.003	34.46 ± 0.003	44.61 ± 0.003	36.34 ± 0.003
LRE	6.19 ± 0.223	22.09 ± 0.079	131.87 ± 0.749	116.55 ± 3.483
ERE	24.88 ± 0.814	60.95 ± 1.398	124.37 ± 0.643	116.86 ± 3.456
Survival %	100	100	100	100
HSI	2.70 ± 0.066	2.73 ± 0.003	2.79 ± 0.003	2.75 ± 0.003
VSI	7.10 ± 0.007	7.16 ± 0.006	7.22 ± 0.003	7.15 ± 0.003

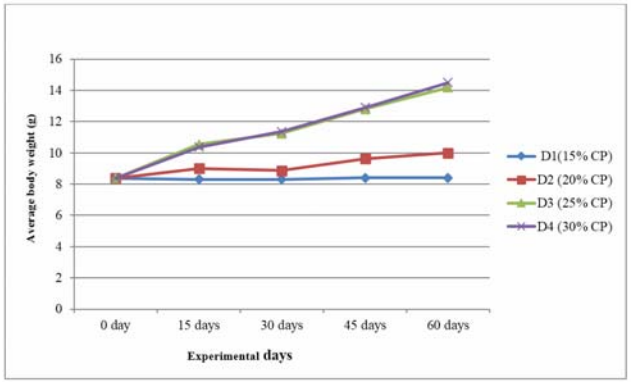

Fig 1: Growth pattern in Jayanti rohu during the experiment

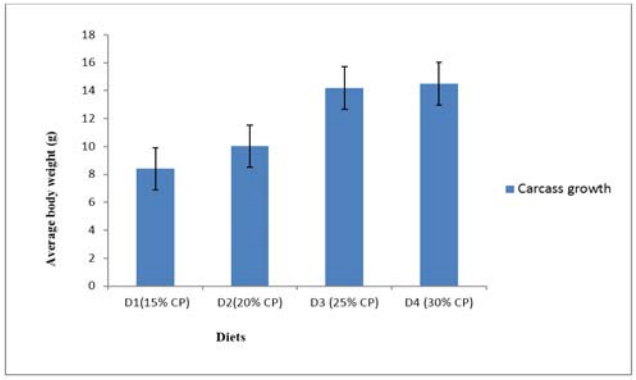

Fig 2: Carcass growth with respect to the experimental diets

3.1 SGR

D-3 fed group registered 4.15% 0.14 / Day which is also closely comparable to D-4 (4.23% ± 0.23), SGR of other group is 0.03± 0.003% m D-1 3.45± 0.025% in D-2. Lowest FCR (1.92± 0.008) observed in D-3 which is closely comparable to D-4 fed group (2.00± 0.061%). FCR values of D-1 D-2 are 103.077± 17.296 5.05± 0.096 respectively with a significant difference. PER values in different diet treatments are 2.04 in D-3, 1.65± 0.052 in D-4 0.87± 0.018 in D-2 0.07± 0.01 in D-1. Daily feed intake was in D-4 is 197.03± 4.829 mg/feed/fish/day followed by 189.53± 1.282 (D-3), 163.54± 3.20(D-2) 190.30± 1.72(D-1). Daily protein intake was maximum in D-4 (59.81± 1.867mg protein/fish/day) followed by D-1 (28.77), D-2 (33.69) ± 0.805 D-3 (48.30± 0.331mg/p/fish/day Table-4. The highest and lowest PRE values were registered in D-3(44.61+0.003), D-1(29.34+0.003) respectively followed by D-4(36.34+0.003), D-2 (34.46 ± 0.003) D-1 (29.34± 0.003) which presented in Table-4. The LRE value in D-1 to D-4 varied between D-1 60.19± 0.223, D-2 (22.10± 0.079), D-3 (131.87± 0.749) D-4 (116.55 ± 3.483), the ERE value was significantly higher (124.377± 0.643, p<05) in D-3 than those of other treated groups (24.88% ± 0.814 – 116.86%± 3.456) Table 4.

3.2 Carcass composition

The whole body carcass composition of the experimental fish received various protein diets are presented in Table 5. Moisture level in the initial fish the experimental groups ranged from 80.03 ± 0.172 – 72.88± 0.071.

The average initial moisture content (80.03%) was significantly higher (p<0.05) than the experimental groups like D-1(79.99 ± 0.18), D-2 (77.41± 0.27), D-3 (72.88± 0.10) D-4 (73.11± 0.037). At the same the carcass protein content was significantly lower in initial fish (63.22 p>0.05) than the dietary treatment groups (63.22 – 70.01%). The average lipid content of initial fish was 10.04% higher lipid content among the treatment groups was found in D-3 (14.12%± 0.39) followed by D-4 (13.47%± 0.37), D-2 (9.81± 0.13) D-1 (9.21%± 0.32). The total ash content of treatment groups (15.86 – 26.67) was significantly lower (p>0.05) than the initial fish group (26.90%). The carcass gross energy level in initial fish was significantly lower (3.494 Kcal/g, p>0.05) than those of experimental / diet treated groups where gross energy level varied between 4.541± 0.01 to 5.409± 0.03Kcal / g.

Table 5: Carcass composition of IR – Jayanti rohu fingerlings fed varying protein diet.

Dietary Protein level (r)	Moisture	Crude protein	Crude lipid	Total ash	Energy (Kcal/g)
INTIAL	50.03 ± 0.03	63.22 ± 0.07	10.00 ± 0.05	26.91 ± 0.07	3.404 ± 0.12
15% C.P.	79.99 ± 0.18c	64.03 ± 0.10a	9.21 ± 0.32a	26.36 ± 0.37c	4.54 ± 0.01a
20% C.P.	77.41 ± 0.27b	66.72 ± 0.01b	9.81 ± 0.13a	22.91 ± 0.10b	4.80 ± 0.01b
25% C.P.	72.88 ± 0.10q	70.01 ± 0.02c	14.12 ± 0.39b	15.36 ± 0.38a	5.40 ± 0.03c
30% C.P.	73.11 ± 0.37a	69.87 ± 0.06c	13.47 ± 0.37b	16.19 ± 0.37a	5.34 ± 0.03c

3.3 Bio-chemical changes

Data on RNA DNA concentration, RNA: DNA ratio enzyme profile i.e. protease, lipase Amylase activities in experimental fishes reared on various protein diets are presented in Table-6.

Table 6: RNA DNA concentration of body tissue of Jayanti Rohu fingerlings and digestive enzyme activity.

Parameters	D-I (15% cp)	D-2 (20% cp)	D-3 (25% cp)	D-4 (30% cp)
Nucleic acid				
Muscle RNA (µg / mg muscle tissue)	2.80	3.50	5.03	4.33
Muscle DNA (µg / mg muscle tissue)	0.30	0.31	0.31	0.31
RNA : DNA	9.23	11.43	11.85	11.50
Digestive Enzyme Activity				
	Protease	Lipase	Amylase	
INTIAL	16.17 ± 0.16	19.5 ± 0.236	12.05 ± 0.151	
D_1	18.25 ± 0.081	22.39 ± 0.183	9.0 ± 0.221	
D_2	22.54 ± 0.128	25.04 ± 0.166	9.12 ± 0.016	
D_3	27.27 ± 0.087	28.95 ± 0.162	9.10 ± 0.162	
D_4	25.23 ± 0.138	26.26 ± 0.212	10.56 ± 0.212	

As observed from the table-6 there was a very little differences in DNA concentration (0.03 – 0.34 µg /mg muscle tissue) in all dietary groups. But there was a significant ($p<0.05$) variation in muscle RNA. Concentration (µg /mg muscle tissue) in dietary treatment group with highest (5.03 – D_3) lowest D-1 (2.80) found in fish fed D-3 D-1 group respectively. RNA: DNA ratio was also found significantly higher (14.96, $p<0.05$) D-3 group lower (9.23, $p<0.05$) in fish fed on D-1 group compared to other diet group.

As regards enzyme profiles, the enzyme protease activity (µg lecine liberated / mg tissue protein/ h at 37 ^{0}C) was significantly higher (27.27± 0.087, $p<0.05$) lower (18.25± 0.081, $p<0.05$) in experimental fish fed D-3 D-1 group respectively compared to other dietary protein group as compared to initial 16.17± 0.362. At the same time the lipase activity (α –napthol reduced / mg tissue protein / h at 37 ^{0}C) found significantly higher (28.95 ± 0.122, $p<0.05$) in D-3 lower (22.39 ± 0.103, $p<0.05$) in D-1 group compared to other dietary protein groups in compared to initial group 19.5 ± 0.1242. But, the Amylase activity (mg of maltose liberated / mg tissue protein 10.56± 0.212/ h at 37.0 ^{0}c) gradually decreases significantly from fish fed diet D-1, D-2, D-3 D-4 (9.0 ± 0.221, 9.12 ± 0.0164, 9.10 ± 0.162)- whereas initial 12.05± 0.151. From the above result discussion we can determine that there is very close difference between D-3 D-4. As regard to protein utilization, growth performance of carcass composition D -3 is best among other dietary group Table – 4 and table-5.

In the present study significantly higher growth was observed in Diet – 3 group (25%cp diet) compared with lower or higher protein (15%, 20% and 30% cp) fed group. Similar observation was also reported in several others warm water fish species such as Tilapia [21], striped bass [22], Milk fish [23] with feeding of low protein diet, the pressure of body protein seems to be high because of dietary need to meet the demand of tissue building, repair metabolism, while feeding high protein diet, protein in deaminated [24] catabolized to provide energy for maintenance, thus reducing the protein conversion efficiency in fish [25]. Although the feed intake was (189.53 ± 1.282mg feed / fish / day) second highest Diet 3 group than other diet feed group (Diet – 4 – 197.03 ± 4.82 mg feed / fish / day) Diet – 2 – (163.54 ± 3.92 mg feed / fish / day) Diet – 1 – (190.30 ± 1.72 mg feed / fish / day) the weight gain was also proportionately high in Diet -3 - (25% cp) (5.92 ± 0.012) than Diet – 1 – (0.120 ± 0.105), Diet – 2 – (1.897 0.049 Diet – 4 – 5.92 ± 0.046). I imply that the amount of feed, which was consumed almost more by Diet – 3 group over other group was efficiently utilized commensurate for growth resulting lowest FCR in Diet – 3 group (1.92 ± 0.008) than all the treated groups.

Although protein intake is low in Diet– 3 Protein / fish / day (48.30 ± 0.331) than Diet – 4 mg Protein / fish / day (59.81 ± 1.897) still weight gain is more. It may be due to better protein retention efficiency in Diet – 3 fed group. This may better fed efficiency of D-3 also due to better P/E ratio (74.08 ± 0.167) the proper balance in protein non-protein energy in *C idella* [26], in carps [27], in *Catla Catla* [28], in *C. batrachus* [1] in big head carp [29] found a significant decrease in weight gain when fed excessive dietary protein because of in sufficient non-protein energy in the high protein diet as part of the dietary protein metabolized used for energy. Winfree & Stickney [24] was reported when insufficient non-protein is available in the feed, dietary protein is deaminated in the body to supply energy for metabolism rather than being utilized for growth. This explains the reason for relatively poor performance of fish fed high protein D-4 (30.29). A non-protein source of energy and also where the protein intake was maximum for the fish. According to Tucker [30], an optional digestible protein/digestible energy ratio allows the maximum protein to be available for growth of fish by minimizing that used for energy.

Similar trend was also observed for SGR, which is not agreed by many other workers, Siddike *et al.* [21] for *O. niloticus*, Khan & Jafri [1] in *C. batrachus*, Mohanty & Samantaray [31] for *C. Striatus*, Tibbetts *et al*. [32] for *Anguilla rostrata*. Although feed intake of D 3 (189.53± 1.282 mg feed/fish/day) was almost similar to Diet-4 (197.03± 4.82 mg feed/fish/day). The FCR was found to be lowest compared to all diet fed groups indicating that the optimum protein requirement (25% cp) of Jayanti Rohu fingerlings for maximum growth (weight gain 5.92± 0.012 is 5.92± 0.012 is in D3. Further enhancement of dietary protein beyond (25% CP) level decreased the feed intake increased the FCR, indicating the poor utilization of dietary protein because of the imbalance in P/E ratio. A lot of authors report similar findings (Siddike *et. al*. [21] in *O. Niloticus*, Khan & Jafri, [1] in *C. Batrachus* Salhi et *al.* [33] in *R. Quten*. In the present study, SGR decreased significantly ($P \leq 0.05$) with increase in protein level in the feeds. This was agreed by the observer, such as in big head carp [29], in rohu [34], in *Catla Catla* [35], in *Oliver flounder* [41]. The decrease in P with increase in dietary protein in several fish species is probably because of utilization of more dietary protein is energy source when high protein diet are fed to fish [36, 39-41].

PRE-found highest in D-3 (44.61 ± 0.003) with increase dietary protein percent (25.00) which decline in D-1, D-2 D-4. Protein utilization of diet where the body protein does not commensurate with protein intake. Protein utilization of diet decrease with increasing dietary protein levels which is known to all aquaculturists [36-38]. They suggested that net protein retention is inversely related to the dietary protein concentration. LRE (131.66 ± 0.749) was highest in D-3 which is decreasing gradually in D-1, D-2 D-4 rather than D-3. The ERE value was maximum in D-3 (124.37 ± 0.643) protein fed group was significantly higher ($P < 0.05$) from other dietary treatment groups (Table-6).

RNA: DNA is known to act as a reliable indicator of protein synthesis thus growth [1, 34, 43, 44]. The muscle RNA concentration the RNA: DNA ratios (Table-7) significantly higher in D-3 group that influenced the protein synthesis and growth. Gangadhar *et al.* [34] observed the highest RNA: DNA ratio at the dietary protein lipid levels of D-3 respectively in rohu. DNA is a pre-requisite for RNA synthesis [14] which in turn is a requirement for protein synthesis. As the DNA content of a cell remains normally constant, measurement can be made for fluctuation in cell numbers cell divisions in an organism. In the present study also the DNA content was almost constant in all the experimental groups.

The increase in protease activity with increase in dietary Protein in D-3 in Jayanti rohu then the decrease with further rise in dietary protein might have resulted in maximum protein synthesis atD-3 Protein diet as evidenced by the highest level of RNA: DNA ratio. Therefore, the growth of the fish was maximum in D-3 dietary level. Hofer [45] also reported that protease activity tends to vary depending upon the protein content in the diets. According to Falge *et al*. [47], high indigestible carbohydrate reduces the proteolytic activity. As with protease activity the lipase activity also increased up in D-3 (25% cp). The whole body protein was maximum in D-3

group which increased with increase in feed intake dietary protein up to 70.01 ± 0.02 then decrease with decrease in feed intake. Similar observation had by many workers in other fish species including carps [21, 28, 48, 49]. In the present study lipid content was comparable in D-3 (14.12 ± 0.39) D-4 (13.47 ± 0.37). In other group the lipid content was almost same. The whole body carcass composition of the fish (Table-5) fed various protein diets indicated that the initial moisture content was significantly higher ($P < 0.05$) (80.03 ± 0.03) than the final in all the experimental groups. Although the whole body protein content of fish varied in a narrow range, it was maximum in the D-3 phase group found to be significantly higher ($P < 0.05$) among all treatment groups including the initial group. But whole body lipid content of all treatment groups was significantly higher ($P < 0.05$). The total whole body ash content of all treatment groups was significantly lower ($P < 0.05$) than the initial group. The gross energy content of all treatment groups was significantly higher ($P < 0.05$) than the initial group. Considering result discussion we came into conclusion that 25% cp diet is preferable optimum for growth of Jayanti rohu fingerling it is comparable with 30% cp diet group. After evaluation the nutritional indices, carcass composition bio-chemical parameters, 25% and 30% treated groups performances is almost identical. So, it is clear that 25%cp diet is best among all the other treated groups in the present study.

4. Conclusion

As the feed protein utilization, growth, performance, carcass composition, other nutritional indices in D-3 is the best it can be comparable with D-4. We can conclude that 25% cp diet is preferable for IR-Jayanti. It is known that the protein requirement of normal rohu is 30% from the present study we observed that 25% c.p. diet is best for growth of IR-Jayanti, so 5% protein can be saved which will minimize the feed cost help our aqua-culture system also help aqua culturists. If 5% crude protein can decrease in the diet of Jayanti rohu a huge amount can be saved without hampering the growth performance of Jayanti, our farmer as well as aqua-culture system will welcome the new approach. So we welcome the system.

5. Acknowledgement

The author is grateful to Dr. M. Sarangi, former Director, Dr. P. Jaysankar, Director CIFA, Bhubaneswar, India for providing the necessary facilities for the work. Dr. K.D. Mohapatra, Principal scientist, CIFA, Bhubaneswar providing the Experimental fish and her valuable guidance. Thankful to HOD, Dr. S.S. Giri for constant help and guidance. Dr. S.C. Rath, CIFA for his valuable guidance. Author duely acknowledge the above personnel. I am sincerely grateful to Mrs. Rashmi Rekha Rout for her great help.

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