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Effect of Replacement of Fish Meal by Poultry Waste Meal on muscle composition of three fish species cultured in two ponds of Gaya (Bihar) India

Parvati Kumari, Dr. S.N.P Yadav
Research Scholar, Reg no.-XM/R/198/22, P.G. Department of Zoology, Magadh University Bodh Gaya Bihar, India
Prof, Deen, P.G. Department of Zoology, Magadh University Bodh Gaya Bihar, India

ABSTRACT

The growth of pisciculture is increasing in India due to human population growth and other socio-economic factors. The three fish species such as Catla catla, Labeo rohita and Cirrhinus mrigala were cultured in monitored feed supply in two ponds of Gaya town such as Ram Sagar Pond and Dighi Pond. The Fish Meal and Poultry waste Meal mere used two ponds respectively. The nutritional value of fish muscle such as crude protein (%), crude lipid (%), carbohydrate (%), phosphorus (%) and moisture content (%) were examined to know the impact of different feeds. Moisture content in muscle of Catla catla remained as 77.51-77.65% after application of Fish Meal and 76.46-77.40% after application of Poultry waste meal. The moisture content in muscle of Cirrhinus mrigala remained higher as compared to Catla catla and Labeo rohita reared under both types of diets. Higher value of protein, lipid, carbohydrate and phosphorus were observed in all three fish species after application of Poultry waste meal as compared to Fish meal. So, Poultry waste meal was observed more suitable than Fish meal for rearing of three major carps in Ponds. The data observed for both ponds showed slight variation. This may be due to their physico-chemical parameters.

Key words: Fish Meal, Poultry Waste Meal, Muscle composition, Three Fish Species.

INTRODCUTION

Fishes are cheapest and easily available source of animal protein used by human beings. About one third of the population of India are fish eaters. Increasing fish production is required to bridge the gap between demand and supply. Catal catla, Labeo rohita and Cirrhinus mrigala are major Indian carps. The high growth rate and good consumer performances makes these fish species suitable for culture in ponds. The type and quality of fish feed affects the nutritional value of fish flesh (Olvera-Novoa et al., 2002). Selection of suitable feeding material is requisite for satisfying nutritional requirements of cultured fishes (Ismat et al. 2013). The quality of crude protein present in diet directly affects the physiological functions of fishes (Anizah et al. 2021). They studied about nutritional requirement of fresh water fishes. They also worked in direction of development of cost-effective diet for common fresh water fishes.

Application of scientific approach in fish culture in any pond became apparent in modern age in direction of cost-effectiveness and increasing productivity. Previously fishermen of Bihar engaged in pond aquaculture considered fish meal as suitable protein source for cultured fishes. But the fish meal faces fluctuations on the supply side and remain costly. In this perspective poultry waste meal can be an alternative protein source for cultured

fish species. Thus, during present research work, fish meal and poultry waste meal were comparatively evaluated for three fish species by rearing in two ponds of Gaya town (Bihar).

MATERIALS AND METHOD

Three fish species such as Catla catla, Labeo rohita and Cirrhinus mrigala were cultured in two perennial ponds of Gaya town such as Ram Sagar Pond and Dighi. Fish meal and Poultry waste meal were applied as fish feed. Fish meal was procured from local fish feed seller. Poultry waste meal was collected from local poultry farm and processed before application in proper manner. Fingerlings were obtained from hatchery. Fingerlings of approximately 5 gm weight were transferred in respective ponds. The experimental diets were provided two times per day during 9.00 AM in morning and 4.00 PM in afternoon after 14 days of adaptation. Parameters such as moisture content (%), crude protein content (%), crude lipid (%), carbohydrate (%) and phosphorus (%) of fish muscle were examined after harvesting on steps basis. Harvested fishes were dissected in the laboratory and muscles were obtained for this purpose. Conventional methods and standard protocol were adopted during this research work. Moisture content was examined after drying of fresh muscle in oven. Crude protein content was observed by Kjeldahl's method. Crude lipid content was analysed by Soxhlet extraction method. Carbohydrate content and phosphorus content were examined by Phenol sulphuric acid titration and colorimetric spectrophotometry respectively. All experiments were conducted in triplicate and mean data were recorded for analysis. Standard deviation for each parameter was also calculated.

RESULT AND DISCUSSION

Catla catla, Labeo rohita and Cirrhinus mrigala are considered as high value food fishes in Bihar. Inland fish culture has been practiced in two ponds of Gaya town as Ramsagar Pond and Dighi Pond. But fishermen are not aware about scientific methods of fishery. Application of scientific approach in fish culture in any pond became apparent in modern age to increase productivity and reduce production cost. In this regard, evaluation of the impact of fish meal and poultry waste meal on biochemical composition of three common carps of Bihar was conducted during this research work. The data obtained was tabulated within tables 1 to 4.

Fish meal was applied during first step of experimentation in both ponds. It became evident from data mentioned in tables 1 and 2 that moisture content in muscle of all three fishes reared in Ram Sagar Pond remained slightly higher than fishes reared in Dighi Pond. The moisture content ranged from 77.51-78.32% in fishes reared in Dighi Pond and from 77.65-79.24% in fishes reared in Ram Sagar Pond. The moisture content in muscle of Cirrhinus mrigala reared in both ponds remained higher than Catla catla and Labeo rohita.

But the crude protein remained higher in Catla catla reared in Ram Sagar Pond and Labeo rohita as well as Cirrhinus mrigala reared in Dighi Pond. Crude lipid % remained higher in muscle of Catla catla and Labeo rohita reared in Ram Sagar Pond and in muscle of Cirrhinus mrigala reared in Dighi Pond. The carbohydrate and phosphorus % also remained variable in muscle of all three species of Fishes reared in both ponds (Table-1 and 2).

The moisture content in fish muscle reared after application of Poultry waste meal also remained in variable amount. The moisture content in muscle of all three fish species

remained lower in fishes reared after application of Poultry waste meal as compared to fishes reared after application of fish meal. The percentage of crude protein, crude lipid, carbohydrate and phosphorus also showed slight variation in muscle of all three experimental fishes reared after application of fish meal and poultry waste meal in both ponds. (Table-1-4). Overall result indicates that the muscle of Catla catla contains higher amount of Crude lipid as compared to Labeo rohita and Cirrhinus mrigala. Phosphorus content was also observed high in muscle of Catla catla reared after application of Poultry wast meal as compared to fish meal. But the carbohydrate content in muscle of Cirrhinus mrigala remained higher as compared to Catla catla and Labeo rohita reared after application of Fish meal as well as Poultry waste meal. In respect of crude protein content, the poultry waste meal remained superior as fish meal for all the experimental fish species.

Table-1

Proximate Analysis of fish muscle of specimens obtained from Ram Sagar Pond fed with Fish Meal.

Sl.No.	Parameters	Fish Species		
		Catla catla	Labeo rohita	Cirrhinus mrigala
1.	Moisture content (%)	77.65±2.35	78.66±3.41	79.24±3.36
2.	Crude Protein (%)	18.19±1.52	17.12±0.57	16.14±1.25
3.	Crude Lipid (%)	2.12±0.14	1.62±0.98	1.69+0.11
4.	Carbohydrate (%)	1.14±0.19	1.30±0.14	1.71±0.11
5.	Phosphorus (%)	0.60±0.03	0.30±0.01	0.42±0.02
	±SD, n=3			

Table-2

Proximate Analysis of fish muscle of specimens obtained from Dighi Pond fed with Fish Meal.

Sl.No.	Parameters	Fish Species		
		Catla catla	Labeo rohita	Cirrhinus mrigala
1.	Moisture content (%)	77.51±2.43	77.87±3.28	78.32±3.03
2.	Crude Protein (%)	17.25±1.37	18.11±2.49	17.09±1.40
3.	Crude Lipid (%)	2.08±0.16	1.53±0.28	2.05±0.33
4.	Carbohydrate (%)	1.17±0.09	1.33±0.21	1.55±0.18
5.	Phosphorus (%)	0.51±0.11	0.44±0.08	0.37±0.04
	±SD, n=3			

Table-3

Proximate Analysis of fish muscle of specimens obtained from Ram Sagar Pond fed with Poultry Waste meal.

Sl.No.	Parameters	Fish Species		
		Catla catla	Labeo rohita	Cirrhinus mrigala
1.	Moisture content (%)	76.46±2.39	76.96±3.52	78.44±2.96
2.	Crude Protein (%)	19.14±1.11	19.11±2.08	16.80±1.72
3.	Crude Lipid (%)	2.22±0.74	1.81±0.89	1.82±0.41
4.	Carbohydrate (%)	1.16±0.08	1.35±0.35	1.86±0.22
5.	Phosphorus (%)	0.70±0.03	0.42±0.10	0.63±0.38
	±SD, n=3			

Table-4

Proximate Analysis of fish muscle of specimens obtained from Dighi Pond fed with Poultry Waste meal.

Sl.No.	Parameters	Fish Species		
		Catla catla	Labeo rohita	Cirrhinus mrigala
1.	Moisture content (%)	77.40±2.68	77.52±3.40	77.12±4.07
2.	Crude Protein (%)	17.68±1.70	18.18±0.87	17.93±1.41
3.	Crude Lipid (%)	2.15±0.17	1.60±0.08	2.16±0.19
4.	Carbohydrate (%)	1.19±0.10	1.46±016	1.68±0.21
5.	Phosphorus (%)	0.61±0.09	0.54±0.05	0.45±0.07
	±SD, n=n			

According to Gupta and Noble (2001), poultry waste can be used for wealth creation in fish farming. Abdel-warith et al. (2001) observed during their research work that poultry waste meal contains amino acids, fatty acids, minerals and vitamins for proper growth and development of fishes. The type and quality of fish feed affects the lipid profile of fish flesh (Olvera-Novoa et al. 2002). According to Yehya et al. (2012), the quality of fish flesh remains affected by quality of fish feed available and level of dietary intake of different fish species. Lipid profile of fish flesh remain directly related with lipid content of feeding material. Most of the species of carnivorous fishes used for culture in pond requires high protein containing feed. During present study, it became evident that lipid content of experimental fish species varied during two different diets. Thus, results of present study

remained in accordance with results obtained by Yehya et al. (2012). Giri et al. (2010) examined the effect of replacement of fish meal by chicken viscera meal on carcass composition of Catfish. On the basis of results obtained by them, it was recommended that fish meal can be replaced by poultry waste meal without affecting the development of experimental fish species. Yones and Metwali (2015) examined the impact of substitution of fish meal by poultry waste meal on bio constituents of Nile tilapa. They do not observe any significant difference with respects of crude protein and lipid content. During present research work, slight variation in observed parameters became evident after application of two types of feeds separately. Different fish species does not show significant variation in these parameters. Thus, results of present study correspond with results obtained by Giri et al. (2010) and Yones and Metwalli (2015).

Okoliegbe et al. (2017) pointed out that fish productivity is hindered by high cost of feed. So, cheap and easily available fish feed is a requisite for fish culture at economically convenient mode. Thus, several workers conducted research study with regard to assessment of the impact of fish meal and poultry waste meal on quantity and quality of different fish species (Ali et al., 2016; Singh et al. 2019; Ahmad et al. 2020. They also pointed out that poultry litter stimulates the rate of production of natural food organisms in the fishery pond. This feed increases the population of microbes, zooplanktons and phytoplankton in the pond ecosystems. These organisms act as protein containing natural food for cultured fishes. On the basis of overall performance of three fishes' species during present research work, it became evident that poultry waste meal remained superior to fish meal with regard to availability and cost effectiveness also. Thus, results of present research work showed similarity with results obtained by Ali et al. (2016), Singh et al. (2019), Ahmed et al. (2020).

CONCLUSION

During present research work, it was observed that biochemical composition of fish muscle changes according to available quality of feed. Bioavailability of nutrients for fishes depends on the ingredients of dietary material. Variation in biochemical constituents in muscle of three major carps was observed after use of fish meal and poultry waste meal. Poultry waste meal was observed as almost equally suitable as fish meal with regard to nutrients enhancement of fish species observed during present research work. Poultry waste meal also remain more suitable with regard to availability and cost. Thus, use of poultry waste meal is recommended for culture of Catla catla, Labeo rohita and Cirrhinus mrigala in fresh water ponds.

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