Jr. of Industrial Pollution Control 29(1)(2013) pp 33-38

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EFFECT OF SPECIAL FISH FEED PREPARED USING POTATO PEELS ON FRESH WATER FISH *LABEO- ROHITA*

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Key words : Fish feed, *Labeo-rohita*, Potato peel waste, Probiotics

(Received 19 June, 2012; accepted 25 July, 2012)

ABSTRACT

Fresh potato consumption is decreasing in many countries; more potatoes are currently processed into value-added products to meet the demand especially from the fast food and convenience food industries. Potatoes are usually peeled during processing, either by steam, lye or abrasive peeling, depending on the type of products. As a consequence, large quantities of peels are generated which represent a severe disposal problem for the industry, especially with the increasing awareness and aims of minimizing environmental impact and sustainability. However, potato peel contains a number of nutritionally interesting compounds and may be used as a key ingredient in fish feed. A growing concern for the high consumption of antibiotics in aquaculture has initiated a search for alternative methods of disease control. Improved resistance against infectious diseases can be achieved by the use of Probiotics. By using processed potato peel and Probiotics experimental diet was formulated. Effect of this fish feed on major carp *Labeo-rohita* is discussed in details in this article.

INTRODUCTION

Fish is safer and healthier to be consumed by humans compared to mutton, meat and chicken. Fish are good sources of protein, fat, vitamin, and mineral. Compared to other sources of protein, fish are well known to be excellent sources of protein which can be seen from amino acid composition and protein digestibility (Astawan *et al.* 2004). It seen that shark liver oil and cod liver oil are good source of protein and is also used in pharmaceutical preparation i.e. for medicine. Fish is an important source of both food and income to people in developing countries.

The population of the world is growing at an exponential rate. This situation calls for quick action and an aggressive approach tailored at food production to feed the already high human population in order to ameliorate inadequate food supplies and the consequential malnutrition. One of the promising solutions to the shortage of animal protein intake in developing countries is the proper development of aquaculture (The World Fish Center The Millennium Development

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Goals: Fishing for the future. 2007). Fish feed is the most expensive input in aquaculture operations (Jauncey *et al.* 1982). Much of the high cost of feed arises from extensive reliance on protein sources, such as fishmeal and shrimp meal (Lim *et al.*, 1997; Omoregie, 2001). The shortage and high cost of pelleted feed severely constrained the development of low cost aquaculture systems suitable for small-scale farmers in the developing countries; hence, the need to assess the potential of non-conventional raw ingredients such as the potato peels. It would therefore be more economical to utilize plant protein in fish feed than high cost animal protein materials (Omoregie *et al.* 1993).

Feed production in India is mostly based on ingredients derived from crop residue. On the other hand, India has rich resources of slaughter house/poultry/silkworm/vegetable by-products which are also the better source of proteins and minerals (Zargar *et al.* 2010). However, most of these are being waste can be fruitfully utilized towards the production of value added products. Utilization of such waste materials, in the production of fish feeds, will not only solve the problem of nutritional needs of fish but also helps in reducing the environmental pollution which is caused by the unused waste lying scattered all over the rural as well as the urban areas, leading to public nuisance as vector breeding ground and ground water pollution.

Potato waste is one of those by-products that remain after potatoes have been processed to produce frozen potato products for human consumption. The total world potato waste is estimated to be 12 million ton per year (Boushy *et al*. 1994). The potato industry generates lots of waste. One-quarter of what goes into potato processing plant, comes out as waste. Potato peel waste are the major portion of the processing waste, represent a severe disposal problem to the potato industry, especially since the wet peels are prone to rapid microbial spoilage. On the other side, potato peel contains an array of nutritionally interesting components (Charmley *et al*. 2006). In view of the growing rejection of synthetic food additives by consumers, functional ingredients obtained from natural resources may be a promising alternative. The utilization of by-products also contributes to reduced amounts of waste and thus to sustainable production (Schieber *et al.*, 2001).

Aquaculture is one of the fastest developing growth sectors in the world and Asia presently contributes about 90% to the global production (Mohideen *et al.*, 2010). However, disease outbreaks are constraint to aquaculture production thereby affects both economic development of the country and socio-economic status of the local people in many countries of Asia. Disease control in aquaculture industry has been achieved by following different methods using traditional ways, synthetic chemicals and antibiotics. However, the use of such expensive chemotherapeutants for controlling diseases has been widely criticized for their negative impacts like accumulation of residues, development of drug resistance, immunosuppressant's and reduced consumer reference for aqua products treated with antibiotics and traditional methods are ineffective against controlling new diseases in large aquaculture systems. Therefore, alternative methods need to be developed to maintain a healthy microbial environment in the aquaculture systems there by to maintain the health of the cultured organisms. Use of probiotics is one of such method that is gaining importance in controlling potential pathogens (Balcazar, 2003).

Potato peel being highly nutritious, it should not be wasted but should be reused for the production of few value added products. One such value added product is the fish feed. The present study was aimed at formulating fish feeds comprising of by- products and nutritious food industry waste- based materials using quality evaluation by probiotics and assessing the effects on fish treated with this new variety of feed.

MATERIALS AND METHODS

Fish Feed formulation and Preparation

Wet potato peel waste was collected from Pepsico International Holding Private Limited (Fritolay Division) situated at MIDC, Ranjangaon, Pune and analyzed for routine parameters of importance as per the standard method and is shown in Table 1 (Standard Method, 1998). For digestion of Potato Peels alkali treatment were given. After digestion potato peels were filtered and washed with water to neutralize the pH, dried and crushed into fine powder using a ball mill. The filtrate was used as media to grow the probiotics. The pure culture of Probiotics was inoculated into the filtrate used as media in sterile condition and incubated at 37°C for 24 hrs. After 24 hrs growth was observed. Calcium carbonate was used to immobilize the probiotics spores grown in media. Experimental diet contained 4% potato peel powder, 4% calcium carbonate blended with probiotic and 2%

starch as binder. Experimental diet was analyzed for nutritional value Table 2.

Table 1. Potato Peel Characterization

Sr. No	Parameters	Values
1.	Protein	3.18 gm
2.	Carbohydrate	13.2 gm
3.	Fat	0.08 gm
4.	Total Dietary Fiber	2.8 gm
5.	Calcium	28 mg
6.	Iron	3.7 mg
7.	Potassium	414 mg
8.	Sodium	9.7 mg

Table 2. Proximate Nutritional Values of Experimental Feed

Sr. No	Parameters	Values in %
1.	Ash	54.17
2.	Total Nitrogen	0.62
3.	Fat	1.00
4.	Carbohydrate	14.9
5.	Total Dietary Fibers	3.79
6.	Protein	3.87

Experimental Set-up

Fish species identified for experimental work was purchased from Maharashtra Animal and Fishery Science University, Nagpur. Edible major carp *Labeo-rohita* was selected based on its consumption and nutritional value. Experiments were carried out in 3 glass tanks of 18 lit capacities and a constant water volume of 15 liter maintained in each tank. Prior to feeding of experimental diets, the fish were acclimatized and starved overnight to empty their gut and increase their appetite and reception for new diets. For the experimental trials, 20 fish were weighed using electronic digital balance and introduced into each of the experimental tanks. Each tank was assigned as Control (C), Common Fish Feed (CFF) provided by Fishery Dept. (5% Rice bran+ 5% groundnut cake) and Potato Peel Feed (PPF). The fish were fed (5% body weight) twice daily at 10.00 and 20.00 hr. As the water becomes turbid, water was changed every second day to maintained good water quality/dissolved oxygen content.

Water Quality

Water quality was monitored for temperature, pH, alkalinity, dissolved oxygen, total hardness, calcium hardness and magnesium hardness.

After 30 days of experiment, fish were removed from the aquarium and sacrificed. Then they were dissected to remove muscle tissue and liver, which are nutritious and edible. Tissues like muscle and liver are separated from the bones and cleaned by dabbing it in filter paper to remove excess water. Thus obtained, tissues were weighed and processed for fat and protein content.

RESULT AND DISCUSSIONS

Water quality

The water quality during the study period remained in following range: pH 7.4 - 8.4, alkalinity 140-170 mg/L, dissolved oxygen 6.8-8.0 mg/L, total hardness 120-160mg/L, calcium hardness 32-53mg/L, magnesium hardness 6.5-9.4mg/L. Since fish are poikilotherm, water temperature plays an important role in energy partitioning, protein assimilation and growth (Choudhary*et. al*, 2002). Water temperature was varied from 28-30°C. All important water quality parameters were in the ranges recommended for aquaculture practices wherein the values of pH: 6.7-9.5; alkalinity: 50-300 mg/L; dissolved oxygen: 5-10 mg/L and total hardness: 30-180 mg/L (Course manual, 2003).

During experimental period, morphological and behavioral characteristics of fish were observed. Fishes were swimming actively throughout the entire tank, not just hanging out or laying at the bottom. They Consume the fish feed regularly and swims to the surface quickly during feeding time. Did not show any white spots or blemishes on their body; fins were not torn, curved or ragged and eyes were not bulged. Gill movements were very normal and controlled. Fish showed healthy features. No stomach bulging or fin curving were observed. This indicates that the fish are healthy and potato peel feed is not toxic and can be used.

Results of 30 days and 60 days of potato peel feed to the fish are shown in Fig. 1 and Fig. 2 respectively. It is very clear from the Fig. 1 and 2 that the fish feed of potato peels seems very efficient in the growth of *Labeo-rohita*. It is seen from the Figures that liver shows maximum protein content compared to control and common fish feed available in the market (provided by the fishery department). This change could be observed in 30 days exposure itself.

Fat content also showed increased percentage in liver. This is an encouraging result. It is very clear that potato peel is really a good feed material for fishes.

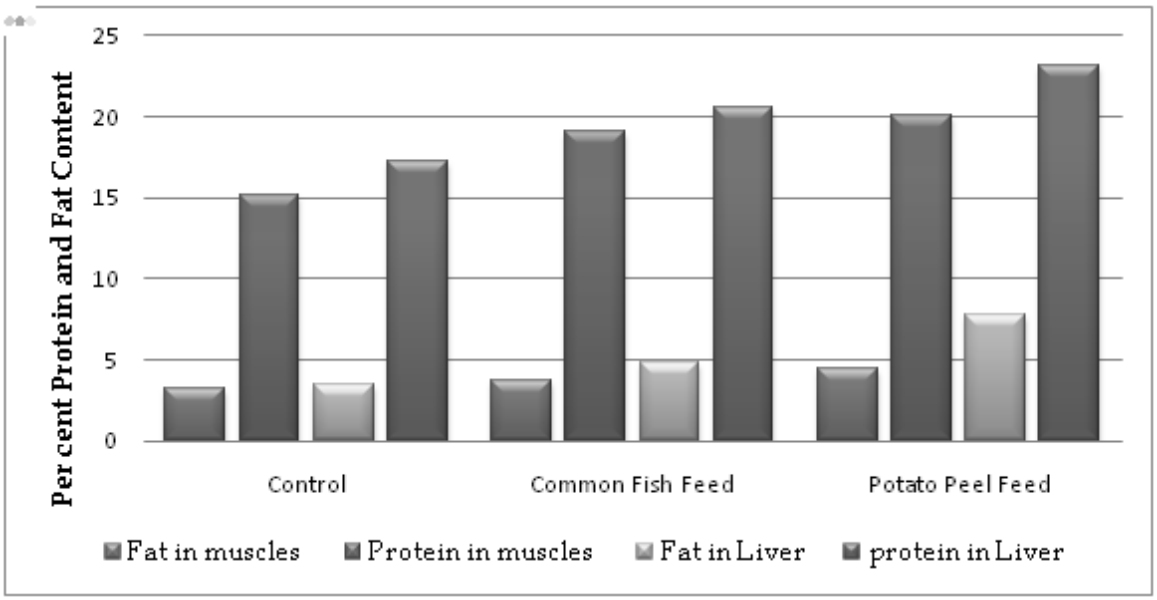


Fig.1 Per cent Protein and Fat Content in Muscles and Liver After 30 Days

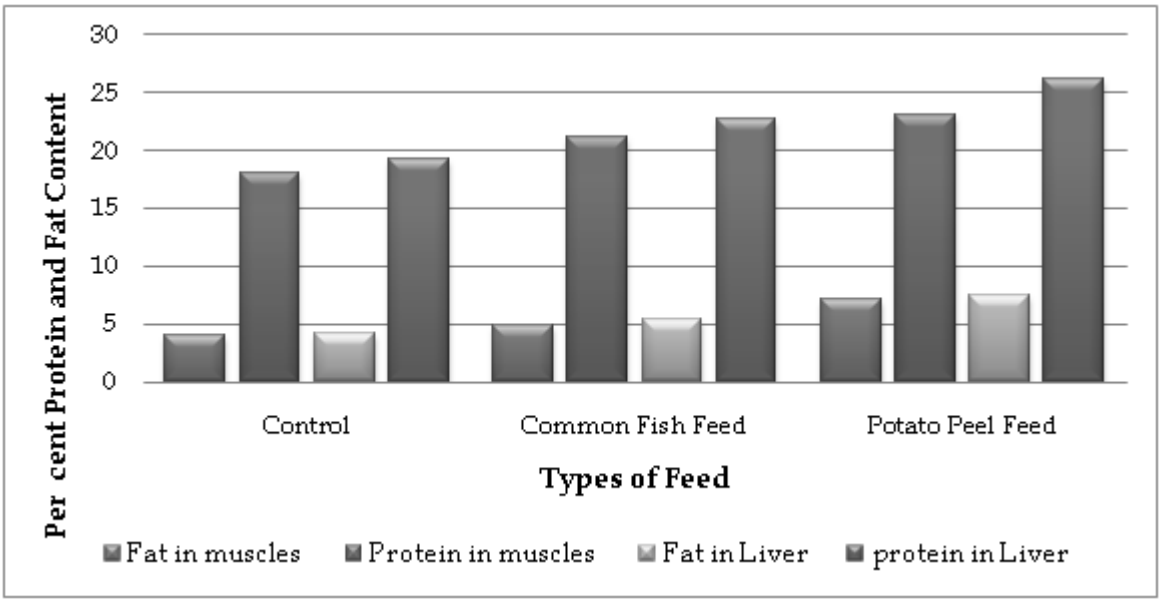


Fig. 2 Per cent Protein and Fat Content in Muscles and Liver After 60 Days

Protein content of muscles tissue also showed an increased concentration. In general, all the important nutritional parameters like fat, protein showed gradual increase in both muscles and liver tissue, when the fish were fed with potato peel feed.

As the experimental days increased from 30 days to 60 days, corresponding increase in fat and protein also showed increasing trend in both the tissues during 30 and 60 days exposure. Comparative increase in fat and protein content in muscles and liver tissues with an interval of 30 days and 60 days is shown in graph 3 and 4.

CONCLUSIONS

It is clear that this experimental feed is very nutritive

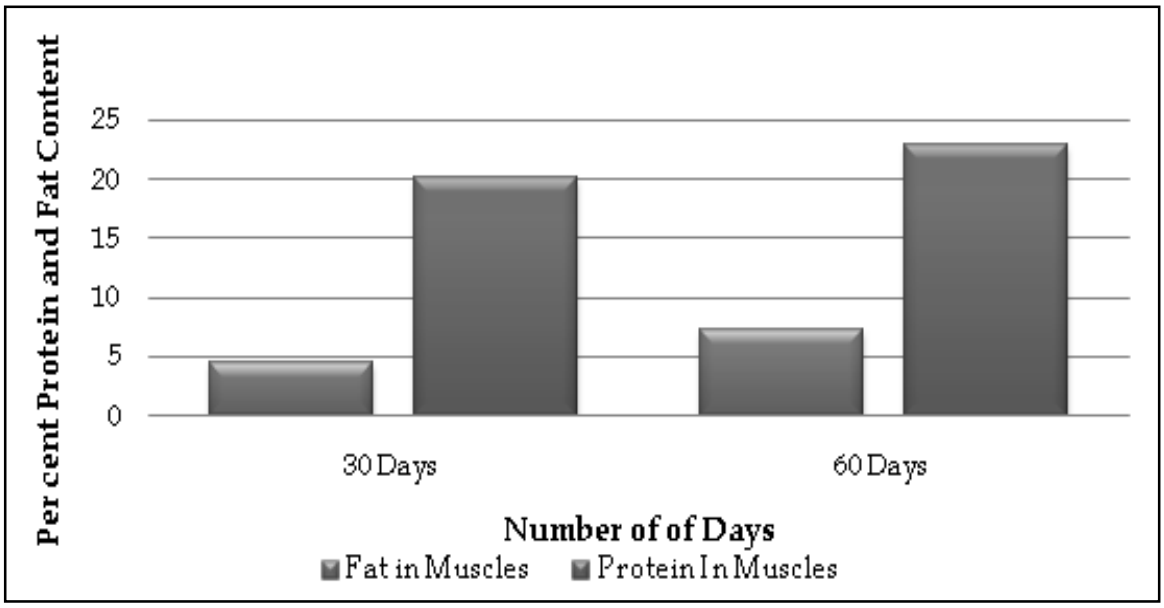
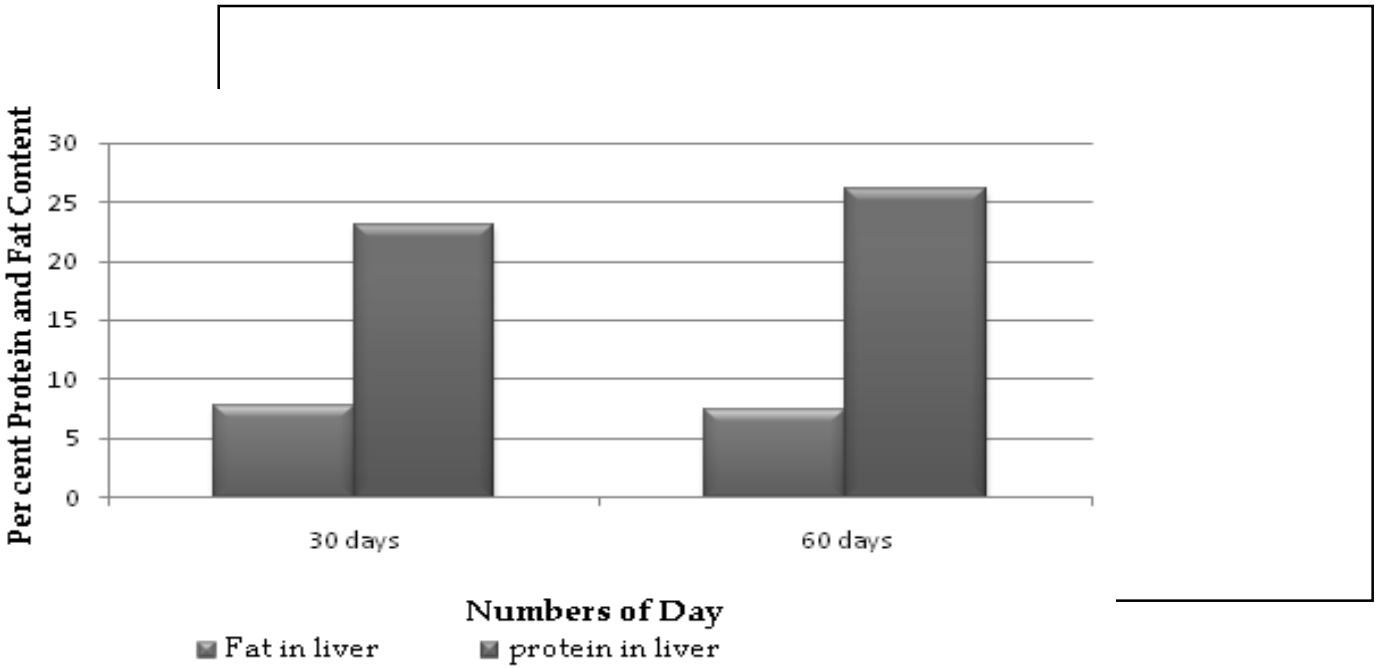


Fig. 3 Comparative Increase in Fat and Protein in Muscles



and helps in the growth of fish. There appeared no adverse changes morphologically. Instead the fish showed very healthy growth with bright body scales. Fishes were very healthy and normal throughout the study period indicating no adverse effect on their health. No infection whatsoever was noted during sixty days of experimental period. Results showed increase in fat and protein content in the muscles and liver tissue.

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