Aquacultural and socio-economic aspects of processing carps into some value-added products

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Abstract

Carps are the mainstay of Indian aquaculture, contributing over 90% to the total fish production, which was estimated to be 1.77 million metric tonnes in 1996. Carp culture has a great potential for waste utilization and thus for pollution abatement. Many wastes such as cow, poultry, pig, duck, goat, and sheep excreta, biogas slurry, effluents from different kinds of factories/industries have been efficiently used for enhancing the productivity of natural food of carps and related species. Besides, several organic wastes/by-products such as plant products, wastes from animal husbandry, and industrial by-products have been used as carp feed ingredients to lower the cost of supplementary feeding. However, to ensure the continued expansion of fish ponds and the pollution control, there must be a market for the fish (carps) produced in these ponds. The carps have, however, a low market value due to the presence of intra-muscular bones, which reduces their consumer acceptability. Thus, a need was felt to develop some boneless convenience products for enhancing the consumer acceptability of the carps. Efforts were made to prepare three value-added fish products, namely fish patty, fish finger and fish salad from carp flesh and were compared with a reference product (‘fish pakoura’). Sensory evaluation of these products gave highly encouraging results. The methods of preparation of these products were transferred to some progressive farmers of the region who prepared and sold these products at very attractive prices. Carp processing has a great potential for the establishment of a fish ancillary industry and thus for boosting the production of these species. In Punjab alone, there is a potential of consuming 32,448 metric tonnes per annum of such value-added products (which would require 54,080 metric tonnes of raw fish). The development of value-added products has a significant role in raising the socio-economic status of the people associated with carp culture. The average cost of production of these products was estimated to be INR 80 per kg. With a sale price of INR 110 per kg, and a sale of 50 kg per day of the value-added products (26 days a month), the average monthly income of a carp-processing unit comes to be INR 39,000 (929 USD, approximately). © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Carps; De-boning; Value-added products; Sustained carp production; Socio-economic status

1. Introduction

The world aquaculture production has increased from 7.72 million metric tonnes (mmt) in 1985 to 26.38 mmt in 1996 (Ayyappan and Jana, 1999). This increase in fish production has corresponded with an increase in the consumption of fish meat as an alternative or substitute for red meat. India has also made a significant progress in increasing its aquaculture production. Aquaculture, once considered to be associated with poor, illiterate, undernourished fishermen, is now a priority area of research and development. The total fish production in the country increased from 2.44 mmt in 1980-81 to 5.26 mmt in 1996: the aquaculture sector contributed 1.77 mmt (FAO, 1998a,b).

The bony fishes including Indian major carps (Labeo rohita, Catla catla, and Cirrhinus mrigala) and Chinese carps (Cyprinus carpio, Ctenopharyngodon idella, and Hyophthalmichthys molitrix) form a major component of Indian aquaculture, as they can be easily cultured in low-input technology systems due to their herbivorous feeding habit. Carp culture has a great potential for waste utilization and thus for pollution abatement. Many wastes such as cow, poultry, pig, duck, goat, and sheep excreta (Kapur, 1981), biogas slurry (Sehgal et al., 1991, 1992), effluents from different kinds of factories/industries (Szlauer, 1977, 1979; Ogburn and Ogburn, 1994) have been efficiently used for enhancing the productivity of natural food of carps and related species. Besides, several organic wastes/by-products such as plant products, wastes from animal husbandry, and industrial...
by-products have been used as carp feed ingredients to lower the cost of supplementary feeding (Matty and Smith, 1978; Jackson et al., 1982; Sehgal and Thomas, 1985, 1987; De Silva and Gunasekera, 1989; Sehgal and Sharma, 1991, 1993; Singh et al., 1999). However, to ensure the continued expansion of fish ponds and the pollution control, there must be a market for the fish (carps) produced in these ponds. Although, the production of carps has gone up, significantly, their market value has come down during the recent years. The main reason for the low market price is the low consumer preference for these species (due to the presence of intramuscular bones). Thus, a need was felt to develop some convenience products from the meat of carps to enhance their consumer acceptability, as also suggested by Gopakumar (1997), Basu (1999) and Upadhyya et al. (2001). The efforts were made to prepare three value-added products namely fish patty, fish finger, and fish salad. The consumer acceptability of these products and their role in promoting carp culture as a profitable venture is discussed in this paper.

2. Methods

2.1. Fish

Two year old, *Cyprinus carpio* were procured from the experimental fish farm of the Fisheries Research Division, Regional Research Station, Punjab Agricultural University, Ropar. For each trial, they were caught fresh and transported live to the laboratory, situated about 0.5 km from the farm. These were then quick frozen at −30 °C in a quick-freezer.

2.2. Preparation of fish patty and fish finger

Fish patty and fish finger were prepared from de-boned fish, corn flour, spices, salt, monosodium glutamate and covered in bread crumbs.

2.3. Preparation of fish salad

Fish salad was prepared from de-boned fish, macaroni, mayonnaise sauce, vegetables, canned pineapple, honey, lime-juice, and American spices.

2.4. Preparation of reference product

A reference product namely ‘fish pakoura’ (the most commonly cooked fish dish in Northern India) was also prepared from fish chunks, Bengal gram flour, salt, tynol seeds, and garlic.

The full details of the recipes can be obtained from the authors.

3. Sensory evaluation

The frozen products (fish patty and fish finger) were taken out of the quick-freezer and kept in the refrigerator until deep-fried in refined groundnut oil for 30–35 s (golden-brown colour). Fish salad was served directly after taking out of the refrigerator. A panel of six judges was constituted and a score card was prepared by using a nine-point Hedonic Scale. The three products prepared from de-boned carp flesh and a reference product prepared from fish chunks (with bones) were served to the judges who were asked to score them for appearance, colour, flavour, taste, texture (hardness) and overall acceptability, as per proforma (Piggott, 1984).

3.1. Statistical analysis

One-way ANOVA was used to find the significance of difference between the various value-added and reference fish products on the basis of their sensory qualities mentioned above.

4. Results and discussion

All the three de-boned value-added fish products were preferred over the reference product (fish pakoura). All the three products scored higher than the reference product in terms of taste, overall acceptability, and total scoring (Table 1). Fish patty was, however, the most preferred product in terms of appearance and colour. In terms of firmness, the reference product was the most preferred one. There was no significant difference amongst the value-added and the reference fish products in terms of their flavour (Table 1). The results, therefore, indicate that the development of value-added fish products from de-boned carp flesh significantly increased the overall acceptability of the carp flesh from as low as 1.83 scores in case of the reference product to as high as 7.67 scores in case of fish patty. Thus, there is a good scope for the processing of carp flesh into value-added products, which is important for boosting the production of these species for the continued expansion of fish culture ponds which can efficiently recycle wastes into nutritive human food. In Punjab alone, for example, there is a potential of consuming 32,448 metric tonnes per annum of these and other similar products, which would need 54,080 metric tonnes of raw fish per annum.

The development of value-added products from carp flesh has a significant role in raising the socio-economic conditions of the people associated with carp culture. The average cost of production of these products was estimated to be INR 80 per kg (see Table 2). With a sale price of INR 110 kg⁻¹ and a sale of 50 kg of these products day⁻¹ (26 days a month), the average monthly
income of a processing unit (operated by two persons) comes to be INR 39,000 (equivalent to 929 USD, approximately), which is a very good income in the Indian context.

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References