



Research Note

Fermented Fish Powder Based Cookies from *Johnius* sp.

A. A. Zynudheen*, George Ninan and K. G. Ramachandran Nair¹

Central Institute of Fisheries Technology, P.O. Matsyapuri, Cochin - 682 029, India

Utilization of low value fishes for the production of mince based products and Type B fish protein concentrate has been reported (Joseph et al., 1984; Gopakumar, 1997; Ninan et al., 2010). Chattopadhyay et al. (2004) has outlined a process for the preparation of edible fish powder from small bony fish which find use as a fortifying agent in different food items. Fish protein and their hydrolysates have good functional properties and have specific health benefits including the ability to lower blood pressure, reduce the risk of type II diabetes (McCarthy, 2003), and improve glucose tolerance and insulin sensitivity (Lavigne et al., 2000). Protein powder and hydrolysate made from the fillets of underutilized species or protein derived from fish processing by products have good functional properties that can be used as ingredients in both animal and human foods (Sathivel et al., 2007). Lactic acid fermentation represents a low cost method for the preparation of food and feed products having hygienic quality and improved shelf life. Sumarsih et al. (2010) summarized the advantages of fermented fish when compared to fish meal. Fermentation of fish and fishery products with lactic acid bacteria have emerged as a promising field for the production of various products of commercial and pharmacological significance. The probiotic effect of lactic acid bacteria incorporation and the presence of partially digested protein can improve the digestibility and absorption of nutrients. The present work was carried out to

standardise the preparation of cookies incorporated with fermented fish powder and to evaluate its quality.

Fresh jew fish (*Johnius* sp. 15-20 cm; 100-150 g) was collected from landing centre at Cochin and brought to the laboratory in iced condition. Jaggery and other ingredients (Table 1) were procured from the local market. *Lactobacillus plantarum* type culture (No.1425) procured from Microbial Type Culture Centre, Institute of Microbial Technology, Chandigarh, revived and repeatedly sub-cultured in MRS broth was used for the inoculation. The fish was thoroughly washed with potable water and dressed retaining only the edible portions. It was homogenized for 10 min and cooked in glass beaker with 10% (w/w) jaggery, cooled and inoculated with *Lactobacillus* at 5% level (w/v) and fermented at 26±2°C for seven days. The fermented mass was vacuum dried, powdered and packed. For preparation of cookies, fermented fish powder at three levels viz., 2, 5 and 10% (w/w) were mixed with other ingredients (Table 1). They were kept for 10-15 min, shaped into cookies, baked in an electric oven at 170-180°C for 20 min and packed in laminated pouches after cooling. Similarly, control was prepared, without addition of fish powder.

Moisture, crude protein, fat, ash, sodium, potassium and iron were estimated as per AOAC (2000). Organoleptic quality assessment was carried out by a seven-member panel using a 10-point hedonic scale (Anon 1984). The observations were converted to equivalent numerical scores and a sensory score of 4 was taken as the borderline of overall acceptability.

Cookies prepared by incorporating 2% of fermented fish powder had an overall acceptability score of 8.1 compared to 8.4 of control sample (Table 2). Even

Received 18 December 2011; Revised 26 October 2012; Accepted 15 November 2012

¹Present Address: Ambili, North Janatha Road, Palarivattom, Cochin - 682 025, India

* E-mail: zynu@rediffmail.com

Table 1. Ingredients for the preparation of cookies incorporated with fermented dried fish powder (g kg⁻¹)

| Ingredients | Control | 2% level | 5% level | 10% level |
|-----------------------|---------|----------|----------|-----------|
| Fermented fish powder | — | 20 | 50 | 100 |
| Refined wheat flour | 400 | 380 | 350 | 300 |
| Vegetable fat | 200 | 200 | 200 | 200 |
| Sugar | 200 | 200 | 200 | 200 |
| Ginger | 20 | 20 | 20 | 20 |
| Chilli powder | 20 | 20 | 20 | 20 |
| Curry leaves | 10 | 10 | 10 | 10 |
| Spice mix | 30 | 30 | 30 | 30 |
| Vanilla essence | 2 | 2 | 2 | 2 |
| Baking powder | 4 | 4 | 4 | 4 |
| Cashew nut | 60 | 60 | 60 | 60 |
| Sesame | 40 | 40 | 40 | 40 |
| Egg (Nos.) | 3 | 3 | 3 | 3 |
| Salt | 10 | 10 | 10 | 10 |

Table 2. Sensory evaluation scores of the developed cookies

| | Cookies incorporated with fermented fish powder at | | | |
|-----------------------|--|---------|---------|---------|
| | Control cookie | 2% | 5% | 10% |
| Appearance | 8.6±0.5 | 8.7±0.4 | 7.4±0.3 | 7.5±0.6 |
| Colour | 8.4±0.5 | 8.4±0.6 | 7.4±0.5 | 7.4±0.4 |
| Texture | 8.5±0.4 | 8.2±0.7 | 7.5±0.4 | 7.4±0.5 |
| Flavour | 8.3±0.6 | 8.1±0.5 | 6.1±0.2 | 4.1±0.3 |
| Odour | 8.4±0.7 | 7.9±0.4 | 5.3±0.5 | 3.7±0.4 |
| Overall acceptability | 8.4±0.5 | 8.1±0.5 | 6±0.4 | 3.9±0.5 |

though cookies with 5% fermented fish powder had an overall acceptability score of 6.0, it had a strong fishy flavour. Cookies with 10% fermented fish powder had an overall acceptability score of 3.9 and this product was rejected organoleptically due to the strong fishy odour. The cookies incorporated with 2% fermented fish powder were found to be acceptable.

Proximate composition of fermented fish powder and cookies prepared with fermented fish powder incorporated at 2% level is given in Table 3. The fermented fish powder had a protein content of 59.4% whereas cookies prepared with 2% fish powder had 10.4% protein. A marginal increment of protein content was observed in the sample when compared to control. Shaviklo et al. (2011) reported 9.3-9.8% protein in carp mince incorporated extruded puffed corn-fish snacks when compared to control, which had 6.5% protein content, with a substantial increase in peroxide value during storage of the product. Other parameters like crude fat and ash did not show much variations between the control and fish powder incorporated cookies. Chattopadhyay et al. (2004) reported 62.52% crude protein in edible fish powder prepared from silver bellies. The protein, moisture, fat and carbohydrate were 74.5-92.8, 3.9-5.8, 2.1-3.2 and 1.0-1.51% respectively in the fish protein powder prepared from saithe (*Pollachius virens*) (Shaviklo, 2010).

Mineral composition of fermented fish powder and cookies is given in Table 4. The mineral content showed noticeable difference between the control and samples. Sodium content increased to 1241.44 mg 100g⁻¹ from the initial value of 1066 mg 100 g⁻¹ in control sample. Fermented fish powder had calcium content of 918.12 mg 100 g⁻¹ whereas it was 1046.22 mg 100 g⁻¹ in cookies incorporated with 2% fermented fish powder. Chattopadhyay et al. (2004) reported a calcium content of 1310.96 mg 100 g⁻¹ for edible fish powder from silver bellies. Larsen et al. (2000) reported that the intake of small fish with bones can increase calcium bio-availability and

Table 3. Proximate composition of fermented fish powder and cookies (g 100g⁻¹)

| | Fermented fish powder | Control Samples | Cookies incorporated with fermented fish powder at 2% level |
|------------------------------|-----------------------|-----------------|---|
| Moisture | 8.3 | 2.25 | 2.21 |
| Crude Protein | 59.4 | 9.56 | 10.42 |
| Crude Fat | 10.1 | 18.57 | 18.23 |
| Ash | 14.6 | 0.065 | 0.32 |
| Carbohydrate (By difference) | 5.2 | 70.02 | 68.16 |
| Calorific value (kcal) | 319.2 | 466.7 | 460.0 |

Table 4. Mineral composition (mg 100 g⁻¹) of fermented fish powder and cookies

| Product type | Na | K | Ca | Fe |
|---|---------|---------|---------|------|
| Dried fermented fish powder | 405.91 | 1305.62 | 918.12 | 1.08 |
| Cookies-control | 1066.77 | 1469.21 | 1023.49 | 0.42 |
| Cookies-incorporated with fermented fish powder at 2% level | 1241.44 | 1483.85 | 1046.22 | 0.59 |

small fish can be an important source of calcium, especially in population with low intake of milk and dairy products.

The present study indicated that incorporation of fermented fish powder at an optimum level in popular snack items like cookies enhances the nutritive value of the product without compromising on sensory qualities.

References

Anon (1984) Report on training programme on retortable pouch processing of fish and fish analysis at Tropical Development and Research Institute (TORI), UK, Published by Central Institute of Fisheries Technology, Cochin, India

AOAC (2000) Official Methods of Analysis, 17th edn., 1298 p, Association of Official Analytical Chemists, Washington DC

Chattopadhyay, A.K., Rao, M. and Gupta, S. (2004) A simple process for the utilisation of small bony fish as edible fish powder. *Fish Technol.* 41 (2): 117-120

Gopakumar, K. (1997) Products from whole fish. In: *Tropical Fishery Products*, pp 45-67, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India

Joseph, J., Perigreen, P.A. and Thampuran, N. (1984) Preparation and storage of cutlet from low priced fish. *Fish Technol.* 21: 70-74

Larsen, T, Thilstead, S.H., Kongsback, K and Hansen, M. (2000) Whole small fish as a rich calcium source, *Br. J. Nutr.* 83: 191-196

Lavigne, C.M.A. and Jacques, H. (2000) Cod and soy proteins compared with casein improve glucose tolerance and insulin sensitivity in rats, *Am. J. Physiol. Endocrinol. Metab.* 278: E491-E500

Mc Carty, M. F. (2003) ACE inhibition may decrease diabetes risk by boosting the impact of bradykinin on adipocytes, *Medical Hypothesis*, 60(6): 779- 783

Ninan, G., Bindu, J. and Joseph, J. (2010) Frozen storage studies of value-added mince-based products from tilapia (*Oreochromis mossambicus*, Peters 1852), *J. Food Process. Preser.* 34: 255-271

Sathivel, S. and Betchel, P.J. (2007) Engineering and functional properties of powders from underutilized marine fish and seafood products In: *Maximising the Value of Marine Byproducts* (Shahidi, F., Ed), pp 249-256, Woodhead Publishing Ltd., Cambridge, CB 21, 6AH, England

Shaviklo, G. R., Thorkelsson, G., Arason, S., Kristinsson, H.G. and Sveinsdottir, K. (2010) The influence of additives and drying methods on quality attributes of fish protein powder made from saithe (*Pollachius virens*). *J. Sci. Food Agric.* 90(12): 2133-43

Shaviklo, G.R., Thorkelsson, G., Rafipour, F., Sigurgislodottir and Sjofn (2011) Quality and storage stability of puffed corn-fish snacks during 6 months storage at ambient temperature. *J. Sci. Food Agric.* 91(5): 886-893

Sumarsih, S.T., Yudiarti, C. S., Utama, E. S., Rahayu, and Harmayani, E. (2010) The influence of using fish fermented by lactic acid bacteria As feed substitution on serum lipid profile of broilers. *J. Indonesian Trop. Anim. Agric.* 35(2)