



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2017; 5(6): 2552-2554

© 2017 JEZS

Received: 17-09-2017

Accepted: 23-10-2017

#### Ganesan P

Department of Fish processing Technology, Fisheries College and Research Institute, Tamil Nadu Fisheries University Thoothukudi, Tamil Nadu, India

#### Rathnakumar K

Department of Fish processing Technology, Fisheries College and Research Institute, Tamil Nadu Fisheries University Thoothukudi, Tamil Nadu, India

#### Brita Nicy A

Department of Fish processing Technology, Fisheries College and Research Institute, Tamil Nadu Fisheries University Thoothukudi, Tamil Nadu, India

#### Vijayarahan V

Department of Fish processing Technology, Fisheries College and Research Institute, Tamil Nadu Fisheries University Thoothukudi, Tamil Nadu, India

#### Correspondence

#### Ganesan P

Department of Fish processing Technology, Fisheries College and Research Institute, Tamil Nadu Fisheries University Thoothukudi, Tamil Nadu, India

## Improvement of nutritional value of extruded snack product by incorporation of blanched dried fish powder from sardine and Lizard fish and selection by organoleptic evaluation

Ganesan P, Rathnakumar K, Brita Nicy A and Vijayarahan V

#### Abstract

In the present study, blanched dried fish powder from two fishes, sardine and lizard fish procured from Thoothukudi fishing harbor were incorporated in to extruded snacks and their nutritional and organoleptic characteristics were analyzed. The study was conducted from June, 2017 to August, 2017. Highest protein content was recorded in extruded fish snack with 30% blanched dried Lizard fish powder ( $28.79 \pm 0.35\%$ ) and was lowest ( $5.81 \pm 0.18\%$ ) in control extruded snack whereas highest fat content was recorded in extruded fish snack with 30% blanched dried sardine fish powder ( $11.32 \pm 0.09\%$ ) and was lowest ( $3.52 \pm 0.12\%$ ) in control extruded snack. However, addition of more than 10% of blanched dried fish powder reduced the acceptability and hence the optimum percentage of blanched dried fish powder that can be added to extruded snack product is 10%.

**Keywords:** Extruded snack, blanched dried fish powder, nutritional value and organoleptic characteristics

#### 1. Introduction

Snack consumption is increasing its popularity everyday in India and a wide variety of these items are present in the market. The consumer interest in ready-to-eat snack foods is constantly growing mainly due to their convenience, wide availability, appearance, taste and texture [1]. Extrusion technology has been used in many industries that produce new and unique snack foods due to advances in this technology compared to other traditional methods [2]. For many years, nutritionists have been concerned about snack eating behavior of people [3]. Extruded products based on cereals and grains were the most widely consumed snack food items, and many of these were low in nutrient density and high in calories and/or fat content [4] and hence their protein content must be improved to convert these in to healthy products. Some of the extruded products were incorporated with fishes, such as the inclusion of fish meal from Tilapia, salmon, tuna, Brazilian sardinella [5] and minced fish meat from Silver Carp [6] to increase the protein content. Water-soluble proteins – both of plant and animal origin – reduce extrudate expansion, while myofibrillar protein of animal meat and vital gluten are a well-extrudable material [7] and hence the quantities of fish that can be incorporated in to the product without causing quality loss is limited. However, studies on the incorporation of blanched dried fish as raw material for extruded snack preparation are not available in literature. The aim of this study was to produce extruded fish snacks containing different levels (10%, 20% and 30%) of blanched, dried and pulverized fish powder obtained from sardine and lizard fish and evaluate and compare their nutritional characteristics and sensory acceptance.

#### 2. Materials and Methods

The study was conducted from June, 2017 to August, 2017. Sardine (*Sardinella longiceps*) and Lizard fish (*Saurida tumbil*) were procured from Thoothukudi fishing harbor. Fishes were iced immediately at the ratio of 1:1 (fish: ice) placed in an insulated box and transported as fresh to the laboratory within 30 minutes. Flake ice was used for chilling the fish during the transportation. The fishes were de-scaled, beheaded, eviscerated and washed with potable water. The dressed fishes were blanched by boiling in water for 8-10 minutes under normal atmospheric pressure. The cooked fishes were cooled and dried in an oven drier at 50-60 °C. The dried fish were powdered in a domestic mixer at the rate of 100 g/ 2 minutes.

The fish powders were used for the development of the product. Other ingredients such as Corn flour, Rice flour, Dhal, pepper and salt procured from the market were used for the experiment.

A weighed amount of cooked dried fish powder was mixed with a known quantity of corn flour, Rice flour, Dhal, pepper and salt and 8% of water was added. These ingredients were hand mixed and left for equilibration for at least one hour. The above mixture was passed through the twin-screw extruder (co-rotating twin screw extruder— Basic Technology Pvt. Ltd., Kolkata). The operation conditions of the equipment are given in Table 1.

**Table 1:** Operation conditions of the equipment

Sl.no.	Parameter		Value
1	Barrel screw speed		350 rpm
2	Barrel temperature (constant)	Heater 1	100 °C
		Heater 2	60 °C
3	Final mass temperature		100 °C to 135 °C
4	Feeding rate		21 rpm
5	Cutter speed		435 rpm
6	Line voltage		420 volts

**Table 2:** Proximate compositions of extruded fish snacks

Extruded Snack	Moisture	Protein	Fat	Ash	Carbohydrates
With 10% blanched dried sardine powder	1.67±0.12	10.29±0.25	5.61±0.13	0.09±0.02	82.34±0.21
With 20% blanched dried sardine powder	1.89±0.21	19.64±0.17	8.25±0.17	0.09±0.01	70.13±0.39
With 30% blanched dried sardine powder	1.98±0.17	26.53±0.31	11.32±0.09	0.09±0.03	60.08±0.32
With 10% blanched dried Lizard fish powder	1.86±0.14	11.75±0.43	3.7±0.11	0.14±0.04	82.55±0.45
With 20% blanched dried Lizard fish powder	2.17±0.32	22.02±0.26	5.06±0.10	0.14±0.03	70.61±0.31
With 30% blanched dried Lizard fish powder	2.29±0.27	28.79±0.35	6.94±0.13	0.14±0.01	61.84±0.37
Control (without fish powder)	1.62±0.19	5.81±0.18	3.52±0.12	0.18±0.02	88.87±0.17

Increasing the amount of blanched dried fish powder increased the protein content and fat content in the extruded fish snack and resulted in the decrease of carbohydrates content but the moisture and ash contents did not vary to a greater extent. Highest protein content was recorded in extruded fish snack with 30% blanched dried Lizard fish powder (28.79±0.35%) and was lowest (5.81±0.18%) in control extruded snack. According to Goes *et al.*,<sup>[5]</sup> extruded Tuna snack had the highest protein rates (11.85%) among the snacks with 9% fish meal, followed by the sardine and tilapia snacks (respectively with 10.21% and 9.80%), whilst the salmon snack had the lowest protein rates (9.21%).

Highest fat content was recorded in extruded fish snack with 30% blanched dried Sardine fish powder (11.32±0.09%) and was lowest (3.52±0.12%) in control extruded snack. Fat content in extruded fish snack with blanched dried Sardine fish powders were higher than that in extruded fish snack with

Moisture and ash content of extruded snacks were determined by the standard AOAC method (1995)<sup>[8]</sup>. The Nitrogen content of extruded snacks were determined by the Microkjeldahl method (AOAC, 1995)<sup>[8]</sup> using KEL-PLUS digestion and distillation apparatus. The protein content was calculated by multiplying nitrogen content with a factor 6.25. Crude fat content of extruded snacks were determined by Soxhlet method (AOAC, 1995)<sup>[8]</sup> using petroleum ether 60-80 degree Celsius as solvent in a SOCS PLUS-SCS 12 system. The organoleptic analysis was carried out on a 9-point hedonic scale, a score of five being the borderline of acceptability. Descriptive statistics were done for data to describe the results.

### 3. Results and Discussion

#### (i) Proximate analysis

The proximate compositions of extruded fish snacks determined for those prepared from blanched Sardine and blanched Lizard fish are given in Table 2.

blanched dried Lizard fish powder in all respective percentages of fish powder as sardine is a fatty fish and lizard fish is a lean fish. The carbohydrates content decreased from 88.87±0.17% in control extruded snack to 60.08±0.32% extruded fish snack with 30% blanched dried Sardine fish powder and 61.84±0.37% in extruded fish snack with 30% blanched dried Lizard fish powder.

Low protein (6.8±1.8 g.100g<sup>-1</sup>) and high lipid content (14.3±8.0 g.100g<sup>-1</sup>) were observed in commercially available snacks as reported by Capriles *et al.*,<sup>[9]</sup> which makes the products unhealthy due to high calorific value as compared to the high protein blanched dried fish powder incorporated extruded snacks.

#### (ii) Sensorial analysis

Sensory characteristic profiles of extruded snacks are given in Table 3.

**Table 3.** Sensory characteristic profiles of extruded snacks

Extruded Snack	Appearance	Colour	Flavour	Texture	Taste	Overall acceptability
With 10% blanched dried sardine powder	7.5±0.02	7.3±0.3	7.9±0.05	8.5±0.05	7.5±0.03	7.6±0.02
With 20% blanched dried sardine powder	5±0.01	5.1±0.04	4.4±0.03	5.9±0.03	4.3±0.05	4.3±0.03
With 30% blanched dried sardine powder	4.2±0.04	4±0.02	3.6±0.01	3.1±0.02	3.3±0.02	3.2±0.06
With 10% blanched dried Lizard fish powder	7.8±0.03	7.6±0.02	7.8±0.04	8.2±0.04	7±0.04	7.4±0.04
With 20% blanched dried Lizard fish powder	5.6±0.01	5.5±0.04	4.3±0.06	5.4±0.03	4.1±0.03	4±0.03
With 30% blanched dried Lizard fish powder	4.3±0.02	4.4±0.04	3.3±0.03	2.9±0.04	3±0.02	3.1±0.05
Control (without fish powder)	8.4±0.04	8.6±0.03	8.7±0.04	8.9±0.02	8.8±0.01	8.9±0.06

Control sample was liked for all of its attributes by all panel members as compared to other extruded products. This might be to the fact that control sample had bright yellow colour

whereas experimental extruded snacks were incorporated with fish powder which might have changed the bright yellow colour and also imparted fishy flavour and taste. Moreover the

incorporation of fish might have lead to the hardened texture. The increase in percentages of blanched dried fish powder reduced the grades for all attributes. The products with 20% and 30% of blanched dried fish powder were hard with fishy flavour, taste and also poor appearance that made them unacceptable. Protein enrichment was found to reduce expansion, and to increase hardness, of the extrudates as reported by Wianecki <sup>[7]</sup> which might have been the reason for the declining acceptability of the products with increase in concentration of protein rich blanched dried fish powder.

However, extruded fish snack with 10% blanched dried sardine powder and that with 10% blanched dried Lizard fish received score above acceptable levels. This was in accordance with the report by Justen *et al.*, <sup>[10]</sup> that the addition of up to 12% of flavored tilapia meal did not affect sensory parameters of extruded corn snacks, obtaining grades between 6.92 and 8.15 for all attributes. Against the expectation, extruded fish snack with 10% blanched dried sardine powder obtained better scores than that with 10% blanched dried Lizard fish making it the better snack compared to all other products which was a deviation from the studies by Goes *et al.*, <sup>[5]</sup>. The result is also as deviation from the report by Wianecki that states meat of lean fish had better extrusion characteristics than that of fatty fish <sup>[7]</sup>.

#### 4. Conclusion

Inclusion of blanched dried fish powder increased the protein and fat content of the extruded snack product and decreased the carbohydrate content. However, addition of more than 10% of blanched dried fish powder reduced the acceptability and thence the optimum percentage of blanched dried fish powder that can be added to extruded snack product is 10%. Inclusion of blanched dried fish powder of sardine which is a fatty fish obtained better organoleptic acceptance than that of lizard fish which is a lean fish.

#### 5. Acknowledgement

The authors wish to thank Dean, Fisheries College and Research Institute, Ponneri for providing facilities to carry out this research.

#### 6. References

1. Omwamba M, Mahungu S. Development of a Protein-Rich Ready-to-Eat Extruded Snack from a Composite Blend of Rice, Sorghum and Soybean Flour. *Food and Nutrition Sciences*. 2014; 5:1309-1317.
2. Riaz MN. *Extruders in Food Applications*. Technomic Publishing, Lancaster, 2000.
3. Tangkanakul P, Tungtrakul P, Mesomya W. Nutrient Contents of Commercial Snack Food Products. *Kasetsart J. (Nat. Sci.)*. 1999; 33:270-276
4. Tettweiler P. Snack foods worldwide. *Food Technol*. 1991; 45:58-62.
5. Goes, Reis ESD, Souza, Maria LR, Campelo, Vasconcelos DA. Extruded snacks with the addition of different fish meals. *Food Science and Technology*. 2015; 35(4):683-689.
6. Shahmohammadi HR, Bakar J, Russly AR, Noranizan MA, Mirhosseini H. Puffed corn-fish snack development by extrusion technology. *Iranian Journal of Fisheries Sciences*. 2014; 13(3):748-760.
7. Wianecki M. Evaluation of fish and squid meat applicability for snack food manufacture by indirect extrusion cooking. *Acta Sci. Pol., Technol. Aliment*. 2007; 6(4):29-44.
8. AOAC. *Official methods of analysis*. 16th edition. Arlington, Virginia, USA: Association of Official Analytical Chemists, 1995.
9. Capriles VD, Soares RAM, Arêas JAG. Development and assessment of acceptability and nutritional properties of a light snack. *Ciência e Tecnologia de Alimentos*. 2007; 27(3):562-566.
10. Justen AP, Franco MLRS, Monteiro ARG, Mikcha JMG, Gasparin E, Delbem AB. Inclusión de harina de pescado en snacks. *Infopesca Internacional*. 2011; 47:35-38.