

Development of battered and breaded fish and fishery products: A Review

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Abstract

Battered and breaded seafood products play a significant role in the global food industry, offering consumers convenient and appetizing options for incorporating fish and shellfish into their diets. This review aims to provide a comprehensive analysis of battered and breaded products derived from fish and shellfish, focusing on their quality attributes, nutritional composition, and consumer perception. Quality attributes of battered and breaded seafood products are multifaceted, encompassing sensory characteristics, texture, and overall acceptability. Factors such as coating thickness, crispiness, and moisture retention play pivotal roles in determining product quality. Studies have explored various techniques for improving batter adhesion and texture, including the incorporation of different breading materials, additives, and processing methods. These advancements have contributed to enhancing product quality, resulting in greater consumer satisfaction.

Key words: Battered and Breaded, Quality attributes, Additives and Fishery Products

Introduction

The coated products are constituting an extensive sector in ready meal market (Flick, G. J. et al., 1990), because of their convenience, appearance and taste these products is extensively preferred by the most of consumers. The technology employed for coating has developed significantly over the past few years in response to the rising demand of consumers. Venugopal (2006), reported in their book chapter the majority of developments come from the United States, Europe, and Japan. Today a variety of coated products technologies are available in market such as fish steaks, fish fingers, fish cutlets, coated stretched shrimps (Nobashi), coated squid rings and different coated bivalves.

Development in coated technology has been synchronized with the development in machinery and equipment's, prior to introduction of machinery all the process used to be done manually in which the maintain of hygiene was a problem. This article gives a brief note on the procedure of breading and battering for making coated seafood products of breaded and battered products, some of the trouble shooting which are faced during its making and also has discussed about some commercially important coated seafood products.

Value additions are the most important aspects in fish processing industries, especially in export oriented fish processing industry because of the increased realization of valuable foreign exchange. Value can be added to fish and fishery products according to the requirements of different markets. These products are ranges from live fish and shellfish to ready to eat convenience products. The fish processing industry is concerned value addition is one of the possible approaches to raise profitability, so these industries are becoming highly competitive and increasingly expensive. There is great demand for seafood based products in ready to eat and convenience form. Large amount of such diverse products have already available in the western markets. One of the important factor is responsible for such a situation due to more and more women getting educated and taking up employment, because of this reasonably good expendable income, education, awareness and consciousness towards hygiene and health are some of the reasons are useful for awareness in value added fish and fishery products. Marketing of value added products is completely different from the traditional seafood trade. Market surveys, packaging and advertising are a few of the very important areas, which ultimately determine the successful movement of a new value added fish products and battered and breaded sea food products. Most of the market channels currently used is not suitable to trade value added products. A new appropriate channel would be the super market chains which want to procure directly from the source of supply. Appearance, packaging and display are all important factors leading to successful marketing of any new value added product. Few important criteria for retail pack must be clean, crisp and clear and make the contents appear attractive to the consumer. The consumer must be given confidence to experiment with a new product launched in the market. Packaging requirements change with product form, target group, market area, species used and so on (Zang et al., 2020).

Preparation of batter and breading's

The important steps for the preparation of battered and breaded products are washing fish and dressing of fillets, fillets shaped into fingers, mixing with salt, frying Ginger, Garlic, Onion, Green chili paste in oil slurry of Bengal gram flour with water, adding fried paste to slurry, salt & other spices, mixing. dipping finger in batter, rolling over bread crumb and deep fry in oil.

Catla (*Catla catla*) was used to make cutlets that were 30 g in weight, 5 cm in size, and 1 cm thick. As standardised by Pawar et al. (2012), cutlets were made with cooked Catla meat (40.16%), cooked potato (28.11%), cooked onion (10.04%), bread powder (8.03%), oil for frying (4.02%), green chilli (2.01%), coriander leaves (2.01%), ginger (2.01%), garlic (2.01%), table salt (1.20%), pepper powder (0.12%), clove powder (0.12%), cinnamon powder (0.08%), and turmeric powder (0.08%). With the highest level of overall acceptability, all readily available substances were employed in formulations specifically specified for Catla cutlets. Coated in a standardised batter mix created by Pagarkar et al. (2012) that includes 77.5% refined wheat flour, 9.7% corn flour, 9.7% Bengal gramme flour, 1.20% salt, 0.47% sodium tri polyphosphate (STTP), 0.47% turmeric powder and 0.96% carboxy methyl cellulose (CMC), mixed with water in a ratio of 1:2 (Solid: Liquid), and then blended to homogeneity. Further coated with bread crumbs and quickly fried at 180°C for 30 seconds in sunflower oil, followed by aerobic packing in polypropylene bags and chilling prior to further analysis (Fig.No. 1) (Pawar et al 2020).

Preparation of batter mix

The batter mix was prepared by using a 1:2 powder to liquid mix ratio and included wheat flour (77.5% w/w), Bengal gramme powder (10% w/w), maize flour (10% w/w), sodium tri-polyphosphate (0.5% w/w), guar gum (0.25% w/w) and turmeric powder (0.25% w/w). Throughout the experiment, the batter solution's internal temperature was held constant at 20°C. The experiment's batter had a viscosity of 25 cP (Chinmaya et al 2020).

Preparation of bread crumbs

For preparation of the bread crumbs, locally obtainable white slices with the crust removed were employed. The crust-free loaves were first put through a 1-minute, room-temperature puree in an electric blender. The finalised bread powder was once again dried in an electric dryer at 50°C (moisture level 5% (w/w) of the dried sample). To achieve uniform particle size (3–4 mm), the dried crumbs were then sieved twice, once with a 4 mm sieve and once with a 3 mm sieve. Prior to uses, bread crumbs were kept in polyethene bags and in a dry place and cool environment. Similar to that, vermicelli and dry-pressed rice were crushed, then sieved through a 4 mm and a 3 mm sieve to achieve homogeneous particle sizes (3-4 mm), and then they were stored in a dry, cool environment (Chinmaya et al 2020).

Different types of batter

Batters are Classified into main two groups

i). Conventional or adhesive batter

This type of batter can be prepared by using with supplemental breading or bread crumbs. The purpose of batter is to increase crumb adhesion by acting as an interface between food & coating. Generally, a typical ratio of batter mix to water is 1:2, always associated with a supplemental breading or bread crumb for the purpose of to increase the adhesion during coating of products by acting as an interface between the food & the subsequent coating uniformity & thickness acceptability of the finished product. The formulation & viscosity of the batter determine the amount of coating pickup is mainly depending upon consistent batter produce uniformly coated products. Batter viscosity depends on the ratio of the flour to water the temperature of mixing. A typical ratio of batter mix to water is 1:2.

ii) Puff or tempura batter

In this type of batter used to provide an aerated crisp coating with or without application of other coating. Combination of wheat & rice flour with a chemical raising agent are used. The main purpose to provide aerated crisp coating with or without the application of any other coating, a combination of wheat & corn flour is used along with a chemical raising agent. The tempura batters are used at very high viscosity levels and containing raising agents like batter mix- powder-reconstituted with water and desired viscosity. The final texture –frying the coated product in oil at 180°-220°C for submersion is used rather than overflow batter application

Types of breading

A). Extruded crumbs

- Extruded crumbs are produced by a continuous process where high starch ingredients are cooked under high pressure.

- When the pressure is suddenly released, the moisture expands rapidly as steam and the extrudate expands.
- In the extrusion cooking process, the heated dough exits from the extruder die as a fully cooked glassy material is quickly flashes off and, in effect, there is no drying system required.
- Because of its lighter density the extruded crumbs have a tendency to float in oil, potentially leading to contaminating black spots in the fryer and rapid deterioration of oil quality.

B). Japanese crumbs

- Also called as ‘**oriental or panko crumb**’
- It has an open & porous texture imparts a light tender crispiness
- Has characteristic flake-like elongated structure □ excellent visual & provides unique surface structure when fried
- one half the time taken for conventional baking
- Baked Electrical induction heating process
- results in a loaf–crust-free & of low density
- loaves are cooled, shredded through specially designed mills and dried to low final moisture level

Coating ingredients

Main ingredients were used for coating purpose i.e. polysaccharide sources are wheat flour, corn flour, starch, farinaceous material, modified derivatives of cellulose and gums. As a protein sources like a milk powder, milk protein fractions, egg albumin, cereal flours and seed proteins, a source of fats is hydrogenated oil, a seasonings sources were used as sugar, salt, pepper, other spice extractives and adequate amount of water.

Coating parameters

The coating parameters evaluated include coating pickup, adhesion degree, frying yield, cooked loss, fat uptake, and oil reduction. Processing parameters of the samples, that is, the coating pickup, cooked yield, and frying loss, were measured by the methods described by Smith and Hasia (1992)

Main functions of coatings are

- It enhances the appearance of food products
- It enhances the taste characteristics by providing food products with crispier texture
- It improves the nutritional value of the product
- It provides the better desirable colour
- It acts as a moisture barrier and minimise moisture loss during frozen storage and microwave reheating
- It acts as food sealant by preventing natural juices from flowing out and seal in the flavour
- It enhances appearance, flavour & texture of food product.
- It provides desirable colour.
- It acts as food sealant, prevent natural juices from coming out during freezing or reheating & seal flavour.
- It maintains crisp on the outside, tender and juicy inside.
- It improves overall acceptability of the product

Important steps involved during the preparation of a coated fish products

a) Portioning/Forming:

- The fish steak is usually cut from fish blocks in a series of separate band saw operation.

b) Pre-dusting:

- Pre-dusting by using very fine, dry, raw flour material.
- Sprinkled on the moist surface of the frozen seafood substrate before any coating
- Creates more conducive surface for batter adhesion
- Most commonly pre-dusting materials used are wheat flour, gums & proteins, spices.

c) Application of batter:

- Pre-dusted product conveyed to batter applicator
- Transferred to next conveyor belt which draw it through batter.
- Fish portion should be totally submerged in batter.

d) Application of breading:

- Pressure roller apply sufficient force to press crumbs on to battered product.
- Specially designed breading machines to apply uniform particle size distribution or granulation to both top and bottom of the product with minimum crumb.

e) Pre-frying:

- Pre-frying in oil is followed by freezing the product.
- Pre-frying set the batter and bread coating on the fish portion.
- Frying develops a characteristic crust and it gives the product a fried oily appearance and taste
- Frying temperature is maintained in between 180-200 °C

f) Freezing:

- Fried fish portion for freezing is air cooled.
- Allow the batter cooking to recover from the frying shock
- Freezing is performed through spiral freezer and completed when external temperature of the product is around -10°C.

g) Packaging & storage:

- Packing of coated seafood should be done in thermoformed containers and usually stored at -10°C or lower.

Types of breaded and battered products

Fish mince based products

1. Fish finger: minced fish that has been stripped of its skin and bones. Large chunks of mince block slabs are chopped into thin fingers, battered and breaded, and then flash-fried using forming machines.

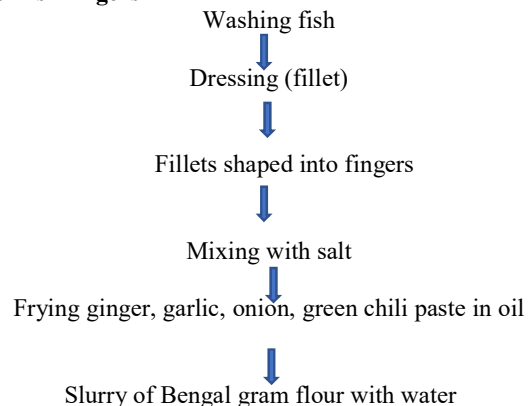


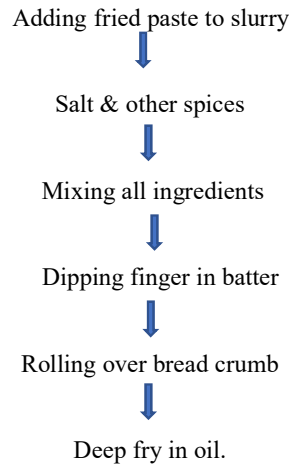
Fig. No. 1. Fish finger

Ingredients:

Fish meat/fillet, salt, onion, garlic, ginger, green chilly, chili powder, pepper, cumin powder, coriander powder, besan, bread crumb, baking powder and refined oil.

Procedure for preparation of fish fingers

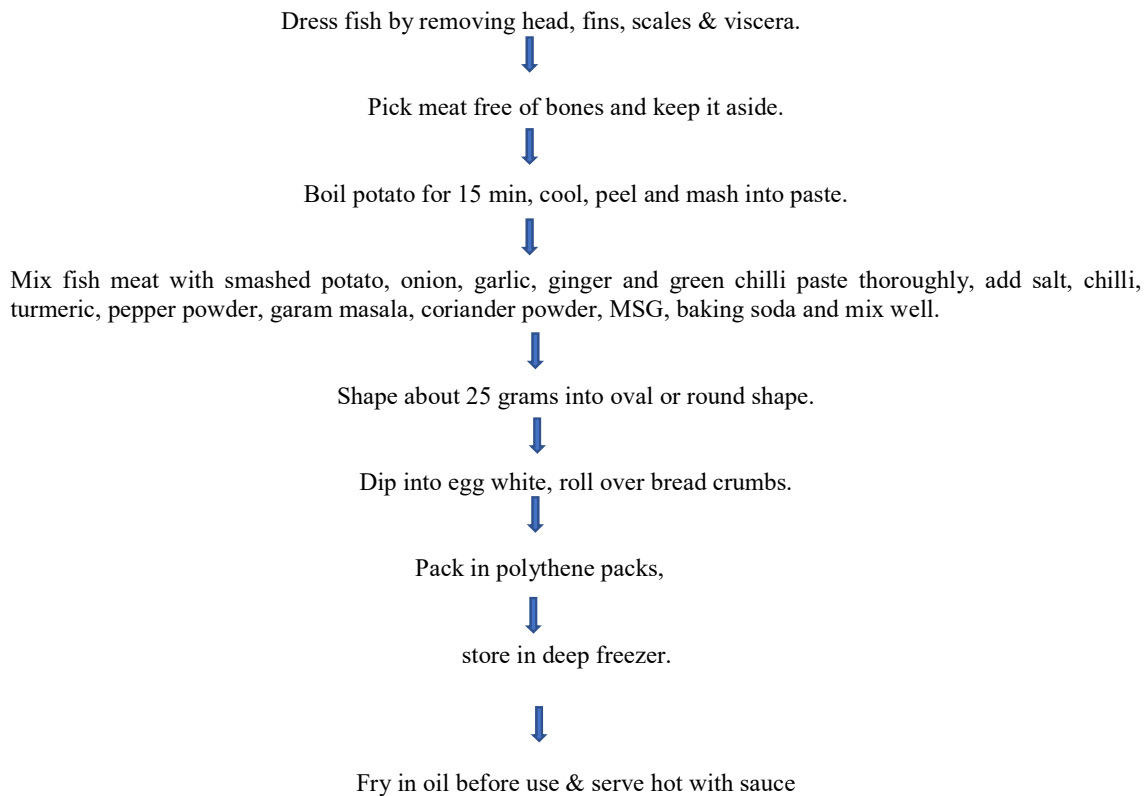


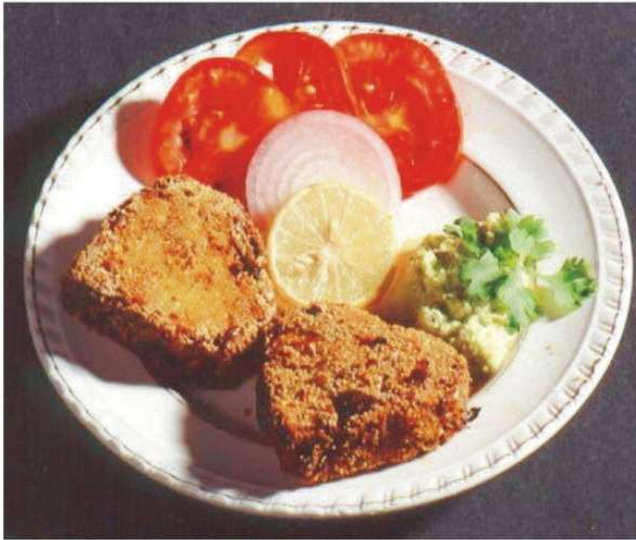


2. Fish Cutlet:

Spicy, deep-fried mince made from starch. fish mince that has been cooked is combined with cooked potato, fried onion, and spices. Cutlets that have been shaped into square shapes and weigh around 40 g are then breaded, battered, and quickly fried.

Method:





Fish Cutlet

Fig. No. 2 Fish Cutlet

3.Fish soup powder

Any good edible fish like grouper /croaker fish/ white flesh fish can be used. They are cooked and the edible meat separated as in the case of preparation of salad.

Procedure for preparation of Fish Soup Powder

Ingredients: Cooked meat :1 kg, chopped onion:500g, Vanaspati :90g, refined salt :60g, maida :250g, pepper powder:15g and monosodium glutamate:2.5 g.

Method: To create a homogeneous dough, the components are completely combined and crushed. It is then freeze-dried or vacuum dried, powdered and packed in air tight containers like cans or laminated pouches, preferably under an inert atmosphere like nitrogen. The freeze-dried material packed in cans remains in good condition for more than two years. The powder is suspended in water at 10 percent level and boiled for a minute to give a wholesome soup ready for the table. According to Nimish et al (2018), the species can be varied to suit individual tastes.



Fig No. 3. Fish soup

4. Fish Flakes/Wafers

Cheaper varieties of fishes like threadfin breams, sciaenid's, catfish, etc., can be used for the preparation of this product. The fishes are dressed, cleaned, cooked in water for 30 minutes, cooled and edible meat alone separated.

Recipe

Cooked and pickled meat:1kg, starch (refined tapioca powder is the cheapest that can be used) :1kg, salt :40g, and water :2.5 litres. All the ingredients are homogenized into a fine slurry and poured in thin layers (1 mm) in flat aluminium trays (previously smeared with oil to prevent sticking), cooked in steam, cooled, cut into desired shaped and dried. The product swells several times on frying in oil, become very crisp and wholesome (Nimish et. al 2018).



Fig. No. 4. Fish Wafers

5. Nobashi – Coated stretched Shrimp

In this the length of peeled and deveined shrimp is increased by application of pressure and the curling effect is reduced by making different cuts at the bottom. This increases the length by 1-2 cm depending on the size of the shrimp. As the surface area is increased by this method so the shrimp will have a more coating pickup and a good appearance. These are then vacuum-packed in thermoformed trays and frozen at -40°C . (Das et al 2014).



Fig. No. 5 Nobashi

6. Coated products from Bivalves

Bivalves such as clams, oysters and mussels can be used for preparing coated products. For clam products, the meat is shucked from live depurated clam and blanched. The meat is then breaded, battered, and quickly cooked. The item is then frozen and packaged. The same process can be used to coat other bivalves, such as oysters, mussels, etc. (Das et al 2014)

Conclusion

In conclusion, battered and breaded seafood products offer a convenient and popular way to incorporate fish and shellfish into consumers' diets. Advances in processing techniques, nutritional optimization, and consumer-driven product development have significantly improved the quality and acceptance of these products. Future research should continue to explore novel technologies and ingredients to further enhance the nutritional value and sustainability of battered and breaded seafood products, catering to the evolving preferences and needs of consumers. Furthermore, the nutritional composition of battered and breaded seafood products has been a subject of investigation. Fish and shellfish are known for their good amount of protein content, omega-3 fatty acids, vitamins, and minerals, which provide numerous health benefits. However, the frying process involved in producing battered and breaded products can lead to changes in their nutritional profile, such as increased fat absorption. Researchers have explored strategies to minimize nutrient loss and reduce oil uptake during frying, including the use of alternative cooking methods like baking or air frying. Consumer perception and acceptance of battered and breaded seafood products are influenced by various factors, including taste, appearance, packaging, and price. Studies have highlighted the importance of sensory attributes and product labelling in shaping consumer preferences. Consumer demand for healthier and sustainably sourced seafood products has also driven the development of innovative formulations and eco-friendly packaging options.

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