

Critical Control Points in the Processing of Fish Snacks in Malaysia

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Abstract

Fish remains an important source of protein for the Malaysian people regardless of their economic status and background. This commodity is an important export earner as well as providing employment to the nation. A substantial percentage of the total marine fish landing and aquaculture produce is processed into various products, namely reduction products, dried and/or salted fish, fish snacks, fermented products, surimi and surimi-based products, frozen and smoked products.

About 7,000 tonnes of fish snacks are produced annually by small-scale processors throughout the country. This comprise mainly of intermediate products and puffed crackers from fish, prawns and cuttlefish and ready-to-eat fish satay, a spiced snack made mainly from yellow goatfish. Some of the problems relating to quality that resulted from improper control of processes are discussed.

This paper outlines and discusses the critical control points in the production of fish crackers namely freshness of raw material, mixing, forming, cooking and the drying processes. This paper also emphasises on the use of simple machinery and processes that can greatly improve the quality of fish crackers for better acceptance by its consumers. These include the use of deboning machines for more efficient flesh recovery, use of the stuffer for better forming of the dough, the use of mechanical/solar driers for better control of temperature and air flow during the drying process and proposes the use of suitable packaging materials to extend the shelf life of the product.

Introduction

The fishing industry contributes significantly to the Malaysian economy with respect to foreign earnings and provision of

employment opportunities. It contributed 1.61 percent to the national gross domestic production in 1994. Fish is an important source of protein in the Malaysian diet, especially so to those dwelling in rural areas. The total fish production was 1,181,763 tonnes in 1994 (Department of Fisheries, 1995) of which more than 90 percent comprised of marine landings. This figure was valued at RM 2.99 billion and this sector provided employment to 97,945 fishermen.

Out of the total marine fish landed in the years 1992 to 1994, an average of about 70 percent was consumed in the fresh state whilst the remainder was processed into numerous products, both traditional and non-traditional. Figures for 1994 indicated the production of manure and fish meal (66.6 percent), salted and/or dried fish (11.5 percent), fish snacks (7.9 percent), surimi and surimi-based products (6.4 percent), fermented produce (6.2 percent) and the remainder (1.4 percent) of boiled and smoked items.

In 1994 a total of 29,797 tonnes of marine fish landed were processed into dried/salted and smoked products. In the same year 6,743 tonnes of fish snacks were processed. These comprise mainly of crackers made from fish and fishery products (94 percent) whilst the remainder is the production of ready-to-consume satay fish, a spiced snack made mainly from yellow goatfish (Wan Rahimah, 1983, and 1983).

Processing of Fish Crackers

Statistics show that 6,315 tonnes of fish crackers, locally known as *keropok ikan* and 22 tonnes of crackers made from prawns and cuttlefish were produced in 1994. These products were produced by small-scale to medium scale processors using some form of mechanization to assist in the production. These were sold in many forms - for example, unfried rolls that are dipped in a special sauce and

consumed; as intermediate products that range greatly in colour, shape, thickness and taste; and in the fried form that has limited shelf life.

The processing technology for fish crackers comprise the following steps - fish flesh recovery, mixing with starch, salt, flavour enhancer and water/ice water, forming into rolls, cooking, cooling, slicing, drying and packing. The intermediate products are then puffed in hot oil for about 3 to 5 seconds prior to consumption.

This paper discusses the critical control points identified in the processing of fish snacks and the quality problems associated with inappropriate technology usage. Research findings that can alleviate these problems are also cited with the aim of improving the overall performance of the industry.

1. Raw Materials

Due to the variability of raw materials and techniques, the fish crackers produced by the traditional processors are inconsistent in quality in terms of physical, organoleptic and chemical attributes. This variability is also attributed to seasonal changes and the supply of raw materials suitable for fish cracker processing.

The freshness and type of raw material used in the production of the fish cracker greatly determine the quality of the end product. The use of dark meat species such as the herrings will yield dark coloured crackers with a very strong flavour whereas species such as the wolf herrings/dorab will give lighter coloured crackers with a milder flavour.

Improper control of flesh recovery led to poor yield coupled with loss of quality. Manual deboning was found to give a lower recovery rate (40 to 55 percent) when compared to mechanical deboning. The incorporation of bones, connective tissues and minute scales would result in poor texture of the end product. Furthermore improper icing of the deboned flesh would subject the raw material to possible contamination from the surrounding and utensils, e.g., during the time lag between deboning and mixing.

The Malaysian Food Regulations 1985 stipulates that the unpuffed crackers made from fish should contain no less than 15 percent protein whereas that prepared from other

fishery resources should not be less than 6.9 percent. Research has shown that for most species a ratio of 1 part fish mince to 1 part flour (w/w) would meet this requirement.

2. Mixing and Shaping

The use of an unsuitable mixer will lead to improper mixing of fish, starch and the other ingredients. This will lead to non-uniform mixing and thus the linear expansion and texture of the final product is beyond the control of the processor. Manual forming is subjective and will lead to uneven shapes and the formation of air pockets which will expand during frying of the product, leading to texture loss.

Research in adapting the use of the sausage stuffer to shape the mixed dough with the use of zip fibrous or cellulose casings has contributed to uniform shaping. Other than contributing to non-uniformity of rolls manual forming involves a lot of handling. This improved method minimises the incidence of contamination as well as increase the variety of end products. The air bubbles can also be eliminated to produce a uniform texture.

3. Cooking and Cooling

The formed dough is cooked until the internal temperature reaches 70°C after which time the rolls are scooped out and cooled overnight prior to slicing. Traditionally, cooking is achieved by boiling in large cemented vats or by steaming. Boiling would undoubtedly result in loss of solubles due to leaching. Steaming is the recommended practice because of ease of handling; it also reduces the leaching of solubles from the rolls.

Cooling is essential in order to achieve a more solid state so that the cooked dough is easy to handle and this will result in a reduction of losses during slicing. There is a need to mention that great care has to be taken at this juncture to ensure that all surfaces coming in contact with the cooked rolls are free of contamination. Research has shown that the bacterial load increase occurs at this stage due to manual handling and lack of hygiene of premises and workers.

4. Slicing and Drying

The cooked, cooled rolls are sliced into 2.0 to 2.5mm thickness, arranged on bamboo trays and dried to an acceptable moisture level. The use of mechanical slicers, both manual and automatic, have replaced manual slicing since the early 80s and this is both time-saving as well as contribute to better product control.

However the use of the sun as the primary source of heat for drying is highly prevalent amongst the processors in Malaysia for obvious reasons. Research has shown that the drying of wet crackers from the initial moisture content of about 50 percent to achieve the final 8 to 12 percent moisture level takes a minimum of one day, subject to the weather. Often the sliced rolls are redried the following day. This practice often leads to fungal growth and thus quality loss. To make matters worse, crackers that are sun-dried are exposed to various forms of contamination such as insects, rodents and dust.

Systematic drying of crackers using mechanical or solar driers equipped with proper control of temperature and air flow can greatly enhance the quality of the end product. The use of driers solves the problem of space, exposure to contamination, natural hazards and reduces handling. The drier varies with capacity, building material, degree of sophistication, temperature control and safety features. The cabinet drier can have an air speed of 0.4 to 0.6 meter per second and have a capacity of 120 kilogram wet product. They are also equipped with thermostatic temperature control. Research has shown that 100 kilogram of wet crackers can be dried to 11 percent moisture content in 5 hours (Mohd. Zainal *et al.*, 1985).

Studies have indicated that drying to a moisture level of less than 8 percent is both uneconomical as well as detrimental to quality. This is because these over-dried crackers will brown too fast during frying resulting in a burnt flavour. The upper limit for moisture content of crackers is 12 percent, above which the product is prone to fungal attack.

Packaging

Packaging and presentation of products have always been an essential item of consumer appeal as well as product protection. Proper

packaging materials are used to protect the fish crackers against moisture absorption, infestation by insects, and other contamination, and to reduce oxidation. In a tropical country like Malaysia with a relative humidity and temperature of about 85 percent and 27°C respectively, reabsorption of water vapour from the atmosphere would lead to quality deterioration (loss of crispiness for fried products) as well as fungal growth. As a result of fat oxidation, rancidity (of fried products) will result. This and coupled with improper handling, would greatly lead to overall quality loss. The unpuffed fish crackers have sharp edges and would tend to pierce the packaging materials; the importance of appropriate packaging materials should be realised.

Researchers at the Food Technology Centre of the Malaysian Agricultural Research and Development Institute (MARDI) have come up with suggestions for proper packaging materials to prolong the shelf life of the product. These are the use of 0.1 to 0.12 mm polypropylene pouches for the local market. The low density polyethylene bag in the box concept and the thermoform packaging are recommended for both local and export markets.

Conclusion

The fish cracker processing industry in Malaysia has progressed from manual to a partly mechanised state. Nevertheless technical skills essential in understanding the processes involved in fish cracker production are still lacking amongst many small-scale processors in the country. This could lead to improper control of processes, thereby resulting in inconsistency of products reaching the consumers. Various breakthroughs have been cited and some have been transferred to interested parties with the hope of upgrading the fish cracker processing industry in the country.

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Discussion

Ms Wan Rahimah informed the seminar that Malaysia has yet to come up with a generic HACCP for its fish crackers. On the other hand, the Codex Alimentarius Committee for Asia is in the progress of putting up standards for fish crackers in Asia.