

Development of Tomato (*Solanum lycopersicum*) Incorporated Fish Nuggets

R.W.M.E.D. Perera, E.D.N.S. Abeyrathne

Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka

and

N. Lalantha

Keells Food Products PLC, Minuwangoda Road, Ekala, Ja-Ela, Sri Lanka

Introduction

Modern consumers prefer processed foods and the changes in consumer life styles have resulted in increasing demands for ready-to-eat and ready-to-cook seafood products (Venugopal, 2005). But due to high post-harvest losses and busy life style fish consumption has reduced gradually in Sri Lanka. Therefore value added fish products have become familiar among most consumers (Sri Lanka Fisheries Year Book, 2009). Fish nuggets are formed meat product in ready-to-cook form and it is a good substitute for above situations.

Most of the people nowadays concern more about their health and prefer to have healthier diets. Tomato is considered as one of the healthiest vegetable and fruit in the world (American Cancer Society, 2014). Tomato contains carbohydrates and several vitamins such as Vitamin A, Thiamine, Niacin, Vitamin B6, Vitamin C and Vitamin E. In addition, tomatoes possess one of the most powerful antioxidants, lycopene (Choski and Joshi 2007; Kavanaugh et al., 2007). It has shown a wide variety of positive health benefits, including a reduced risk of cancer (American Cancer Society, 2014). Therefore tomato incorporated fish nuggets contain more health benefits and deliciousness due to incorporation of tomato. On the other hand, the production of value added fish products using locally available resources is important for the wide range of consumers and manufactures and it is also important to fulfill the market gap by production of healthier fish based formed meat product in ready-to-cook or ready-to-eat forms. The objective of this research is to develop a tomato (*Solanum lycopersicum*) incorporated fish nugget with higher levels of antioxidants.

Methodology

Initially, the basic composition of fish nuggets was determined. The ingredients for fish nuggets were identified and new recipes were formulated based on different fish percentages (30%, 35%, 40% and 45%). After production fish nuggets, a sensory evaluation was carried out using 10 trained panelists to find the best combination. For selection of the best heat treatment for tomatoes, keeping qualities (pH, titratable acidity, moisture content and salt content) and sensory qualities of different heat treated tomato pastes were evaluated. Boiling (10 min, 100 °C), microwave-cooking (50 s, 800 W) and steaming (10 min) were selected as the best heat treatments (Kamiloglu *et al.*, 2013). After selecting the best heat treatment for tomatoes, the best level of tomato paste to be incorporated in to the selected fish nugget recipe

was determined by a sensory evaluation. Tomato paste was incorporated at 5%, 8%, 12% and 15% (w/w) (Deda *et al.*, 2007).

Tomato incorporated fish nugget and fish nugget without tomato incorporation (control) were further analyzed for its physicochemical properties and microbiological quality. Proximate composition, pH value and water holding capacity of the final product were determined. Microbiological analysis was done for *Escherichia coli*, *Staphylococcus aureus*, Total Plate Count (TPC) and Yeast and Moulds. Sensory data were analyzed according to the Friedman test using MINITAB 15 software package. Data obtained from melting tests were analyzed by analysis of variance using MINITAB 15 software package.

Results and Discussion

45% fish incorporated fish nugget sample was selected as the best sample. According to the sensory evaluation, there was significant difference ($p < 0.05$) among treatments. Then 45% fish incorporated fish nugget sample was used as the control. According to another sensory evaluation and keeping quality evaluation, boiling (10 min, 100 C) was selected as the best heat treatment for tomato paste. The results of the above mentioned sensory evaluation showed that there was significant difference between different heat treatments of tomato paste related to the quality parameters such as appearance/ color, aroma flavor/ taste and mouth feel ($p < 0.05$). According to the results (Figure 01), there was significant difference between fish nugget samples with different tomato incorporation levels related to the organoleptic properties such as appearance, color, taste, texture and overall acceptability ($p < 0.05$). Finally 12% tomato incorporated fish nugget sample was selected as the best.

165- Control fish nugget sample

392- 5% tomato incorporated fish nugget sample

437- 8% tomato incorporated fish nugget sample

708- 12% tomato incorporated fish nugget sample

526- 15% tomato incorporated fish nugget sample

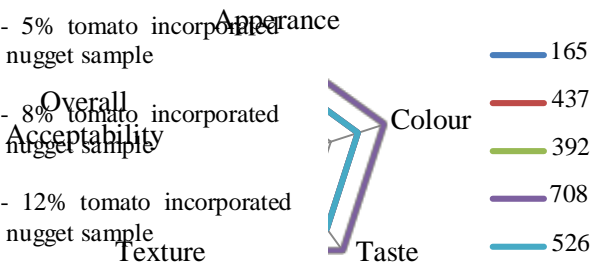


Figure 01: Web diagram of sensory evaluation on different levels of tomato incorporation in fish nugget

The composition of tomato incorporated fish nuggets is given in Table 01. The total solid, organic non-fat, moisture, crude protein and ash contents of the samples were significantly different ($P < 0.05$). But crude fat content of the samples were not significantly different ($P > 0.05$). Tomato incorporated fish nugget sample was contain high amount of crude protein and moisture. This may be due to the incorporation of tomato paste in the fish nuggets.

Table 01: Proximate composition of the samples

Test Parameters %	Fish nugget sample	Tomato incorporated fish nugget sample	Standard Limits
Total Solids	49.01+0.05	45.96+0.1	45% (min)
Crude Fat	10.05+0.14	9.70+0.16	15% (max)
Organic Non Fat	36.30+0.21	33.79+0.12	32.5% (min)
Ash	2.66+0.06	2.47+0.04	2.7% (max)
Moisture	30.99+0.05	34.04+1.0	40% (max)
Crude Protein	27.37+0.14	27.71+0.04	25% (min)

Microbiological analysis revealed, though the microbial count was increased with the time, microbe count of tomato incorporated fish nuggets were within the SLSI requirements. There was a positive effect on reduction of microbial count by frying of fish nuggets. Cost analysis indicated that cost of 1 kg of tomato incorporated fish nuggets is Rs.325.00.

Conclusion

12% (w/w) is the best level for the incorporation of tomato in to fish nuggets. The analysis of the chemical composition in tomato incorporated fish nuggets showed high values for total solids, crude fat, organic non-fat and ash. Boiling is the best heat treatment for tomato paste to retain the sensory qualities, keeping qualities and nutritional value.

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