

## Development of an Egg Based Sausage

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### Introduction

The present trend of demand is for ready to serve or ready to cook food items. Sausages have been developed as a convenient product but mostly composed of meat. Present meat and meat based food products may contain various chemicals and preservatives, which is a cause for cancer (Pearson and Gillett, 1996). Therefore, many people nowadays are reluctant to buy these products. On the other hand, absence of strong preservatives in egg-based sausages cuts down health hazards and gives safe access as foodstuffs. Investigations carried out for development of an egg based sausage by replacing the meat component of sausages with eggs has not been attempted yet. Thus, the present study was aimed at producing an egg based sausage for the people who wish to consume egg based products. Egg-based sausage can reach the optimum acceptability and nutritional requirements if developed properly and will provide a balanced diet for the consumer.

Eggs are considered as one of the highly nutritious natural products. Eggs naturally possess functional properties like good emulsifying, binding, coagulating and stabilizing abilities, which are essential characteristics in food manufacturing processes (Stadelman and Cotterill, 1996). Therefore, additives with those properties are not required to be added artificially to the manufacturing process of egg based sausages, thus the production cost can be reduced. This study was designed to develop egg based sausages using whole egg powder, egg white powder and locally available high nutritious vegetables such as carrot (*Daucus carota*), leeks (*Allium porrum L.*), and mushrooms (*Pleurotus species*), spices and additives.

Fresh eggs are not suitable in sausage production due to several problems. Fresh eggs are difficult to transport since they are bulky, fragile and highly perishable. Moreover, they cause difficulties in stuffing of the sausage mixture into the casing during processing, due to high juiciness and break when fried. Salmonella incidences are also high in raw eggs. Eggs in powder form however, provide a near complete solution to these problems. Dried egg powder could be stored and transported at room temperatures and is quite stable and has a longer shelf life.

Egg yolk powder is not suitable to be used in sausages because yolk has higher fat content and low solubility. It also incurs higher import cost and has poor functional properties such as water activity, which is higher in egg yolk powders than in whole egg powders (Joel *et al.*, 2010). Therefore, only whole egg powder and egg white powder could be used in production of egg-based sausages.

The main objective of this study was to develop an egg based sausage as an alternative product for traditional meat sausages containing preferable characteristics such as texture, color and taste.

## **Methodology**

The experiment was carried out at the Keells Food Products (PLC), Ja-Ela. The preliminary trials were conducted at first to find out the best combination of egg powder by changing the egg powder ratios. Secondly, the best combination of vegetable oil and water corresponding to the best egg powder combination was chosen. These two experiments were done in order to develop the sausage texture. Then experiments were carried out to determine the best salt level, additive combination and spice combination to adjust the flavor of the sausage. Subsequently, experiments were conducted to find out the chopping level and chamber operations suitable in development of egg-based sausage. Once the satisfactory product was developed, the sensory evaluation, microbiological analysis and chemical analysis were carried out for the samples made using the finalized formula.

In order to find out the best recipe which gives better sensory qualities to the sausage, another three samples ( $T_1$ ,  $T_2$  and  $T_3$ ) were prepared by changing only the egg powder combination in small quantities in the finalized recipe (i.e. whole egg powder;  $15\% \pm 1.5$  and egg white powder;  $5\% \pm 1.5$ ), while keeping the other ingredients constant. Then, in order to select the best percentage combination of whole egg powder and egg white powder, sensory evaluation was carried out with 30 untrained panelists of Keells Food Products (PLC). The sensory evaluation analysis was done using the Friedman non-parametric statistical test.

Objective measurements (AOAC, 1995) and proximate analysis (AOAC, 1995) were conducted for all three treatments. Proximate analysis for the data measurement is a combination of crude protein, crude fiber, crude fat, moisture, total solid and ash. Objective measurement was done by analyzing shrinkage percentage, acid value, pH and water holding capacity. For this, samples were taken at regular intervals weekly for two month storage period. Finally data were analyzed using MINITAB and SAS statistical packages.

## **Results and discussion**

Based on the results of preliminary studies; the best percentage combination was 20% of egg powder, 22% of water, 20% of vegetable oil and 1.4% of salt level. The technical operations of egg-based sausage manufacturing process differed from traditional meat-based sausage. Preferred level of chopping was 6 rounds and the suggested cooking time was 35 minutes appropriate to the core temperature of  $76^\circ\text{C}$  of the sausage.

No significant difference ( $P > 0.05$ ) was observed among samples for color, appearance, odor, saltiness, and spiciness but texture, taste, juiciness, overall taste and overall acceptability of the samples varied significantly ( $P < 0.05$ ) among samples and also among treatments  $T_1$ ,  $T_2$  and  $T_3$ . According to the Pair wise comparison, texture, juiciness, taste, overall taste and overall acceptability were significantly different (difference between sum of ranks  $> 18.51$ ) between treatments 1-2 or 2-1, and treatments 2-3 or 3-2. And there were no significant difference (difference between sum of ranks among treatments  $< 18.51$ ) between treatments 1-3, or 3-1. For color, appearances, odour, spiciness and saltiness, there were no significant difference (difference between sum of ranks among treatments  $< 18.51$ ) between Treatment 1, Treatment 2 and Treatment 3. Based on the results, it can be concluded that the egg-based sausage sample prepared in treatment  $T_3$  (whole egg powder with 16.5% and egg white powder 3.5%) had the highest sensory attributes for overall acceptability and overall taste.

Analysis of variance procedure showed by Duncan group was used for measuring samples which were significantly different ( $P < 0.05$ ) among treatments  $T_1$ ,  $T_2$  and  $T_3$  with relevant to protein, fat and moisture percentage. Treatment  $T_1$  had the highest mean value for protein and lowest mean value for crude fat.

Analysis of variance procedure followed by Duncan group showed that treatments from  $T_1$ ,  $T_2$  and  $T_3$  were not significantly different ( $P > 0.05$ ) in relation to pH, water holding capacity and acid value, but each of these three factors showed a significant increase ( $P < 0.05$ ) with storage duration. The shrinkage percentage was significantly different ( $P < 0.05$ ) among treatments  $T_1$ ,  $T_2$  and  $T_3$ . *Salmonella* and *Escherichia coli* were not detected during the storage duration. *Staphylococcus aureus* counts and TPC did not exceed the specifications in Sri Lankan Standards for the sausage during 60 days. In this period of shelf life, the product was stored at  $-18^\circ\text{C}$  to  $-30^\circ\text{C}$  of temperature.

### Conclusions

According to this research findings, egg based sausages with acceptable characteristics can be developed successfully by;

- a) Maintaining whole egg powder: egg white powder percentage combination at 20% level.
- b) Adding 1.4% of salt level into the mixture.
- c) Using a combination of 22% of water and 20% of fat.
- d) Chopping only six rounds in bawl chopper.
- e) Maintaining only cooking operation in the cooking chamber and,
- f) Maintaining  $76^\circ\text{C}/35$  minutes as the cooking chamber condition.

With a lower cost, incorporation of vegetables could be easily done not only to enhance the sensory attributes and nutritional value but also to increase the profit margin of the developed egg-based sausage. Best treatment in this research was  $T_3$  (i.e. 16.5% whole egg powder and 3.5% egg white powder) due to its low cost; SL Rs.15.06 per sausage and high sensory attributes.

This product was developed without any age discrimination, as it is more health conscious, highly nutritious and more convenient food product. And also it expects a rapid market growth and market stability due to the presence of considerable number of niche markets in Sri Lanka.

Without adding any chemical or preservative, shelf life of the egg-based sausage was 60 days at  $-18^\circ\text{C}$  - ( $-30^\circ\text{C}$ ) with respect to microbiological and physicochemical analysis.

### References

- A.O.A.C. 1995. Official method of analysis, 16<sup>th</sup> ed. Arlington, Association of Official Analytical Chemists, Washington.
- Joel, N., Udobi., E. Chinweizu, and A. Nuria 2010. Effect of oven drying on the functional and nutritional properties of whole egg and its components. African Journal of Food Science 4(5):254- 257.
- Pearson, A.M. and T.A. Gillett 1996. Processed Meats, 3<sup>rd</sup> ed 329- 411.
- Stadelman, W.J. and O.J. Cotterill 1996. Egg Science and Technology. 4<sup>th</sup> ed. The Haworth press, Binghamton, New York.