Development of Chicken Sausages by Incorporating Pulses as a Source of Micronutrients

K.A.D.O.P. Kuruppu, R.M.H.Tharangani, N.P.P. Liyanage
Uva Wellassa University, Badulla, Sri Lanka

and

N.C.Sooriaarachchi
Nelna Farm (Pvt) Ltd, Meethirigala, Sri Lanka

Introduction

The increasing pressure of the world population and the need to raise the living standards, have created the need to produce better meals in large scale. Hence, the consumption of meat products has increased and the processing of meat products developed accordingly (Lawrie, 1979). Consumers today eat sausages because of convenience, variety, economy and nutritional value. The great variety of sausage makes it possible to serve many different products, each having its own characteristic appeal and flavor (Pearson and Gillett, 1996). Pulses are annual leguminous crops which have significant nutritional and health advantages for consumers because they are important due to their high protein, essential amino acid content and especially the micro nutrient content such as iron, zinc and selenium (Majumdar, 2011). Present study was intended to fulfill certain objectives such as developing a sausage by incorporating pulses as a source of micronutrients, to evaluating subjective qualities, objective qualities and the proximate composition of the products and finding out the best type of pulse incorporated sausage with improved organoleptic properties.

Methodology

The research was carried out at the Nelna Farm (Pvt) Ltd, Meethirigala, Sri Lanka. Four types of pulses were used such as dhal (*Lens culinaris*), cowpea (*Vigna unguiculata*), chickpea (*Cicer arietinum*) and green gram (*Vigna radiata*) to incorporate in chicken sausages by replacing bread crumbs. At first, four preliminary trials were conducted to find out the best percentage of a particular pulse by changing the ratio of the pulse and bread crumbs while maintaining all other ingredients at a constant level. In preliminary trials, three treatments were prepared for each pulse with the ratios of pulse: bread crumbs as 25%: 75%, 50%: 50% and 75%: 25% out of 10% which is the percentage of bread crumbs generally used in sausage preparation at Nelna company. Sensory evaluation was conducted for each preliminary trial to select the best ingredient combination. Then the final experiment was done to select the best type of pulse incorporated in sausage preparation and the sensory evaluation was conducted by using 30 untrained panelists at Nelna company and Uva Wellassa University. The results were analyzed by using Friedman nonparametric statistical test in MINITAB 14 software.

The products were stored at -18°C temperature throughout the testing period. Microbiological analysis, keeping quality analysis and chemical analysis were carried out for the four types of pulse incorporated sausage samples by using commercial chicken sausage as the control. Objective measurements and proximate analysis were conducted for all four treatments with the control.

Proximate analysis was done to measure crude protein, crude fat, crude fiber, moisture and ash (AOAC, 1995). Objective measurement was done by analyzing pH value and water holding capacity.

Microbiology tests were also done as a part of shelf life study and in which, samples were taken at four days with five days intervals. The results were analyzed by using one way ANOVA procedure in MINITAB 14 software.

Results and Discussion

According to the results of four preliminary trials, no significant difference ($P<0.05$) observed between the samples in relation to appearance, texture, tenderness, and juiciness. Aroma, flavor and overall acceptability were the only characters which showed a significant difference ($P<0.05$) between the samples. 25% of dhal (T1), 25% of cowpea (T2), 50% of chickpea (T3) and 50% of green gram (T4) incorporated sausages were selected as the best percentages incorporated for the chicken sausage from the results of preliminary trials. Based on the final experiment, 25% of dhal incorporated chicken sausage was given the highest scores for the aroma, texture, flavor, tenderness and overall acceptability because there was a significant difference ($p<0.05$) between the treatments T1, T2, T3 and T4 and T1 showed the highest estimated median value (Table 1).

Table 1 Sensory Results of pulse incorporated chicken sausages

Quality character	Median values of treatments (T)				Control	P value
	T1	T2	T3	T4		
Appearance	4.0000	4.0000	4.0000	4.0000	4.1000	0.062
Aroma	*4.0000	3.9000	3.9000	3.5000	3.9000	0.038
Texture	*4.1000	3.9000	3.9000	4.0000	4.0000	0.047
Flavor	*4.1000	3.5000	3.9000	4.0000	4.0000	0.019
Tenderness	*4.0000	3.8000	3.9000	3.5000	4.1000	0.028
Juiciness	4.0000	4.0000	4.0000	4.0000	4.0000	0.448
Overall acceptability	*4.1000	3.7000	4.0000	3.7000	4.1000	0.032

*n–values indicates the highest estimated median for particular sensory character at $p< 0.05$

Treatment 1, 2, 3 and 4 were not significantly different ($P<0.05$) in pH and Water Holding Capacity. According to the results of microbiological analysis, *Escherichia coli* were not detected during the storage period. *Staphylococcus aureus* counts and TPC were in satisfactory level.

According to the results of proximate analysis, there was a significant difference ($P<0.05$) among treatments T1, T2, T3 and T4 in relation to moisture, crude protein, crude fat, crude

fiber and ash content. T1 showed the highest median values in crude protein, crude fiber and ash content as 11.1%, 1.7% and 3.5% respectively.

The cost of production was calculated for 1 kg of sausages. Finally selected best sample from sensory evaluation 05 had the lowest cost out of all four types of pulse incorporated sausages. Even though the price of dhal is high, the cost of production in finally selected dhal incorporated sausage was only 50 cents.

Conclusion

It is evident that high consumer preference was obtained for dhal incorporated sausage which gives a better taste. The cost of production of dhal incorporated sausage was nearly same to the commercial chicken sausage and is economically feasible. Finally, the best pulse incorporated sausage with high micro nutrients was selected as dhal incorporated sausage at the ratio of 25 %: 75 % dhal: bread crumbs.

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