

Original Research Article

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## Quality Evaluation of Nuggets Prepared from Spent Hen Meat by Using Soy and Potato as Extenders

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### ABSTRACT

#### Keywords

Extenders, Nuggets, Potato, Soy, Spent hen meat

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A study was conducted to utilize spent hen meat profitably by preparation of emulsion based product like nuggets and improving its quality by addition of soy and potato as extenders. 20% extender was added by replacing spent hen meat in the nuggets formulation. Results showed that incorporation of extenders at 20% level improved the physico-chemical and sensory qualities of nuggets.

### Introduction

Poultry industry is now recognized as organized and scientifically based industry as well as potential tool for employment generation. As the layer industry is improving its rank, disposal of spent hen is posing difficulties due to inherent qualitative differences between broilers and spent hen meat. Spent hen are aged and culled birds, which have completed their laying period. Spent laying hens are the massive by-products of the poultry industry. Although the meat is inexpensive and nutritious (Suriani *et al.*, 2014; Lakshani *et al.*, 2016), it has been underutilized for human consumption due to

its undesirable tough texture. So, there is good scope for development of emulsion based meat products like nuggets. The demand for ready to eat and easily prepared precooked foods is increasing due to the lack of time for food preparation. However, the consumption of such foods has generated health concerns (Oliveira *et al.*, 2013). But their nutritional quality may be improved by addition of protein or fibre enriched extenders. Several types of fibre have been analyzed or combined with other ingredients in the formulation of meat products with reduced fat, such as restructured and emulsified products (Weiss *et al.*, 2010). Dietary fibers have been added to a range of meat products

to improve the functional and rheological properties of the meat products (Choe *et al.*, 2013). So, a trail was made to prepare valued added products from spent hen meat by addition of soy and potato as extenders.

## **Materials and Methods**

Spent hens of above 72 weeks of age were obtained for Government poultry farm, Patna for use in the preparation of chicken nuggets. The birds were maintained in the cage of LPT Dept., BVC, Patna till slaughtering. The birds were slaughtered and dressed as per standard scientific method and were deboned by hand deboning method. The deboned meat was packed in the polyethylene bag and kept at -10 °C for 24 hrs. The frozen meat chunks thus obtained were used for preparation of minced meat. The meat chunks were minced in meat mincer after proper thawing. Thus obtained minced meat was used for preparation of emulsion for nuggets. Meat emulsions for nuggets were prepared in bowl chopper. Two types of emulsions were prepared containing different extenders viz. soy and boiled potato separately by replacing 20% of chicken meat. Third type of emulsion was prepared without adding any extender and was treated as control. Rest of the ingredients viz. salt (2%), STPP (0.2%), Spices mix (2.5%), Condiments (2.5%), refined oil (5%) and ice flakes (5%) were remain same for all the three formulations. After preparation of emulsions, they were tightly filled in separate stainless steel nugget boxes and were cooked without pressure for 40 minutes and allowed to cool for 15 minutes without opening the lid. After that, the lids of nugget boxes were opened and thus the meat blocks obtained were cooled in refrigerator at  $4 \pm 1^{\circ}$  C and then cut into 2x1x1 cm size for rectangular shape of nuggets and were deep fried at  $170^{\circ}$  C. The quality parameters were assessed as per standard methods. Emulsion stability was determined as per method of Baliga and Madaiah (1971)

with slight modifications. Water Holding Capacity was determined as per method reported by Wardlaw *et al.*, (1973) with slight modifications. pH was measured by using pH meter with electrode and Cooking yield was calculated by recording the weight of minced chicken meat emulsion (raw) and the weight of steam cooked meat block . The proximate compositions were evaluated as per AOAC (1995). Sensory score was calculated on the basis of 8-point Hedonic scale by the 12 evaluation members of scientific panel.

## **Results and Discussion**

### **Effect of extenders on physico-chemical properties**

Results indicated (Table 1) a significantly ( $p < 0.05$ ) higher pH in 20% soy based emulsion as compared to control. The pH value of 20% potato based emulsion reflected numerically lower values than soy based emulsion but was not significantly ( $p < 0.05$ ) different from either soy based emulsion or control. The increase in pH of soy based emulsion might be due to higher pH of hydrated soy nuggets (pH 6.6), while in potato based emulsion was due to its starch content. Similar result was also reported by Gokalp and Yetim (1988). 20% soy based emulsion showed better emulsion stability than potato based emulsion and control. Higher emulsion stability of soy containing emulsion could be attributed to increased water binding, fat encapsulating and gel forming properties of soy protein (Lauck, 1975). Results indicated that higher cooking yield was obtained in extender based emulsions than control, however both extended formulations didn't differ significantly ( $p < 0.05$ ) from each other. Increase in cooking yield might be due to improvement in emulsion stability due to addition of extenders (Richert, 1991). Results depicted that soy based emulsion showed

higher water holding capacity followed by potato based emulsion and control. The improvement in water holding capacity might be due to increase in pH of emulsion by the addition of extenders (Gokalp, 1987). Higher moisture percentage was recorded in potato based emulsion followed by soy based and control. Higher moisture content of potato was might be due to percolation of moisture during boiling and in soy was due to soaking of soy in water (1:2) before mincing. Similar result was also obtained by Vidyarthi (1987). Result depicted that protein content was found to be higher in soy based followed by control and lowest for potato based emulsion. The increased protein percentage in 20% soy based emulsion might be due to higher protein content in soy nuggets (53.8%). The lowest protein % in 20% potato based emulsion might be due to lower protein content as

compared to soy and chicken meat. Thus the replacement of chicken meat with such extenders having lower protein content than raw meat will definitely lowers the protein content of finished products. Result showed that fat % was highest in control than soy based emulsion and lowest in potato based emulsion. Inclusion of extender having lower fat content could dilute the fat content of raw meat. The lower value of fat% in 20% soy nuggets incorporated formulation than control could be due to inclusion of defatted soy, which had relatively higher moisture and protein content. Higher moisture% in hydrated soy nuggets could produce a dilution effect in emulsion, which lowers the fat% of emulsion. The lowest fat% in potato based emulsion might be due to relatively higher moisture content in boiled potato mash.

**Table.1** Effect of extenders on the physico-chemical properties of chicken nugget emulsion formulations

Parameters	Control	Soya (20%)	Potato(20%)
<b>Emulsion pH</b>	6.30 <sup>a</sup> ± 0.04	6.44 <sup>b</sup> ± 0.04	6.38 <sup>ab</sup> ± 0.03
<b>Emulsion Stability (%)</b>	8.42 <sup>b</sup> ± 0.06	6.56 <sup>a</sup> ± 0.04	6.71 <sup>a</sup> ± 0.08
<b>Cooking Yield (%)</b>	86.20 <sup>a</sup> ± 0.07	87.61 <sup>b</sup> ± 0.12	87.52 <sup>b</sup> ± 0.07
<b>Water Holding Capacity (%)</b>	45.27 <sup>a</sup> ± 0.05	52.13 <sup>c</sup> ± 0.04	50.59 <sup>b</sup> ± 0.07
<b>Moisture (%)</b>	64.16 <sup>a</sup> ± 0.06	66.08 <sup>b</sup> ± 0.15	66.24 <sup>b</sup> ± 0.10
<b>Protein(%)</b>	19.75 <sup>b</sup> ± 0.07	20.96 <sup>c</sup> ± 0.05	17.26 <sup>a</sup> ± 0.04
<b>Fat(%)</b>	11.98 <sup>c</sup> ± 0.05	10.02 <sup>b</sup> ± 0.05	8.49 <sup>a</sup> ± 0.06

Means bearing same superscript(s) row wise are not significantly (p<0.05) different

**Table.2** Effects of extenders on sensory parameters of chicken nuggets

Sensory Parameters	Control	Soya (20%)	Potato(20%)
<b>Appearance</b>	6.60	6.70	6.64
<b>Flavor</b>	6.50 <sup>a</sup>	6.78 <sup>b</sup>	6.60 <sup>a</sup>
<b>Juiciness</b>	6.39	6.49	6.45
<b>Texture</b>	6.42 <sup>a</sup>	6.55 <sup>b</sup>	6.50 <sup>ab</sup>
<b>Binding</b>	6.55 <sup>a</sup>	7.09 <sup>b</sup>	7.02 <sup>b</sup>
<b>Overall Acceptability</b>	6.56 <sup>a</sup>	6.90 <sup>b</sup>	6.82 <sup>b</sup>

Means in a row having same or no superscript (s) are not significantly (p<0.05) different.

### **Effect of extenders on sensory attributes of chicken nuggets-**

Results showed (Table 2) that Appearance scores were rated good as per the hedonic scale by the sensory panel in all the formulations. Appearance score showed no significant differences on incorporation of extenders in chicken nuggets formulations. Flavor scores differed significantly ( $p < 0.01$ ) with incorporation of 20% soy nuggets in the formulation as compared to control and 20% potato based chicken nuggets. Incorporation of soy up to 20% has been reported to have no significant ( $p < 0.05$ ) adverse effect on sensory properties of meat products (Yetim *et al.*, 1992). Juiciness scores were higher for both extended formulations as compared to control. Higher scores for extended formulations showed that texture of chicken nuggets were improved by addition of extenders compared to control. Binding scores for extended formulations were significantly ( $p < 0.01$ ) different from control, but didn't differ significantly ( $p < 0.05$ ) from each other. Price and Schweighert (1971) reported that improvement of binding properties in meat products by addition of protein and starches of vegetable origin is a well-established phenomenon. Overall acceptability was found to be higher for 20% soy based chicken nuggets as compared to other two formulations.

In conclusion, soya nuggets and boiled potato could be added as potential source of meat extenders and can suitably be incorporated at 20% level each in chicken nuggets formulation for improvement of physico-chemical and sensory qualities of products.

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