

STUDY ON SENSORY AND QUALITY ATTRIBUTES OF CHICKEN NUGGETS INCORPORATED WITH DIFFERENT LEVELS OF WHOLE EGG LIQUID

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Study was undertaken to develop an acceptable quality chicken nuggets with inclusion of whole egg liquid (WEL) at 10%, 15% and 20%. Sensory quality and physico-chemical characteristics of chicken nuggets improved considerably with incorporation of 15 percent whole egg liquid. Increased incorporation of WEL to 20 per cent was not found beneficial. Nuggets incorporated with 15 per cent WEL ranked superior and exhibited significantly ($P < 0.05$) higher scores for appearance, juiciness, emulsion stability and products yield.

Key words: Chicken nugget, Whole egg liquid, sensory quality, quality attribute, proximate composition.

Egg being nutritious, serves as an important item of human diet. Eggs have been utilized as binders or extenders in comminuted meat products not only to reduce the formulation cost but also to improve its quality attributes such as emulsion stability, water binding properties, slicing characteristics and to reduce cook shrinkage. Anti-oxidative property was enhanced by incorporating liquid egg in stripped poultry meat, which resulted in lowering of malonaldehyde value (Niewiarowicz *et al.*, 1991). Ovalbumin is an important globular protein of albumen responsible for coagulation and antimicrobial effect (Wang and Shelef, 1991). Gupta *et al.*, (1993) observed improvement in emulsion stability and cooking yield of mutton and mutton + chicken sausages but decrease in shear force value with incorporation of liquid egg. (Kalaikannan *et al.* 2007) observed that addition of egg powder significantly enhanced the emulsion stability and product yield of chicken patties.

Increased consumption of poultry meat is mostly because of rapid growth of poultry industry; relatively its cheaper cost, high nutritional value and introduction of newer processed chicken products (Barbut, 2002). It is more acceptable by non-vegetarian group of people because of its flavour, ease of digestion and lower fat content. Present study was thus planned to find out the optimum level of whole egg liquid to be incorporated for improving the quality of chicken nuggets made from broiler meat.

MATERIALS AND METHODS

Broilers of around 6 weeks of age and White Leghorn spent laying hens were dressed at local meat shop following traditional halal method. Body fat, tendons and separable connective tissues were trimmed off. Dressed meat was packed in low density polyethylene pouches and kept in deep freezer at $-18 \pm 1^\circ\text{C}$ overnight which was then subsequently used for product formulation. Deboned meat after thawing at room temperature was cut into small pieces and minced in meat mincer. Salt, sodium nitrite and sodium tripolyphosphate were added in minced meat and chopped in bowl chopper for desired duration with addition of vegetable oil, refined wheat flour, condiments and spice mix. Whole egg liquid (WEL) after grinding was incorporated to improve the quality of chicken nuggets. Minced meat was replaced proportionally by WEL with 10, 15 and 20 % level. Emulsion was stuffed in specially prepared a (Nuggets moulder) steel box having size (14 x 7 x 3 cm) so as to get proper shape. Lid was fixed so as to make air tight. Moulds containing emulsion was kept in a steam cooker and cooked for 35 min without pressure. Internal temperature of loaves was maintained as

75±2°C. Cooked loaf was cooled at room temperature and cut into 4 x 1.5 x 1.5 cm sized nuggets which were subsequently packed in polyethylene pouches. Samples were immediately subjected to sensory evaluation and physico-chemical analysis. Data obtained during the experiment were analysed by Analysis of Variance following the procedure described by Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Sensory quality:

It is clear from table 1, that scores of all the sensory attributes differed significantly due to addition of whole egg liquid (WEL). Among different levels, 15 per cent WEL exhibited significantly ($P<0.05$) higher scores for appearance and juiciness compared to control as well as product with 10 per cent WEL. Though, the differences were non-significant between 15 and 20 per cent WEL added products, the scores declined marginally with increase in WEL to 20 percent. Present findings are in accordance with the observations of Gupta (1990) and Kondaiah and Panda (1989). Flavour scores of chicken nuggets made with incorporation of WEL improved significantly ($P<0.05$) over that of control but the scores were at par between WEL added products. Improvement in flavour might be due to higher retention of fat in WEL added nuggets. Gupta *et al.* (1993) also reported that incorporation of whole egg liquid in mutton and mutton + chicken sausages increased the flavour scores considerably. Sensory scores with regard to texture and overall palatability were significantly higher ($P<0.05$) in 15 per cent WEL nuggets as compared to control and 10 percent WEL incorporated product. With further increase in WEL to 20 per cent, scores of both the attributes declined significantly indicating that higher level of incorporation was not helpful. In 20 percent WEL treated nuggets, reduction in score may be attributed to increased softness due to retention of more moisture.

Quality attributes:

Data on effect of whole egg liquid on quality attributes of chicken nuggets are given in Table 2. The pH of chicken nuggets did not differ significantly due to proportionate replacement of meat with WEL, pH was observed to be increased with increase in WEL to the extent of 15 per cent, but the differences were marginal in WEL chicken nuggets. Findings of present study are similar to those of Kalaikannan *et al* (1998) who also reported non significant effect on pH with addition of 1 to 3 percent dried albumin. Emulsion stability as well as cooking yield differed significantly ($P<0.05$) in chicken nuggets made with or without WEL. Among WEL levels, 15 per cent WEL added products recorded highest cooking yield which was at par with that of 10 per cent WEL. Subsequent increase in WEL to 20 per cent, the cooking yield decreased substantially indicating that 20 per cent WEL treatment was not beneficial in enhancing the cooking yield. Moreover, the emulsion stability of all WEL incorporated products was almost equal. The present findings are in agreement with those of Gupta (1990) who also reported increase in emulsion stability with incorporation of WEL in mutton and mutton + chicken combination sausages. Improvement in emulsion stability of WEL incorporated products may be attributed to well known emulsifying property of egg liquid or egg powder and it is substantially proved that egg components function as good emulsifiers in meat system (Kalaikannan *et al.* 2007).

It is revealed from table 3. that the moisture and fat content of chicken nuggets differed significantly ($P<0.05$) due to partial replacement of meat with WEL. Moisture and fat content of 20 per cent WEL chicken nuggets were significantly higher as compared to that of 10 per cent WEL product and control. Increase in moisture content in WEL incorporated nuggets may be attributed to increased moisture of WEL.

Table 1. Sensory quality of chicken nuggets incorporated with different levels of whole egg liquid

Levels of whole egg liquid	Sensory attributes				
	Appearance	Flavour	Juiciness	Texture	Overall palatability
Control	5.91 ^c ±0.16	6.00 ^b ±0.33	6.00 ^c ±0.33	5.80 ^c ±0.23	5.86 ^c ±0.15
10%	6.93 ^b ±0.15	6.66 ^a ±0.25	6.53 ^b ±0.15	6.73 ^b ±0.15	6.80 ^b ±0.14
15%	7.23 ^a ±0.25	7.00 ^a ±0.20	7.23 ^a ±0.35	7.40 ^a ±0.35	7.47 ^a ±0.23
20%	7.06 ^{ab} ±0.15	6.87 ^a ±0.29	7.20 ^a ±0.20	6.93 ^b ±0.21	6.93 ^b ±0.15
SE±	0.08	0.16	0.17	0.14	0.07
CD	0.23	0.49	0.53	0.44	0.23

Means with different superscripts in a row differ significantly (P<0.05)

Table 2. Quality attributes of chicken nuggets made with incorporation of whole egg liquid

Levels of whole egg liquid	pH	Emulsion stability (%)	Cooking yield (%)
Control	6.24±0.07	92.42 ^b ±0.07	93.16 ^c ±0.27
10%	6.28±0.06	93.28 ^a ±0.44	95.03 ^{ab} ±0.46
15%	6.30±0.24	93.33 ^a ±0.44	95.76 ^a ±0.44
20%	6.29±0.20	93.80 ^a ±0.19	94.43 ^b ±0.45
SE±	0.07	0.27	0.36
CD	NS	0.85	1.10

NS = Non significant

Means with different superscripts in a row differ significantly (P<0.05)

Proximate composition

Table 3. Proximate composition of chicken nuggets made with incorporation of whole egg liquid

Levels of whole egg liquid	Moisture (%)	Protein (%)	Fat (%)
Control	59.23 ^c ±0.46	18.42±0.45	13.55 ^b ±0.45
10%	60.88 ^b ±0.45	17.36±0.49	13.94 ^b ±0.09
15%	61.51 ^{ab} ±0.47	17.05±0.45	14.47 ^{ab} ±0.45
20%	62.22 ^a ±0.46	17.01±0.11	15.26 ^a ±0.44
SE±	0.42	0.38	0.34
CD	1.29	NS	1.06

NS = Non significant

Means with different superscripts in a row differ significantly (P<0.05)

The present findings are similar to those reported by Gupta *et al.*, (1993). Differences in protein content of chicken nuggets with or without incorporation of

WEL were non-significant but it is noted that protein content of product was observed to be declined with increasing levels of WEL. This might be due to proportionately

lower protein content of whole egg liquid compared to lean chicken meat. Similar observations were made by Gupta (1990) for mutton and mutton + chicken combination meat sausages.

Thus it was found that the sensory and quality attributes of chicken nuggets improved considerably with incorporation of Whole egg liquid to the extent of 15 percent.

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