

## Formulation of Chicken Nuggets with the Addition of Chicken Liver as a Product Rich in Iron and Vitamin A for Adolescent Females

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### ABSTRACT

The purpose of this study was to develop chicken nuggets with the addition of chicken liver and analyze their nutritional content. Nugget with 10% chicken substituted with chicken liver was the selected formulation. The nutrient profile of the selected nugget formula was: 56.8 g/100 g moisture, 1.46 g/100 g ash, 14.66 g/100 g protein, 6.5 g/100 g fat, 12.92 g/100 g carbohydrates, 16.39 mg/100 g iron, and 760.16 RE /100 g vitamin A. One serving of the selected nugget formula is equivalent to 100 g (4 pieces) that contribute 168 kcal energy. The selected formulations have met the claims for low fat, high in iron and vitamin A, and source of protein.

**Keywords:** chicken liver, chicken nugget, female adolescent, iron, vitamin A

### INTRODUCTION

Majority of nutritional problems among adolescents are due to inadequate nutrient intake, negative perception of body image and lack of physical activity (Aini 2013). This underlies the researchers' efforts in this study to develop a chicken nugget product with added chicken liver as a snack to meet the iron and vitamin A needs of adolescent females.

### METHODS

This study was an experimental study with a fully randomized design. The treatment is based on the ratios of chicken to chicken liver, which were F0 (100:0), F1 (95:5), F2 (90:10), and F3 (85:15), with two replications. The stages of the study started from the optimization stage for all nugget formulations that was conducted in the Food Experiment Laboratory. Organoleptic test, consisting of hedonic test and rating difference test), proximate analysis and tests for iron and vitamin A content were done in the Sensory Test Laboratory (Rutkowski *et al.* 2006). These analyses were performed at the Nutrient Analysis Laboratory, Department of Community Nutrition, Faculty of Human Ecology, IPB University. Data from different analyses were tabulated using Microsoft Excel 2010 for Windows and

then processed using IBM SPSS Statistics 26 for Windows. Results were analyzed using the difference test between formulas, each attribute was subjected to one-way analysis of variance (ANOVA) ( $p < 0.05$ ) with a 95% confidence interval. The statistical test then followed by Duncan's multiple range test.

### RESULTS AND DISCUSSION

Organoleptic tests were conducted on the chicken liver nuggets produced from each formulation. The tests included hedonic tests for color, aroma, taste, texture, aftertaste, and overall acceptance parameter and rating difference test for meat color intensity, chicken liver aroma, meat chewiness, bitter taste and bitter aftertaste parameters for each nugget formulations. More addition of chicken liver in one formulation produced nuggets with darker color and less chewy texture. It did not significantly affect nugget aroma, but did cause a bitter taste and a bitter aftertaste. The results of hedonic test showed that more chicken liver addition had a significant effect only on the acceptance rate of the color, but it did not significantly affect the other parameters (aroma, texture, taste, aftertaste, and overall acceptance). The results of the proximate test for chicken nuggets with chicken liver added are shown in Table 1.

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The proximate test results showed that there is a significant difference in the iron content of four formulations. The increase in iron content in chicken nuggets with chicken liver added was due to the increased composition of chicken liver.

In addition to proximate analysis, the samples were also analyzed with sensory acceptance test. The results showed that the selected formulation was F2. This sample was further analyzed for vitamin A content using a UV-Vis spectrophotometer according to the method of Rutkowski *et al.* (2006). The results of the vitamin A analysis in the selected formulation were 760.16 RE/100 g. In 100 g of chicken liver, there is 4,957 µg/100 g of vitamin A (MoH RI 2019). The high content of vitamin A in the

nugget produced was due to the high content of vitamin A in the raw material.

Based on the protein, fat, iron and vitamin A content in selected formula, the product can be claimed as a low fat, high iron, high vitamin A product. Table 2 shows the claims against the Nutrition Label Reference of the general group for the selected formulation.

## CONCLUSION

The selected formulation of nuggets which was 90:10 chicken to chicken liver contain 14.66 g/100 g protein, 6.5 g/100 g fat, 16.39 mg/100 g iron and 760.16 RU/100 g vitamin A. This product can be described as low in fat and high in iron and vitamin A, and as a source of protein.

Table 1. Nutritional content of chicken nuggets with chicken liver added (before frying)

Parameter	F0 (100:0)	F1 (91:9)	F2 (82:18)	F3 (73:27)
Moisture (g/100 g)	54.65±0.17 <sup>a</sup>	55.32±0.66 <sup>a</sup>	56.8±2.48 <sup>a</sup>	57.0±1.19 <sup>a</sup>
Ash (g/100 g)	1.33±0.001 <sup>a</sup>	1.34±0.01 <sup>a</sup>	1.46±0.09 <sup>a</sup>	1.47±1.04 <sup>a</sup>
Protein (g/100 g)	16/09±0.08 <sup>c</sup>	15.80±0.23 <sup>c</sup>	14.66±0.19 <sup>b</sup>	13.92±0.08 <sup>a</sup>
Fat (g/100 g)	1.52±0.09 <sup>a</sup>	1.73±0.03 <sup>b</sup>	1.96±0.01 <sup>c</sup>	2.04±0.11 <sup>c</sup>
Carbohydrate (g/100 g)	12.69±0.18 <sup>a</sup>	12.33±0.46 <sup>a</sup>	12.92±0.19 <sup>a</sup>	11.94±0.55 <sup>a</sup>
Iron (mg/100 g)	15.16±0.23 <sup>d</sup>	15.74±0.45 <sup>c</sup>	16.39±0.07 <sup>b</sup>	16.79±0.30 <sup>a</sup>

Treatment Fn (x:y): A mixture of x% chicken meat and y% chicken liver

Values followed by the same letter in a row are not significantly different (p>0.05)

Table 2. Nutrition claims for chicken nugget with chicken liver

Parameter	Nutrition label reference (General group)*	Nutritional content (per 100 g)	Percentage	Nutritional claim
Energy (kcal)	2,150	127.96	5.95	
Protein (g)	60	14.7	24.43	Source**
Fat (g)	67	1.96	2.93	Low**
Carbohydrate (g)	325	12.92	3.98	
Iron (mg)	22	16.39	74.50	High**
Vitamin A (RE)	600	760.18	126.70	High**

\*Based on the Regulation of the Head of the Indonesian Food and Drug Authority (Perka BPOM) No.2 of 2016 (MoH RI 2016)

\*\*Based on the Regulation of the Head of the Indonesian Food and Drug Authority (Perka BPOM) No. 1 of 2022 (MoH RI 2022)

## DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflicts of interest to declare.

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