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# The Effect of Adding Moringa Leaf Powder (*Moringa oleifera*) on the Chemical Content of Chicken Nuggets

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## ABSTRACT

Moringa leaves contain high nutrients, and some saponins play a role in lowering cholesterol levels. Moringa leaves in chicken nuggets are becoming an innovation to produce functional food products. This research aimed to analyze the effect of the mixed use of Moringa leaf powder (*Moringa oleifera*) on the chemical content of chicken nuggets. The research design is completely randomized, with four treatments and four replications. The treatments in this research included Moringa leaf powder, Treatment $K_0$=0% (control); $K_1$= 10%, $K_2$=20%, and $K_3$=30%. Statistical analysis showed a significant effect (P<0.01) on chicken nuggets' crude protein, fat, fiber, and cholesterol content. The conclusion is that adding 10-30% Moringa leaf powder reduces the crude protein, fat, and cholesterol content yet can increase the crude fiber content.

**Keywords**: chemical content, cholesterol, chicken nuggets, functional food, moringa leaf powder

## INTRODUCTION

This research will explain the effect of a mixture of moringa leaf powder (*Moringa oleifera*) on the chemical characteristics of chicken nuggets. Previous studies explained the addition of Moringa leaves to processed products, including a mixture of Moringa leaves in the manufacture of Mocaf biscuits (Augustyn et al., 2017), mackerel nuggets (Hapsari et al., 2022)Sardinella lemuru fish nuggets (Pramono et al., 2021), Tempe nuggets (Sinaga et al., 2021), skipjack tuna nuggets (Winnarko and Mulyani, 2020), chicken and duck nuggets at the level of 0.5-1.5% (Suhaemi et al., 2021). Thus, the novelty and difference with previous studies in the mixture of Moringa leaves with a level of 10-30%, which is added to the chicken nugget mixture.

Chicken nuggets are processed meat that is ground and then added spices. As a result of products that have high cholesterol content, a mixture of Moringa leaves that have saponins can reduce cholesterol levels (Vázquez-León et al., 2017). As a plant that lives in the tropics and tolerates drought, Moringa (Moringa oleifera) is often found in Indonesia. (Aminah et al., 2015). Generally, the leaves are prioritised as additional nutrients (Santi et al., 2021). It also contains phenolic substances, which are antioxidants for health (Toripah et al., 2014). The nutritional content of Moringa leaves contains 9.57% water value, 7.85% ash value, 51.91% carbohydrates, 4.03% crude fiber, 2.52% fat, 26.02% protein, and 1.92% Vitamin C (Augustyn et al., 2017). Research by field (Gega et al., 2022), that adding Moringa leaf powder at 10-30% decreased quality from an organoleptic perspective. Furthermore, (Fidyati et al., 2022) That addition at the 3% Moringa leaf flour level gave the best moisture content, yield and organoleptic results. With the richness of nutrition contained in Moringa leaves, this research aimed to analyze the effect of the mixed-use of Moringa leaf powder (*Moringa oleifera*) on the chemical content of chicken nuggets.

## MATERIALS AND METHODS

The materials used in the research were meat grinding machines, blenders, scales, measuring cups, and other equipment. The ingredients used, main ingredients are broiler chicken meat, additional ingredients Moringa leaf Powder, shallots, garlic, pepper, salt, wheat flour, tapioca flour, bread flour (panir flour), chicken eggs, cheese, cooking oil, enough water, and ice. Experimental research used the completely randomised design with 4 treatments and four replications. The treatment was the level of addition of moringa leaf powder with K0 = 0% (control), K1=10%, K2= 20%, and K3= 30% (w/w).

### Research Procedure

Moringa leaf powder is produced at the Animal Products Technology Laboratory,

Universitas Nusa Cendana, Kupang. The moringa leaf powder production method begins with selecting the young leaves, separating them from the stalks, then washing them thoroughly and draining them. After that, it is dried in the sun for ±6 hours at a temperature of ±30-35°C. Finally, after drying, it is sieved with a size of 80 mesh to obtain the exact size (Augustyn et al., 2017). Making chicken nuggets starts with milling, mixing moringa leaf powder and seasonings, printing and steaming, printing and coating, and frying. The process of making chicken nuggets with Moringa leaf powder is seen in Figure 1.

## Research Variable

Chemical analysis was carried out in the Chem-Mix Pratama Laboratory. The variable that was measured was the protein of crude content at the Kjeldhal method (AOAC, 2005), the content of crude fiber at the gravimetric method (AOAC, 2005), Soxhlet method of fat content (AOAC, 2005), and total cholesterol by Spectrophotometric method (Rahman et al., 2005; Gusmayani et al., 2021).

## Data Analysis

The research data were analyzed by Variance Analysis (ANOVA), and if it had effects, continued with the F test. This analysis used Minitab 16 software. Data are displayed as mean values and standard deviations.

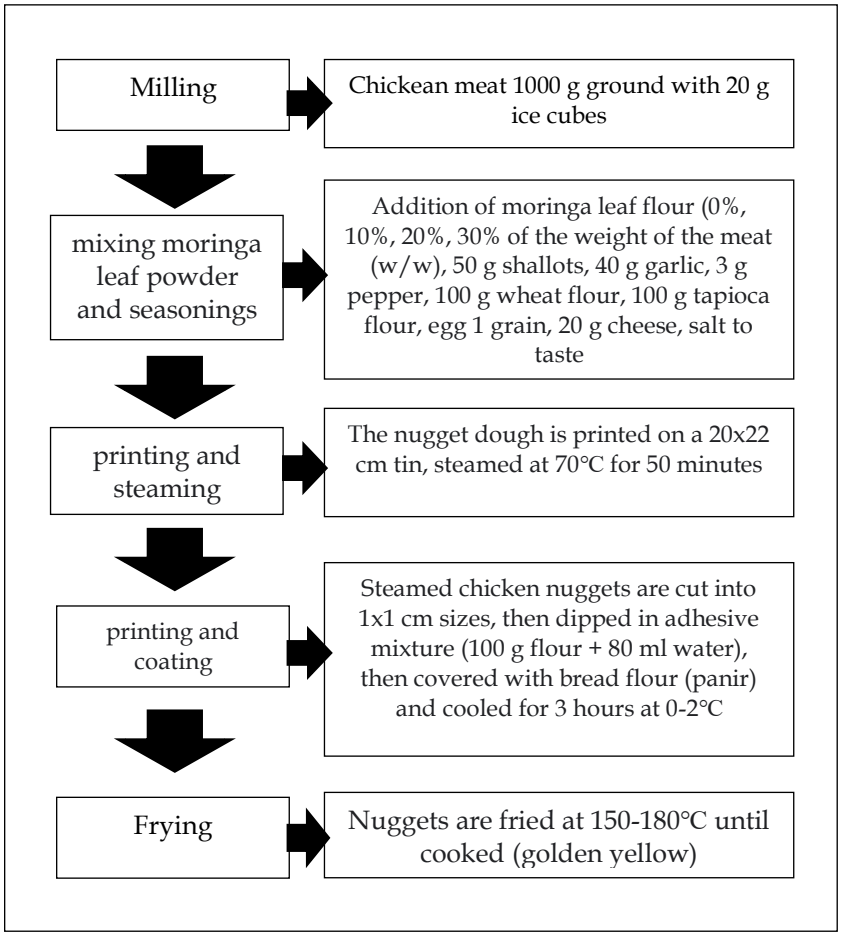


Figure 1. Flowchart of the process for making chicken nuggets with the addition of Moringa leaf powder

# RESULTS AND DISCUSSION

The addition of moringa leaf powder affects the chemical content of the chicken nuggets. The mean and standard deviation of the content of protein, fat, crude fiber, and cholesterol in chicken nuggets with the level of addition of Moringa leaf powder can be seen Table 1.

## Crude Protein Content

The protein content of chicken nuggets is in the range 10.11±0.03%-11.61±0.07% (Table 1). The treatment of adding Moringa leaf powder has the highest crude protein content at the level of 0% (w/w) (control) (K0) 11.61±0.07% and the lowest level in the treatment with a level of 30% (w/w) (K3) 10.11±0.03%.

Table 1. Content of protein, fat, crude fiber, and cholesterol in chicken nuggets with levels of addition of Moringa leaf powder

| Variable | Moringa leaf powder level | | | | P Value |
|---|---|---|---|---|---|
| | $K_0$ | $K_1$ | $K_2$ | $K_3$ | |
| Crude protein (%) | 11.61±0.07[a] | 10.80±0.04[b] | 10.54±0.09[c] | 10.11±0.03[d] | 0.000 |
| Crude fat (%) | 6.60±0.10[a] | 5.56±0.08[b] | 4.79±0.10[c] | 4.19±0.06[d] | 0.000 |
| Crude fiber (%) | 3.37±0.06[a] | 5.15±0.07[b] | 6.54±0.07[c] | 7.71±0.10[d] | 0.000 |
| Cholesterol (mg/g) | 39.36±0.13[a] | 30.57±0.11[b] | 26.12±0.15[c] | 20.16±0.12[d] | 0.000 |

[abc)] superscript values showed significant differences (P<0.05).
$K_0$=0% (control); $K_1$=10%, $K_2$= 20%, and $K_3$= 30% Moringa leaf powder level (w/w).

The results of ANOVA of adding levels effect of significant (P<0.05) and the further F-test of Moringa leaf powder showed a difference of significant (P<0.05). It explains that the mixture of moringa leaf powder in chicken nuggets has affects reducing protein content (Augustyn et al., 2017) with a total content of about 26.02%. This result is different from the research (Suhaemi et al., 2021), that the protein content of chicken nuggets mixed with moringa leaf powder increased the protein content of 0.5-1.5%, the crude protein content of chicken nuggets was 13.57-13.87%. In line with research (Hapsari et al., 2022), there was an increase in the protein content of mackerel nuggets in line with the increase in the addition of 10-50% moringa leaf puree. The results obtained were a decrease in the protein content of chicken nuggets after being mixed with Moringa leaf powder, which was influenced by the heating effect during the chicken nugget making process. The protein content of the chicken nuggets produced in this research is still within the standard quality for chicken nuggets, namely having a protein content for combined chicken meat nuggets according to SNI 6683: 2014 of at least 9% (BSN, 2014).

## Crude Fat Content

The fat content of chicken nuggets is in the range 4.19±0.06% – 6.60±0.10% (Table 1). The treatment of adding Moringa leaf powder has the highest crude fat content at the level of 0% (control) (K0) 6.60±0.10% and the lowest level is in the K3 treatment at the 30% level treatment (w/w) 6.60±0.10%. The results indicated a decrease in the crude fat content in line with the increase in the level added of moringa leaf powder.

The results of ANOVA with the addition mixture of moringa leaf powder levels showed effect of significant (P<0.05). Further F-test results for each treatment level showed difference of significant (P<0.05). Based on the results above, chicken nuggets with a mixture of moringa leaf powder affect reducing fat content. The results obtained are in line with the study (Suhaemi et al., 2021), there was a decrease in the fat content of 2.06-3.73% in chicken nuggets after being mixed with 0.5-1.5% moringa leaf powder. Also can be seen in the study (Hapsari et al., 2022) that there was an increase in the fat content of fish nuggets after the addition Moringa leaf puree. The fat content in combined chicken nuggets according to SNI 6683:2014 is a maximum of 20% (BSN, 2014).

## Crude Fiber Content

The crude fiber content of chicken nuggets is in the range 3.37±0.06% - 7.71±0.10% (Table 1). The treatment of adding the highest crude fiber Moringa leaf powder at the level of 30% (w/w) (K3) 7.71±0.10% and lowest level at 0% level (K0) 3.37±0.06%. The results indicated an increase in crude fiber in line with the increase in Moringa leaf powder level of added.

The result of ANOVA is that there is effect of significant (P<0.05) from the effect of a mixture of moringa leaf powder. The F-test results for each treatment at each level showed a difference of significant (P<0.05). The above analysis explains that adding moringa leaf powder to chicken nuggets affects the crude fiber value. The study results (Hapsari et al., 2022), showed increased crude fiber content after mixing with Moringa leaf puree. The crude fiber content of about 4.03% in Moringa leaf powder affects increasing the crude fiber content of chicken nugget products(Augustyn et al., 2017).

## Cholesterol Content

The cholesterol content of chicken nuggets is in the range 20.16±0.12 mg/g – 39.36±0.13 mg/g (Table 1). The treatment of adding moringa leaf powder to chicken nuggets has the highest cholesterol content at the 0% level (K0) 39.36±0.13 mg/g and the lowest level at the level of 30% (w/w)

(K3) 20.16±0.12 mg/g. The results showed a decrease in cholesterol content in line with the increase in the level of moringa leaf powder added.

The ANOVA results have an effect of significance ($P<0.05$) on adding Moringa leaves powder. The F-test results for each treatment at each level showed a difference significance ($P<0.05$). The analysis explained that chicken nuggets mixed with moringa leaf powder affected reducing cholesterol. This result is the same as the study (Suhaemi et al., 2021), that chicken nuggets mixed with 0.5-1.5% Moringa leaf powder decreased cholesterol content from 34.0-52.5%. The content contained in Moringa leaves, which has a hypolipidemic effect and plays a role in reducing cholesterol activity is the presence of saponins (Saini et al., 2016; Vázquez-León et al., 2017).

## CONCLUSION

Adding moringa leaf powder at 10-30% reduces the protein, fat and cholesterol content, and can increase the crude fiber content. Recommendations for using moringa leaf powder can be used less than 10%.

## REFERENCES


Aristika, G. I., A. R. Riwu, and S. Sulmiyati. 2022. Pengaruh Penambahan Tepung Daun Kelor (*Moringa oleifera*) dalam Pembuatan Nugget Ayam terhadap Mutu Organoleptik. J. Peternak. Lahan Kering. 4(4):2416–2420.

Aminah, S., T. Ramdhan, and M. Yanis. 2015. Kandungan Nutrisi dan Sifat Fungsional Tanaman Kelor (*Moringa oleifera*). Buletin Pertanian Perkotaan 5(30): 35–44.

Aminur, R. M. 2005. Electrochemical Biosensors for Biomedical and Clinical Applications: A Review. Journal of Biomedical Engineering Research 26(5): 271-282.

[AOAC] Association of Official Analytical Chemist Inc. 2005. Official Methods of Analysis (18 Edn). Association of Official Analytical Chemist Inc. Mayland.

Augustyn, G. H., HCD. Tuhumury, and M. Dahoklory. 2017. Pengaruh Penambahan Tepung Daun Kelor (*Moringa oleifera*) terhadap Karakteristik Organoleptik dan Kimia Biskuit Mocaf (Modified Cassava Flour). AGRITEKNO, Jurnal Teknologi Pertanian 6(2): 52–58. https://doi.org/10.30598/jagritekno.2017.6.2.52.

[BSN] Badan Standarisasi Nasional. 2014. SNI 6683:2014: Naget Ayam (Chicken Nugget). [Indonesian].

Fidyati, K. P., B. Sabtu, and Sulmiyati. 2022. Moringa (Moringa oliefera) Leaf Flour Addition on Water Content, Sensory Quality, Favorability Level, and Yield of Chicken Nuggets. Chalaza J. Anim. Husb. 7(2):42–47. Available from: https://usnsj.id/index.php/CJAH/article/view/7.2.42-47

Gusmayani, Y., H. Anggraini, dan F. Nuroini. 2021. Perbedaan Kadar Kolesterol Serum Metode Spektrofotometri dan Metode Point of Care Testing (POCT). Jurnal Labora Medika 5: 24–28.

Hapsari, K. A. P., I. M. Sugitha, dan I. P. Suparthana. 2022. Pengaruh Penambahan Puree Daun Kelor (*Moringa oleifera* Lamk.) terhadap Karakteristik Nugget Ikan Kembung (*Rastrelliger kanagurta*). Jurnal Ilmu dan Teknologi Pangan (ITEPA) 11(1): 123–133. https://doi.org/10.24843/itepa.2022.v11.i01.p13.

Pramono, M. A., FW. Ningtyas, N. Rohmawati, dan K. Aryatika. 2021. Pengaruh Penambahan Tepung Daun Kelor (*Moringa oleifera*) terhadap Kadar Protein, Kalsium dan Daya Terima Nugget Ikan Lemuru (*Sardinella lemuru*). Penelitian Gizi dan Makanan (The Journal of Nutrition and Food Research) 44(1): 1–10. https://www.neliti.com/publications/223576/hubungan-asupan-energi-lemak-dan-serat-dengan-rasio-kadar-kolesterol-total-hdl.

Saini, R. K., I. Sivanesan, and Y. S. Keum, 2016. Phytochemicals of Moringa Oleifera: A Review of Their Nutritional, Therapeutic and Industrial Significance. 3 Biotech, 6 (203): 11–14. https://doi.org/10.1007/s13205-016-0526-3.

Santi, M. W., C. Triwidiarto, T. M. Syahniar, R. Firgiyanto, and H. Oktafa. 2021. Moringa chicken nugget as supplementary food for toddler to prevent stunting. IOP

Conference Series: Earth and Environmental Science, 672(1). https://doi.org/10.1088/1755-1315/672/1/012065.

Sinaga, E. F., TM. Langi, and T. Koapaha. 2021. Effect of Additional Flour of Moringa oleifera on Organoleptic and Chemical Properties of Tempe Nugget. Jurnal Agroteknologi Terapan 3(2): 205–212.

Suhaemi, Z., Husmaini, E. Yerizal, and N. Yessirita. 2021. Pemanfaatan Daun Kelor (*Moringa oleifera*) dalam Fortifikasi Pembuatan Nugget. Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan 9(1): 49–54. https://doi.org/10.29244/jipthp.9.1.49-54.

Toripah, S. S., J. Abidjulu, and F. Wehantouw. 2014. Aktivitas Antioksidan dan Kandungan Total Fenolik Ekstrak Daun Kelor (*Moringa oleifera* Lam). Pharmacon 4(3): 37–43. https://doi.org/https://doi.org/10.35799/pha.3.2014.6043.

Vázquez-León, L. A., D. E. Páramo-Calderón, V. J. Robles-Olvera, O. A. Valdés-Rodríguez, A. Pérez-Vázquez, M. A. García-Alvarado, and G.C. Rodríguez-Jimenes. 2017. Variation in Bioactive Compounds and Antiradical Activity of Moringa oleifera Leaves: Influence of Climatic Factors, Tree Age, and Soil Parameters. European Food Research and Technology 243(9): 1593–1608

Winnarko, H. dan Y. Mulyani. 2020. Uji Coba Produk Nugget Berbahan Dasar Ikan Cakalang (*Katsuwonus pelamis*) dengan Penambahan Tepung Daun Kelor (Moringa oleifera L). JSHP : Jurnal Sosial Humaniora dan Pendidikan 4(1): 13–20. https://doi.org/10.32487/jshp.v4i1.776.