

Development of Nutritious Sprinkles from Chicken Feet and Mung Beans for Pregnant Women at Risk of Chronic Energy Deficiency

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ABSTRACT

This research was aimed to develop the formulation of nutritious sprinkle made from chicken feet and mung beans and evaluate its nutritional and sensory quality. This pre-experimental study used a Completely Randomized Design (CRD). The sensory evaluation showed that most of the panelists accepted all formulations. The most preferred formulation based on the ranking test was F2 (chicken feet flour:mung bean flour of 2:1), which is suggested for use in energy-dense food. The water and protein content of the new formulation met the standard of supplementary food for pregnant women at risk of chronic energy deficiency. It is also claimed that the formulation can be used as a high protein and high calcium food.

Keywords: CED, chicken feet, mung bean, pregnancy, sprinkle

INTRODUCTION

Stunting is still considered a major health problem, with prevalence still above 20%. It is influenced by many factors, including nutritional status during pregnancy. The prevalence of pregnant women who are at risk of Chronic Energy Deficiency (CED) is still greater than 5% (WHO 2010), which makes CED in pregnant women to be classified as a health problem. One study showed that among pregnant women who received micronutrient sprinkle, there were fewer cases of low-birth-weight babies and fewer preterm births (Haider & Bhutta 2017). Chicken feet and mung beans contain protein and minerals that are good for fetal growth and development, and they are affordable. Thus, the researchers are interested in developing nutritious chicken feet and mung bean-based sprinkles for pregnant women at risk of CED.

METHODS

Design, location, time, and steps of the research

This pre-experimental research used a completely randomized trial design and was conducted at IPB University and Saraswanti Indo Genotech Laboratory from October 2022 to April 2023. The research was conducted in four stages: formulation determination, sensory evaluation,

proximate analysis, and mineral analysis for the four formulations. From the selected formulations resulting from the sensory evaluation (ranking test), two formulations were selected, followed by analysis of sodium, cholesterol, and saturated fat, and analysis of contributions to nutrition label references based on the Indonesian Food and Drug Authority Regulation (BPOM RI 2022).

Production of nutritious sprinkles

The production of nutritious sprinkles was done by combining the chicken feet flour and mung bean flour as well as other supporting ingredients, with the ratio of the chicken feet flour and mung bean flour of each formulation as follows: F1 (3:1), F2 (2:1), F3 (7:5), and F4 (1:1). Chicken feet flour was prepared by boiling at 100°C for 10 minutes, followed by pressure cooking for 3 hours, drying at 60°C for 20 hours, and then coarsely grinded. Mung bean flour was prepared by boiling at 100°C for 15 minutes, followed by drying at 60°C for 5 hours. The process was continued by grinding and sieving with an 80-mesh sieve.

Statistical analysis

The research data were processed using Microsoft Excel 2010 and analyzed using IBM Statistical Program Social Sciences (SPSS) version 27.

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(Received 02-06-2023; Revised 14-07-2023; Accepted 26-07-2023; Published 30-12-2023)

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RESULTS AND DISCUSSION

As shown in Table 1, the addition of mung bean flour improved the preference for color attributes. The results of the ANOVA showed no significant differences in the attributes of aroma, texture, taste, and aftertaste and the overall results between F1, F2, F3, and F4. The results of the ANOVA showed that there were significant differences in the mouthfeel attributes. F1 was ranked as the second most liked formula by the panelists, it had the highest proportion of chicken feet flour, because it had a crunchy sensation when it was eaten. In general, the results of the ranking test showed that most of the panelists preferred F2 to the other formulations, and there was no significant difference between the different treatments.

Proximate and mineral analyses

Table 2 shows that the more the mung bean flour was added, the higher the water and carbohydrate content became. According to

Jumanah *et al.* (2018), the higher the amylose content is, the higher the water content will be. The results of the proximate analysis showed that the water content of F1 and F2, fat content of F1, and protein content of the four formulations in 100 g of the product met the quality requirements for supplementary food for pregnant women at risk of CED based on the Regulations on Complementary Foods of the Ministry of Health, Republic of Indonesia (MoHRI 2016). The results of the mineral analysis showed that the contents of calcium, zinc, magnesium, and iron were 962.09–1,227.75 mg/100 g, 2.93–3.59 mg/100 g, 204.35–258.70 mg/100 g, 8.89–10.04 mg/100 g, respectively. The protein and calcium content of F2 is considered to meet the requirements of "high" or "rich" according to the Indonesian Food and Drug Authority because the protein content of F2 meets the Nutrition Label Reference of 35% per 100 g of product. The calcium content of the product meets the Nutrition Label Reference as it is at least twice the amount of its sources (30% per 100 g of product) with 1.9 g of total

Table 1. Results of the organoleptic test of the nutritious sprinkle

Attributes	Hedonic score			
	F1	F2	F3	F4
Color	5.71±1.792 ^b	6.67±1.021 ^a	6.72±1.019 ^a	6.76±1.153 ^a
Aroma	5.34±1.575 ^a	5.40±1.479 ^a	5.77±1.190 ^a	5.79±1.462 ^a
Texture	5.73±1.502 ^a	5.80±1.431 ^a	5.40±1.311 ^a	5.76±1.437 ^a
Taste	5.53±1.277 ^a	5.66±1.327 ^a	5.20±1.587 ^a	5.00±1.879 ^a
Mouthfeel	5.74±1.314 ^a	5.73±1.347 ^a	5.44±1.418 ^{ab}	4.86±1.630 ^b
Aftertaste	5.17±1.403 ^a	5.41±1.385 ^a	5.16±1.718 ^a	4.83±1.689 ^a
Overall	5.61±1.249 ^a	5.76±1.330 ^a	5.59±1.353 ^a	5.37±1.536 ^a

^a and ^b denote significant difference at $p < 0.5$

Ratio of chicken feet flour:mung bean flour: F1: (3:1); F2: (2:1); F3: (7:5); F4: (1:1)

Table 2. Results of proximate analysis of nutritious sprinkle

Content (%)	Proximate content			
	F1	F2	F3	F4
Water	4.62±0.06 ^c	4.96±0.08 ^b	5.19±0.92 ^b	6.19±0.13 ^a
Ash	19.58±0.62 ^a	17.22±0.07 ^b	15.57±0.47 ^c	12.65±0.40 ^d
Fat	21.31±0.37 ^a	18.80±0.4 ^{ab}	17.57±0.35 ^c	13.38±0.33 ^d
Protein	35.73±0.03 ^a	35.59±0.01 ^b	35.29±0.78 ^c	32.64±0.01 ^d
Carbohydrate	19.77±0.97 ^d	23.44±0.44 ^c	26.41±0.81 ^b	35.15±0.63 ^a

^a and ^b denote significant difference at $p < 0.5$

Ratio of chicken feet flour:mung bean flour: F1: (3:1); F2: (2:1); F3: (7:5); F4: (1:1)

fat, 0.5 g of saturated fat, 0 mg of cholesterol and 63.8 mg of sodium per serving. According to the Indonesian Food and Drug Authority regulations, processed foods with a claim on the label must meet the following requirements, among others: they must not contain more than 18 g of total fat, 6 g of saturated fat, 60 mg of cholesterol and 300 mg of sodium per serving.

CONCLUSION

F2 (chicken feet flour:mung bean flour of 2:1) was the formulation of choice based on the results of the hedonic evaluation and ranking tests. The protein and calcium content of F2 meet the requirements for a "high" or "rich" nutrient content claim. Nutritious sprinkles are better when used with energy-dense foods such as rice and bread to support energy fulfillment.

DECLARATION OF CONFLICT OF INTERESTS

This study was supported by the Indonesia Endowment Funds for Education/*Lembaga Pengelola Dana Pendidikan* (LPDP).

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