

The Influence Of Chicken Feet Addition To The Nutrition Value And Organoleptic Quality Of The Corn Nugget

Novian Swasono Hadi¹⁾ Rahma Labatjo¹⁾ Denny Indra Setiawan¹⁾
Indra Domili¹⁾ Puspita Sukmawati Rasyid²⁾ Abdul Rahmat³⁾

Abstract--Corn and chicken feet have several benefits for the development of food science and can be combined to create highly nutritious food product in the form of corn-chicken feet nugget. This study was an experiment study with three treatments and three replications. The addition of chicken feet into the corn nugget significantly contributes to the nugget's nutritional value as well as the taste of the chicken feet corn nugget (p value = 0.000). The result of nutritional analysis revealed that the third treatment (incorporation of 30% chicken feet to the corn nugget) are of the highest nutritional value and the most favorable by the panelists.

Keywords: Nugget, chicken feet, corn, nutritional value, organoleptic

I. INTRODUCTION

Corn has several benefits for the development of the food science, one of which is as the alternative carbohydrate source. Within 100 grams of corn, there are 361 kcal of energy, 74.4 grams of carbohydrate, 8.7 grams of proteins, 4.5 grams of fats, 9 mg of magnesium, and 380 mg of phosphor (Kementerian Kesehatan Republik Indonesia, 2019). One of the least liked part of chicken in Gorontalo community is the chicken feet. Despite this, the nutritional value of the chicken feet value is essential for child's growth. A 100 gram of chicken feet contains 9.84 gram of protein, 2.87 mg calcium, 1.70 mg phosphor and 3.16 gram fat, 4 mg water-soluble collagen, 187 mg omega-3 and 2.571 mg omega-6 (Muyonga, Cole and Duodu, 2004; Taufik, 2004; Voutilainen *et al.*, 2009). The omega-3 serves as anti-inflammation agent and supports the brain's function (Soeparno, 2011). In addition, the water-soluble collagen in chicken feet helps increase immunity (Tong *et al.*, 2010).

Chicken feet, like corn, is also often utilized as supplement in several food products. Some food products that uses chicken feet are, kaastengels cookies, *dawet* (rice flour jelly), and chips (Shobikhah and Syifaatus, 2014), (Andriyani *et al.*, 2015). Similarly, corn and chicken feet can be combined to produce highly nutritious food, such as nugget. School-age children need balanced quantity and quality nutrition for their optimum growth (Judarwanto, 2006). One of the indications of less-efficient human resource development is stunted children. Malnutrition problem and provision of less-nutritious meals will have negative impacts. In bigger picture, lack of people productivity, lack of cognitive skills, human resources loss, high health cost are potential hindrances for the nation's development. (Bappenas, 2009)

Nugget is one of the fast-food that are familiar to many people. Nugget, like sausages, burger, and canned food has become the alternative staple food that are practical and easy to prepare. Nugget is usually made from seasoned mincemeat shaped into sticks, coin, or other shapes. The commonly available nugget products are chicken nugget, beef nugget, and fish nugget. Hence, we opted to examine the corn nugget with chicken feet addition regarding its nutritional value and organoleptic quality aspects.

II. METHOD OF RESEARCH

¹ Department of Nutrition, Health Polytechnic of Ministry of Health, Gorontalo¹⁾ Department of Midwifery, Health Polytechnic of Ministry of Health, Gorontalo²⁾ Gorontalo State University³⁾ nieno.poenya@gmail.com¹⁾ abdulrahmat@ung.ac.id³⁾

This was an experiment study. The treatments in this study was addition of chicken feet on corn nugget, which consists of three types of treatment and three times repetition. This study was carried out to explore the influence of chicken feet addition on the nutritional value and consumer's acceptance on corn nugget supplemented with chicken feet.

This study was implemented on March to May 2018 located in the food technology laboratory of Nutrition Department of Health Polytechnic od Ministry of Health, Gorontalo.

Procedure

1. Experiment Preparation

a. Ingredients Preparation

The chicken feet used in this study are chicken feet from the chicken (*Gallus domesticus*) bought at Central Market of Gorontalo city. Whereas the corn used in this study are the sweet corn from *Bunanza* variety bought at the same market.

Ingredient Composition in the Production of Corn-Chicken Feet Nugget

Ingredient (gram)	Control Group (P0)	Experiment Groups (E)		
		P1	P2	P3
Sweet Corn	250	250	250	250
Wheat Flour	70	70	70	70
Egg	150	150	150	150
Onion	20	20	20	20
Garlic	20	20	20	20
Pepper	2	2	2	2
Salt	2	2	2	2
Bread crumb	200	200	200	200
Egg white	50	50	50	50
Chicken feet	-	25	50	75

2. Experiment Process

The experiment process of corn nugget production with addition of 25 gram, 50 gram, and 75 gram of chicken feet is described below:

- 1) Whisk the egg, add garlic and onion paste, and sprinkle salt. Mix evenly.
- 2) Add flour into the bowl, then incorporate the mixture above into the flour.
- 3) Add corn and the chicken feet mixture. Mix evenly
- 4) Shape the dough into the desirable shape
- 5) Steam for 15 minutes.
- 6) While waiting for the steamed nugget, pour the bread crumble into the pan.
- 7) Prepare whisked egg white.
- 8) Cool the steamed nugget in the room temperature for 10 minutes.
- 9) Put nugget into the whisked egg white solution and then roll into the bread crumble for coating, then put into a prepared plate.
- 10) Store the bread crumble coated nugget into the refrigerator for 20 minutes, for the bread crumble to perfectly stick to the nugget
- 11) Then, heat the cooking oil.

12) Fry the nugget until the color turned into golden brown in the temperature of 180°-195°C for 4 minutes.

3. Analysis Stage

The organoleptic quality analysis was carried out through consumers' acceptance, whereas the nutritional value analysis employed Nutrisurvey 2007.

Instruments and Technique of Data Collection

The organoleptic quality of the corn nugget with chicken feet addition consists of color, texture, taste, and flavor. The test was carried out by 30 semi-trained panelists. The semi-trained panelists were students who have obtained explanation and knew the sensory characteristics of the corn nugget. The test was carried out using scoring method. The nutrition was calculated using *Nutrisurvey2007* software program.

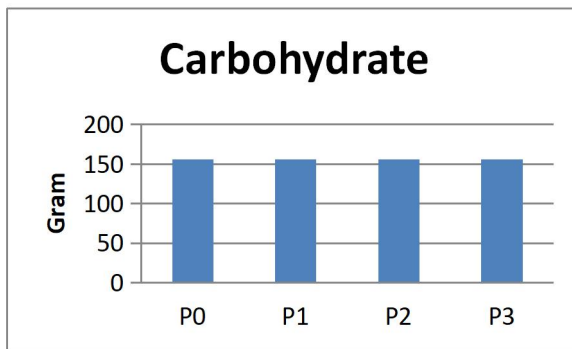
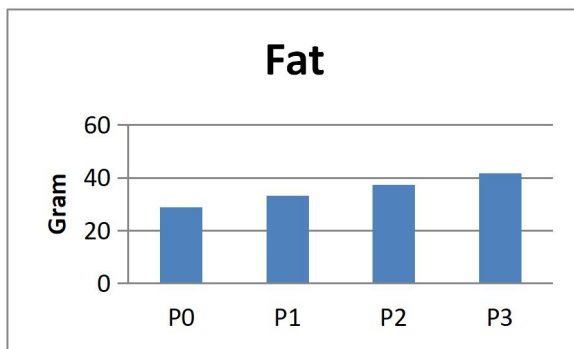
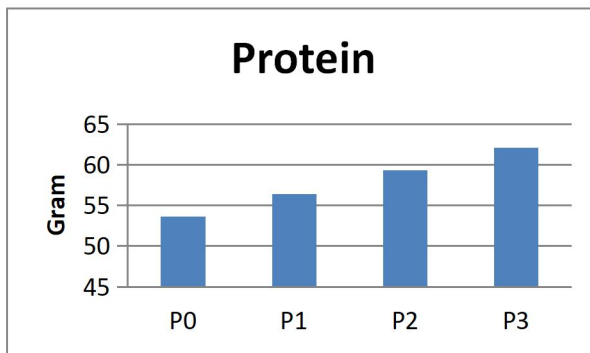
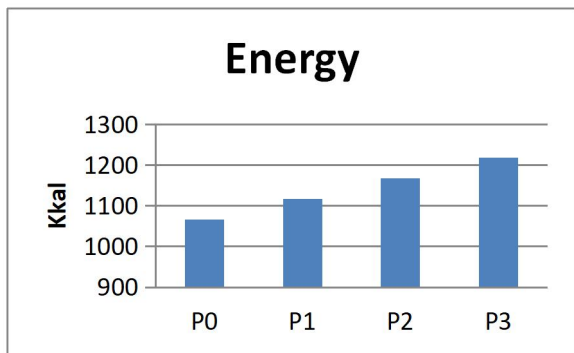
Technique of Data Analysis

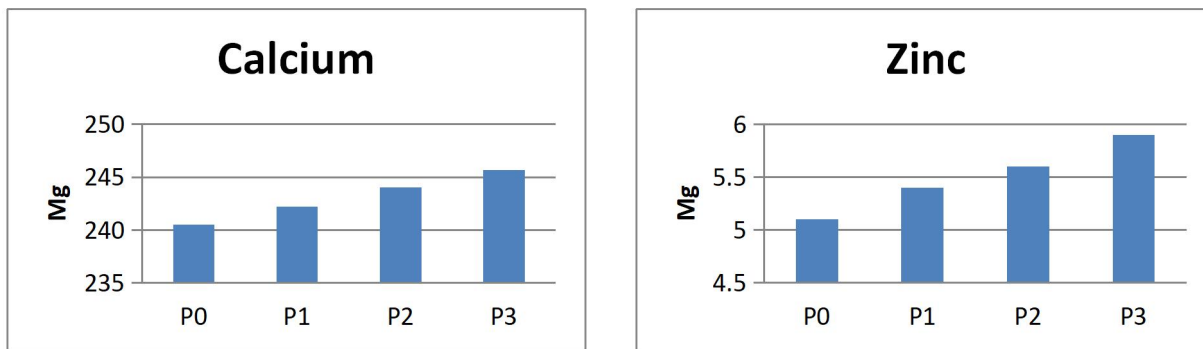
The analysis of organoleptic data used the computer software with Friedman test whereas the nutrition value was analyzed using Anova test.

III. FINDING AND DISCUSSION

1. Nutritional Value

The nutrition value in each treatment experienced an increase, the higher the concentration of chicken feet added into the corn chicken nugget, the higher the nutrition value of the nugget in each treatment. The nutrition values of corn chicken-feet nugget are presented in the following figures:





Organoleptic Quality

a. Color

The micro and macro nutrition values of corn nugget supplemented with chicken feet experienced an increase. The skin part of the chicken feet mostly contains collagen protein. Histologically, the skin consists of three parts, epidermis, dermis, and hypodermis. The nugget production process is related to the decomposition and hydrolysis mechanisms of collagen fiber bonds on the skin. Collagen fiber bonds especially within the dermis layer which experienced the heat would experience denaturation process. (Muyonga. dkk, 2004)

A 100 gram of chicken feet contains 9.84 grams of protein, 1.70 mg of phosphor, 3.16 fat, 4 mg of water-soluble collagen, 187 mg of omega-3, and 2.571 mg omega-6 (Muyonga, Cole and Duodu, 2004; Taufik, 2004; Voutila *et al.*, 2009). Zinc can stimulate the activation of 100 types of enzymes and serves as the co-factor in 200 types of other enzymes that catalysed the vital metabolism reactions.

Lack of zinc intake would reduce the immune system of the body (Nasution, 2004). Therefore, addition of chicken feet will increase the nutrition values, in which 100 gram of chicken feet contains 2128 mg of calcium and 1.6 mg of zinc (Nutrition Data, 2018).

The Friedman test (appendix 4) shows that addition of chicken feet has no significant influence ($p = 0.306$) on acceptance of the nugget color. Further, the Mean Rank of the panelists likeability toward the organoleptic quality of the color of the corn nugget without the chicken feet addition has the highest Mean Rank by 2.28 and the 20% addition of chicken feet has the lowest Mean Rank by 2.22.

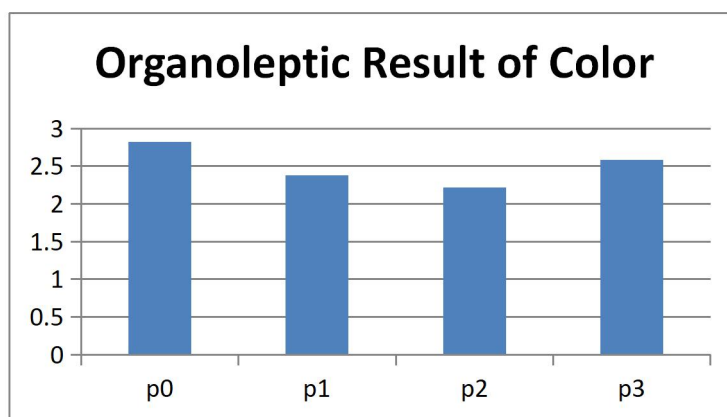


Figure 2. Distribution of Color Organoleptic Result of the Corn Chicken-Feet Nugget

The color of the corn chicken-feet nugget is not influenced by the percentage of chicken feet addition. The addition of chicken feet has no influence on the fried corn chicken-feet nugget. However, the most liked color by the panelists are the corn nugget with the most added chicken feet. This is due to the increase protein, collagen and zinc within the nugget. The best organoleptic test is on the treatment with 7.5 mg of zinc by 50% RDA from adults (Śmigielska and Le Thanh-Blicharz, 2010). Study on gelation of the snakehead fish is also have no influence on the likeability of the color of the sausages products. (Rosmawati, 2018)

b. Flavor

The Friedman test shows that addition of chicken feet has no significant influence ($p = 0.759$) on the flavor acceptance. The corn chicken-feet nugget with no chicken feet addition has the unique corn flavor, however, chicken feet addition strengthened the flavor. This is proven by 10% addition of chicken feet, the flavor is the most liked by the panelists. The higher the concentrate of chicken feet added, the fishier the flavor of the nugget. Hence, the 20% and 30% addition of chicken feet gained the least liked score from the panelists. Previous research on fish meat revealed that the fishy smell and taste of the fish meat was due to the free amino acid of the meat protein and various free-fatty acid of the fish meat (Hasanah and Lestari, 2018).

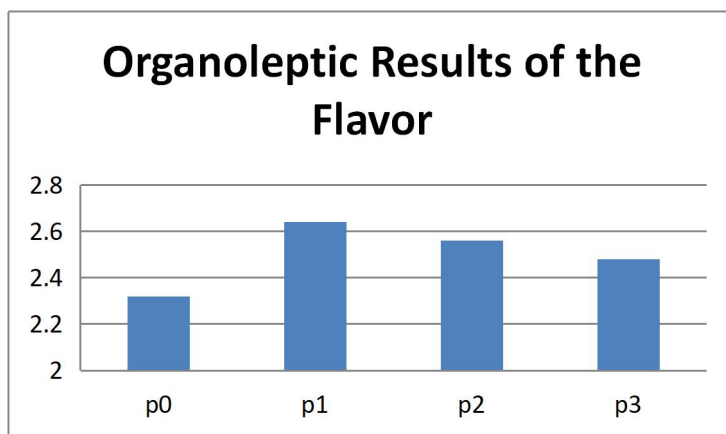


Figure 3. Distribution of the Flavor of Corn Chicken-Feet Nugget

c. Texture

The higher the addition of chicken feet on the corn nugget will result in the more liked product by the panelists, due to its elastic texture. On meat and its processed products, the collagen on the meat influenced the elasticity of the meatball. Collagen is the main structural protein in connective tissue and influenced the hardness of the product (Soeparno, 2005). The result of the Friedman test (see Appendix 6) showed that addition of chicken feet has no significant influence ($p = 0.083$) on the panelists feedback of the organoleptic of the product texture.

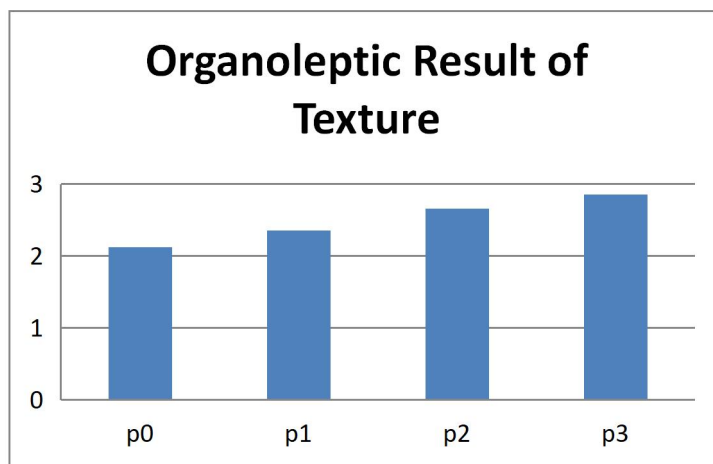


Figure 4. Distribution of Organoleptic Test Result of the Texture of Corn Chicken-feet Nugget

d. Taste

The higher the chicken feet concentrate supplemented in the production of corn chicken-feet nugget, the taste become more favorable. The taste of the nugget is possibly the most influential factor on the likeability of the panelists. The taste of the nugget can almost be ensured to be directly parallel with the likeability of panelists. The savory taste found in almost all meat-based products is the taste cultivated from the existence of high protein, fat, and salt ingredients (Nadia, 2004). The Friedman test (appendix 7) shows that addition of chicken feet has significant influence ($p = 0.000$) on the organoleptic test of the taste.

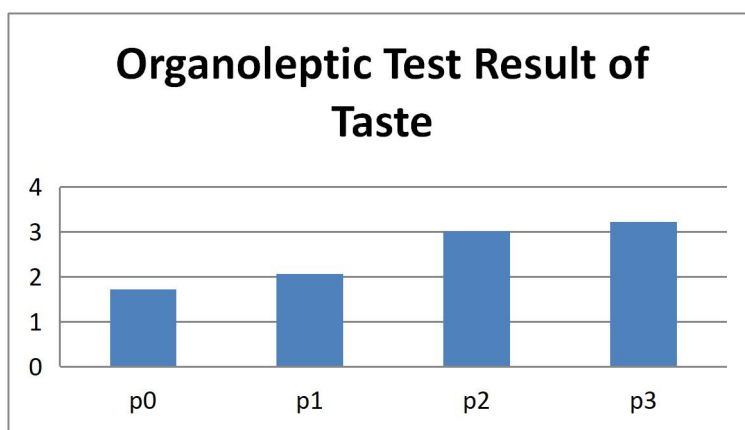


Figure 5. Distribution of Taste Test Result of Corn Chicken-Feet Nugget

IV. CONCLUSION

1. The nutritional value analysis of the three treatments revealed that the highest nutritional value is the third treatment with 30% addition of the chicken-feet, whereas the lowest nutritional value is of the corn nugget with no chicken-feet addition.
2. The most liked color of the treatments is the control treatment with no chicken feet addition.
3. The most liked aroma/ flavor of the corn chicken-feet nugget is the first treatment with 10% addition of chicken feet.
4. The most liked texture of the corn chicken-feet nugget is the third treatment with 30% addition of the chicken feet.
5. The most liked taste of the chicken nugget is the third treatment with 30% addition of chicken feet.

Recommendation

1. Further study on the correlation between length of frying time and the oil temperature in the processing of the corn chicken-feet nugget toward the reduced active ingredients within the nugget due to hydrolysis and oxidation.
2. Further study needs to be considered on the storage time of the corn chicken-feet nugget.
3. Laboratory analysis needs to be carried out to find out the level of Vitamin E within the corn chicken-feet nugget.

REFERENCES

- Andriyani, F. *et al.* (2015) 'Dawet Ceker Ayam "Dawet Kera" Kaya Gizi, Rendah Kolesterol Sebagai Upaya Meningkatkan Kesadaran Gizi Masyarakat.'/'chicken feet dawet "monkey dawet" nutritious, low cholesterol as an effort to increase nutritional awareness of the community, *Fakultas Pertanian Universitas Sebelasa Maret*, 16(2), pp. 39–55. doi: 10.1377/hlthaff.2013.0625.
- Bappenas (2009) *Pengembangan Database Pembangunan Bidang Kesehatan dan Gizi Masyarakat/Development of Community Health and Nutrition Database.*
- Hasanah, F. and Lestari, N. (2018) 'Pengendalian Senyawa Trimetilamin (TMA) dan Amonia dalam Pembuatan Margarin dari Minyak Patin'/'Controlling the Trimetilamin Compound (TMA) and Amoniac in Margarine Production from Patin Fish, 34(2017), pp. 72–80.
- Judarwanto (2006) 'Hubungan pola konsumsi makanan jajanan dengan status gizi dan fungsi kognitif anak sekolah dasar di wilayah Kartasura'/'the correlation between consumption patter of the snacks with the nutritional status and cognitive function of elementary school children at Kartasura area, pp. 1–5.
- Kementerian Kesehatan Republik Indonesia (2019) 'Data Komposisi Pangan Indonesia'. Jakarta: Kementerian Kesehatan Republik Indonesia/Indonesian Food composition. Jakarta: Ministry of Health of The Republic of Indonesia. Available at: https://www.panganku.org/id-ID/semua_nutrisi.
- Muyonga, J. H., Cole, C. G. B. and Duodu, K. G. (2004) 'Fourier transform infrared (FTIR) spectroscopic study of acid soluble collagen and gelatin from skins and bones of young and adult Nile perch (*Lates niloticus*)', *Food Chemistry*, 86(3), pp. 325–332. doi: 10.1016/j.foodchem.2003.09.038.
- Nadia, L. (2004) *Karakteristik Rasa Gurih Pada Beberapa Produk Pangan/the Savory Characteristics of Several Food Products.* Universitas Pertanian Bogor.
- Nasution, E. (2004) 'Efek Suplementasi Zinc dan Besi pada Pertumbuhan Anak'/'the effect of zinc and ferum supplementation on child's growth, *Fakultas Kesehatan Masyarakat.*
- 'Nutrition Data' (2018). Available at: <https://nutritiondata.self.com/facts/custom/1285821/1>.
- Rosmawati (2018) 'Potensi Kolagen Ikan Gabus (*Channa striata*) Sebagai Gelatin Alternatif dan Aplikasinya Dalam Pengolahan Sosis Berbasis Meat By-Product Sapi'/'the potential of snakehead fish as alternative gelation and its application in the production of beef-based saugages , *Journal of Chemical Information and Modeling*, 53(9), pp. 1689–1699. doi: 10.1017/CBO9781107415324.004.
- Shobikhah and Syifaatus (2014) *Eksperimen Pembuatan Kastengel dengan Substitusi Tepung Ceker Ayam sebagai Upaya Peningkatan Gizi/experiment on production of kastengel with substitution of chicken feet flour to increase the nutrition value.* Universitas Negeri Semarang.
- Śmigielka, H. and Le Thanh-Blicharz, J. (2010) 'Research on zinc fortified potato starch and on its use in dessert production', *Acta Scientiarum Polonorum, Technologia Alimentaria*, 9(2), pp. 217–226.
- Soeparno (2005) 'Ilmu dan Teknologi Daging'/'meat science and technology, *Gajah Mada University.*
- Soeparno (2011) *Ilmu Nutrisi dan Gizi Daging./nutrition science and meat nutrition* Yogyakarta: Gadjah Mada University Press.
- Taufik, I. (2004) 'Kandungan Gizi Sifat Fisik dan Organoleptik Bakso Campuran Ampela dan Daging Tulang Ceker Ayam Pedaging'/'the nutrition value, physical atributes, and organoleptic of the meatball made from mixture of heart and liver and chicken feet, *Institut Pertanian Bogor.*
- Tong, T. *et al.* (2010) 'Chicken type II collagen induced immune balance of main subtype of helper T cells in mesenteric lymph node lymphocytes in rats with collagen-induced arthritis', (59 (5)), pp. 369–77.
- Voutila, L. *et al.* (2009) 'No Title', *Journal of the Science of Food and Agriculture*, 89(5), p. 7. doi: 0022-5142.