

THE USE NANOPARTICLES TOMATOES FLOUR AS SOURCE OF FIBER ON CHICKEN NUGGETS

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ABSTRACT

The purpose of this research was to determine the use nanoparticle tomatoes flour as source fiber to increased the quality of chicken nuggets. The materials used in research are nuggets made from chicken meat with optional ingredient other flour tapioca, pepper, onion white, salt, sugar and bread flour. The addition of nanoparticles of tomato flour on chicken nuggets by treatment carried out. Experimental method laboratory used as a method test laboratory. The Completely Randomized Design was used as an experimental design with 4 treatments and 5 replications. The treatment use control that is without the addition of nanoparticles tomato flour (P0), P1 (addition of nanoparticles tomato flour 1%), P2 (2%), and P3 (3%) of the total chicken meat used. The variables measured are protein content, fiber content, pH value, and sensory quality (color, taste, aroma, texture, and acceptance). The addition of nanoparticles tomatoes flour (*Lycopersicum esculentum* Mill) on chicken nuggets gives highly significant effect ($P < 0.01$) on protein content, fiber, pH value, and sensory quality of color, taste, aroma, texture, and acceptance. Protein content in chicken nuggets with addition nanoparticles tomatoes flour (*Lycopersicum esculentum* Mill) produced range between 13.1 – 16.17. The average rate of chicken nuggets fiber range between 0.79 – 1.04%. Chicken nuggets pH value between 5.86 – 6.16. Panelists score on quality organoleptic color chicken nuggets addition nanoparticles tomatoes flour range between 3.15 – 4.50, score taste ranges between 3.25 – 4.65, score aroma ranges from 3.20-4.55 texture range 3.15 – 4.60 dan acceptance 3.40 – 4.70. The research conclusion is the addition of tomatoes flour in the form of nanoparticles could improved the quality of nuggets and additions by 3 percent make chicken nuggets with best quality.

Keywords: Chicken nuggets; nanoparticles; tomatoes flour; filler; fiber

INTRODUCTION

Utilization of carbohydrate industrial complex processing food moment this experience development. One effort to increase value added of carbohydrate complex is to do modification in the form of nanoparticles. Technology nanoparticles will improved characteristics of carbohydrate complex so that have more characteristics good, especially natural physical properties, solubility, stability, and high bonding to the surface active. Technology nanoparticles developed for lower-size carbohydrate complex becomes nano-sized which will be applied to the formulation product meat processed restructuring. Technology restructured meat is one method of processing meat as a step diversification product. The product of restructured meat are nuggets, sausages, cornets, and meatballs. State moment this demand needed which product practical. A number of the weakness of nuggets is less texture compact and solid so that needed ingredient filler, other than that weakness product processed meat restructuration is not enough less fiber and color pulling on the nuggets, so needed ingredient charger that can increase physical quality, chemical, sensory product. One of complex carbohydrate that can be added is vegetables and fruit. Fruit tomatoes in general consumed as a source of fiber, vitamins, and antioxidants. It content lycopene, phenol, and carotenoid are capable play a role as an antioxidant so it could work as an antioxidant (Lin and Chen, 2015). By potential, flour tomatoes contain fiber and nutrients that will increase the quality product. Incorporation of fiber from nanoparticles flour tomatoes will increase

content fiber product processing and improve sensory. The purpose of the studies is to determine the use nanoparticle flour tomatoes as source fiber to improved the quality of chicken nuggets.

MATERIALS AND METHODS

Research Material

Research materials used in this research are nuggets made with ingredient chicken meat using optional ingredient flour tapioca, pepper, onion white, salt, sugar and bread flour. Addition nanoparticles flour tomato on chicken nuggets by treatment carried out.

Research Method

Experimental method laboratory used as method experiment. The Completely Randomized Design was used as an experimental design with 4 treatments and 5 replications. The treatment used control that is without the addition of nanoparticles flour tomato (P0), P1 (Addition of nanoparticles flour tomato 1%), P2 (2%), and P3 (3%) of the total meat chicken used.

Tomatoes flour Preparation

Flour tomatoes were processed with the method of drying and then formed size nanoparticles.

Chicken Nuggets with Addition of nanoparticles Flour Tomatoes Preparation

Chicken meat as ingredient of nugget removed from the fat then washed clean. Meat chicken next grind use *meat grinder* and added ice cubes as well ingredient other flour tapioca, onions white, sugar, salt, pepper, and white eggs. The next stage is to

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add nanoparticles to flour tomatoes in accordance prescribed treatment which is 0%, 1%, 2%, and 3%. Chicken nugget dough with the addition of tomato flour nanoparticles is steamed using a baking sheet for 30 minutes until ripe. Nuggets that have been ripely drained and cooled then greased with use white eggs and bread flour.

Variable Research

The variables measured are protein content with the Kjeldahl method (AOAC, 2005), fiber content and pH value (AOAC, 2005), and sensory quality using Hedonic Scale Scoring (Lawless and Heyman, 1998).

RESULTS AND DISCUSSION

Protein Content

The addition of nanoparticles flour tomatoes (*Lycopersicum esculentum* Mill) on nuggets chicken gives a highly significant effect (P<0.01) on chicken nuggets' protein content. The average of chicken nuggets protein content with addition flour tomatoes nanoparticles presented in Table 1.

Based on Table 1 protein content in chicken nuggets with addition nanoparticles flour tomato (*Lycopersicum esculentum*

Mill) percentages of 0%, 1%, 2%, and 3% range between 13.1 – 16.17. The average highest protein content was found in P3 (addition of flour tomato 3%), whereas the lowest protein content at P0 is without the addition of tomatoes flour. The National Standardization Agency establishes the standard protein content of chicken nuggets (*chicken nuggets*) in SNI 6683: 2014 which is at least 12%. Chicken nuggets protein content with addition flour tomatoes (*Lycopersicum esculentum* Mill) in all treatments different percentage following SNI provisions are > 12 %.

Average chicken nuggets protein content enhancement along increased percentage addition of nanoparticles tomatoes flour. This is caused because the protein contained in flour added to tomatoes influences chicken nuggets' protein content. Form nanoparticles incorporated in the nuggets will be applied evenly to the product. Research results in this are comparable with the study before by Kaur, Kumar, and Bhat (2015) regarding the addition of powder tomato on chicken nuggets that are protein levels have enhancement along increase percentage powder pomegranate with average 17.0% - 17.7%.

Table 1. The Average of protein content, fiber content and pH value of Chicken Nuggets with Addition Nanoparticles Tomatoes flour (*Lycopersicum esculentum* Mill)

Treatments	Protein Content (%)	Fiber Content (%)	pH
P0	13.61 ^a ± 0.26	0.79 ^a ± 0.04	6.16 ^c ± 0.14
P1	14.27 ^b ± 0.23	0.89 ^b ± 0.05	6.07 ^{bc} ± 0.02
P2	15.34 ^c ± 0.36	0.96 ^c ± 0.02	5.99 ^{ab} ± 0.02
P3	16.17 ^d ± 0.26	1.04 ^d ± 0.02	5.86 ^a ± 0.02

Description: ^{a,b,c,d} Different superscripts in the same column show a highly significant effect (P<0.01)

Fiber Content

The addition of nanoparticles tomatoes flour (*Lycopersicum esculentum* Mill) on nuggets chicken gives a highly significant effect (P<0.01) on rate fiber. Average rate fiber nuggets chicken with addition flour tomatoes nanoparticles presented in Table 1.

The mean value of chicken nuggets fiber with addition nanoparticles tomatoes

flour (*Lycopersicum esculentum* Mill) ranges from 0.79-1.04. Average rate fiber highest are in treatment addition of 3 percent, and the value of average rate fiber lowest in treatment control. The enhancement rate of chicken nuggets fiber could be caused by the content of fiber in the flour used in tomatoes. The fiber content of flour and tomatoes used in the study this by 24%.

Based on the results research could be known that the more high amount of nanoparticles tomatoes flour (*Lycopersicum esculentum* Mill) on chicken nuggets, the average score rate of fiber will the more increase, and vice versa the more low percentage addition flour tomato on chicken nuggets will produce rate fiber more rough low. Chicken nuggets with the addition of flour spinach by 3% can increase the rate of fiber in chicken nuggets that are treatment control has a protein content of 2% (control) to 8% in the treatment add 5% flour spinach (Tamsen, Shekarchizadeh and Soltanizadeh, 2018). Chicken nuggets with addition flour leaf moringa 20% percentage contain a rate fiber of 3.4% while treatment control without addition flour leaf moringa has a rate fiber of 1.8% which means occur enhancement rate significant fiber (Santi, Triwidiarto, Syahniar, Firgiyanto, and Octafa, 2021).

pH Value

The addition of nanoparticles tomatoes flour (*Lycopersicum esculentum* Mill) on nuggets chicken gave a highly significant effect ($P < 0.01$) on the pH value. Average pH of nuggets chicken with addition flour tomatoes nanoparticles presented in Table 1.

Chicken nuggets pH value with the addition of nanoparticles tomatoes flour ranges between 5.86 - 6.16. Nuggets pH value with addition flour tomatoes nanoparticles along enhancement percentage flour experience decline.

The average pH of chicken nuggets with the addition of nanoparticles in flour tomatoes was influenced by the pH value of flour tomatoes of 4.2. Raw material pH value and treatment physical on chicken nuggets are factors that can influence the high or low pH of chicken nuggets. During the cooking process could lower the group is acidic so that increment at point isoelectric (Rahmawati and Indrawan, 2021). Product food made from base meat has a pH value that can be influenced by the ingredients used.

Meat who have not been cooked has a pH range of between 5.5 – 5.9, while product results in processed meat will have more pH value because during the cooking process occur release base and acid histidine (Hafid, Nuraini, Agustina, Fitrianiingsih, Indrawati, and Hasnudin, 2018). A decrease in the pH of the nugget can be caused by the compounds formed as a result of the process of protein breakdown by microorganisms and the form of acid lactate (Ismed, Sayuti, and Andini, 2017).

Sensory Evaluation

Score of sensory evaluation showed that the addition of nanoparticles flour tomatoes (*Lycopersicum esculentum* Mill) on nuggets chicken with different percentages gave highly significant effect ($P < 0.01$) on quality organoleptic color, taste, aroma, texture, and level reception. The average quality chicken nuggets organoleptic with addition nanoparticles tomatoes flour could be seen in Table 2.

Table 2. Score Sensory Quality of Chicken Nuggets with Addition Nanoparticles Tomatoes Flour (*Lycopersicum esculentum* Mill)

Treatments	Color	Taste	Aroma	Texture	Acceptance Rate
P0	3.15 ^a ± 0.49	3.25 ^a ± 0.96	3.20 ^a ± 0.82	3.15 ^a ± 0.50	3.40 ^a ± 0.82
P1	3.30 ^a ± 1.29	3.75 ^{ab} ± 0.50	3.60 ^{ab} ± 0.82	3.30 ^a ± 0.58	3.70 ^{ab} ± 0.58
P2	3.90 ^{ab} ± 0.58	4.35 ^{ab} ± 0.50	3.85 ^{ab} ± 0.85	3.60 ^{ab} ± 0.82	4.35 ^{ab} ± 0.50
P3	4.50 ^b ± 0.58	4.65 ^b ± 0.50	4.55 ^b ± 0.50	4.60 ^b ± 0.82	4.70 ^c ± 0.58

Description: ^{a,b,c,d} Different superscripts in the same column show a highly significant effect ($P < 0.01$)

Color

Table 2 showed that the score panelist on quality sensory color chicken nuggets

addition nanoparticles flour of tomatoes percentages of 0%, 1%, 2%, and 3% range between 3.15 (a bit liked) – 4.50 (liked very

much). Based on score the could is known that the more percentage of addition nanoparticles tomatoes flour on chicken nuggets, the more panelists the more like the resulting nuggets. Color is one indicator important in the assessment product end to use increase interest panelists to something productive. That thing is suspected because the content of carotenoids in flour tomatoes, so causes the color nugget the more yellow. Characteristics color flour tomatoes that are color orange (Fitri, 2018). Fruit tomatoes contain source beneficial nutrients including vitamins A and C, lutein, lycopene, flavonoids, beta-carotene, and have the color red from lycopene (Dewi, 2018). Color pigment natural in tomatoes could reduce the oxidation (Ariyanti, Masruriati, Lindawati, Setyowati, and Nurulita, 2022).

Flavor

Quality quality of chicken nugget tastes addition nanoparticles tomatoes flour range between 3.25-4.65. Quality score highest taste organoleptic found in the P3 treatment with a score where the taste of the nuggets is balanced among meat with flour tomatoes, while score lowest contained in P0 which shows that the taste of meat chicken more dominant and savory. Ingredients used in chicken nuggets affect the taste of the product end. In addition to nanoparticles, flour tomatoes give an effect *after taste on* chicken nuggets moment consumed. That thing is caused by the sour taste in tomatoes (Saloko, Handito, Rahayu, Rahman, and Dwiani, 2019). The sour taste in tomatoes shows the existing content of vitamins A and C, as well as could hinder happening changes in taste during the storage process (Jannah, Suwita, and Jayadi, 2021). Tomato added to *yogurt* gives enhancement to favorite panelists' taste, and panelists have a favorite level of different acids (Savitry, Nurwantoro, and Bhakti, 2017).

Aroma

Table 2 shows that the score sensory evaluation of aroma of chicken nuggets

addition of nanoparticles flour tomatoes range between 3.20-4.55. Quality scores highest aroma organoleptic found in P3 treatment with a score where the aroma of nuggets is accepted by panelist while scoring lowest in treatment control that shows that the scent is kind a liked, panelist. The Average score sensory evaluation aroma show that the more high percentage flour tomato nanoparticles used in nuggets, the aroma of meat with special scent mix flour tomato nanoparticles more liked by the panelists.

That is because chicken nuggets with addition flour tomatoes have a meaty smell with fusion distinctive tomato aroma. The addition of tomatoes flour can increase the aroma of the product, so that has a distinctive aroma originating from tomatoes (Talib, 2019).

Texture

The quality score of texture chicken nuggets addition nanoparticles tomatoes flour range between 3.15 – 4.60. Based on score the could is known that the higher percentage addition flour and tomato nanoparticles on chicken nuggets, the more texture nuggets are getting liked by the panelists. Adding flour and more tomatoes increasing the production of more and more nuggets solid.

This is caused by the content of fiber in flour tomatoes, as well as from flour-deep tomato nanoparticles. The smaller size flour tomatoes could repair texture more and more nuggets solid and not hollow. Nuggets with the added sweet potato flour purple produce a fine texture, due to the particle mesh size of sweet potato flour purple and the content carbohydrate complex (Ratulangi and Rimbing, 2021).

Acceptance Rate

Acceptance rate chicken nuggets with addition flour tomato nanoparticles could be accepted by panelists with level excellent reception 3.40-4.70. One assessment used for giving decision received or no product food is level reception. Acceptance rate

obtained from the evaluation of whole component sensory evaluation that is color, taste, aroma, and texture product. Nuggets chicken with addition flour tomatoes nanoparticles as much as 3% accepted by the panelists. Nuggets were liked by panelists based on sensory evaluation. In addition flour tomatoes nanoparticles on chicken nuggets give colors that can be interesting to panelists are yellow and golden. Nuggets Flavor the resulting chicken could balance the savory taste of meat chicken and flour fresh tomatoes.

The aroma of chicken nuggets also has a different variant a consequence distinctive aroma of tomatoes. The important thing next is the texture formed on the product end. Adding nanoparticles flour tomatoes could increase the texture of *nuggets*. The resulting texture the more compact and solid if compared with *nuggets* without addition. Based on sensory evaluation, chicken nuggets with the addition of flour tomatoes nanoparticles could accept and like by the panelists.

CONCLUSION

The research conclusion is the addition of flour tomatoes in the form of nanoparticles could improved the quality of nuggets and additions by 3 percent make chicken nuggets with quality best.

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