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Characteristic Evaluation of Antioxidant Edible Coating Based on Gelatin Broiler Chicken Feet Skin with Addition of Liquid Smoke

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Abstract. The purpose of this study was to evaluate the characteristics of gelatin application from broiler chicken skin as an edible coating that has the potential of antioxidant with liquid smoke. The research method was using Completely Randomized Design (CRD) from gelatin based edible coating from broiler feet skin with smoke concentration treatment each: 0%; 0.5%; 1%; 1.5% and 2%. The results showed that the addition of liquid smoke to a concentration of 2% gave the best results both from the organoleptic aspect (color and aroma) and from the aspect of its antioxidant potential (phenol). Observation of edible microstructure through SEM test on addition of 2% liquid smoke concentration showed edible component composition of edible formula more homogenous than other treatments. The conclusion that the use of liquid smoke as a source of antioxidants has provided an edible alternative to potentially antioxidant characteristics. The concentration of liquid smoke added to this edible preparation of 2% received a positive response of color and taste aspects and contained the highest antioxidant potential.

***Keywords*: Liquid smoke, gelatin, edible coating, antioxidants**

I. INTRODUCTION

Edible Coating is one type of edible film whose function can be used as a natural packing material through dyeing method. The characteristic of this edible is biodegradable that is environmentally friendly and easily degradable. In food products, this thin film serves to inhibit the displacement of water vapor [1], and gas exchange [2], prevents aroma loss and fat transfer [3], improves physical, and as an additive and eco-friendly carrier [4][5].

The materialof edible coating was from the results of collagen protein extraction on animal skin called gelatin. One of the gelatin ingredients is from the utilization of collagen protein extract on broiler chicken skin. Potential use of gelatin from collagen protein extraction results on broiler chicken skin as raw material for making edible coating need to be developed. This is because edible coating has functional properties that are capable of carrying additives and are environmentally friendly [4][5] so that these advantages can be innovated with the addition of potential additives to enrich the characteristics of edible coating, specifically function as a natural packaging that has antioxidant potential.

The use of liquid smoke as an effort to improve the quality of edible coatings that potentially antioxidants need to be developed. Liquid smoke is a product of lignin pyrolysis and cellulose in hardwoods, such as hardwood from coconut shell and produces organic acids, phenols, carbonyls which play a role in food preservation [6]. The potential of this liquid smoke when formulated on gelatin-based edible coating of broiler chicken skin will produce edible coating which also has functional properties (antioxidant properties). The purpose of this study was to evaluate the potential of liquid smoke as an antioxidant source in edible coating through observation indicators of chemical quality and organoleptic edible coating and observation indicator by Scanning Electron Microscope (SEM) method.

II. RESEARCH METHOD

Materials

The main material of the research is gelatin from the results of hydrolysis of collagen protein of chicken broiler skin feet, glycerol, and liquid smoke from coconut shell.

Supporting materials in edible coating process and quality test include: aluminum foil, clear plastic, NaCl 40% (w/v), silica gel and other supporting materials ie ethanol, acetic acid, HCl, NaOH, bicromalcalium, Buffer pH 4.00, buffer pH 7.00, buffer pH 9.00, phenolphtalein (pp), aqueous, deionized water, ordinary filter paper, and Whatman filter paper.

Method

Produced edible coating with gelatin raw material from broiler chicken skin and glycerol as a plastizer and formulated with liquid smoke at different concentrations. The process of making edible coating is done by casting method according to [7][8] with slight modifications. The research design was carried out experimentally based on a Completely Randomized Design (CRD) with 5 types of liquid smoke treatment with concentrations (0%, 0.5%, 1%, 1.5% and 2%). Each combination of treatments applied was repeated 5 times. The data obtained were analyzed in a variety of ways with the help of SPSS Version 20.0 statistical program. The treatment showed a significant effect, then tested with the Duncan's Multiple Range Test (DMRT) at 5% level [9]. The evaluation of the quality of edible coating smoke was measured using chemical test variables (protein content, fat content, ash content and phenol); organoleptic test (color and aroma) and observation of edible coating morphology with SEM.

III. RESULTS AND ANALYSIS

The use of liquid smoke at 0%; 0.5%; 1%; 1.5% and 2% have resulted in new edible coating characteristics. The result of statistical analysis (Table 1) showed that the color and aroma of edible coating produced on treatment A4 got the highest score ($P<0.05$). Increasing the level of addition of liquid smoke increases the preferred edible coating color. The average result of the edible color score is in the range of 1.2 – 1.6 that is on the preference scale with criteria approaching preference. The brown color of the edible coating come from the color character of the liquid smoke itself, which is the interaction of gelatin protein from the skin of broiler chicken feet with carbonyl groups in liquid smoke. As it is known that carbonyl groups are an important component also found in liquid smoke [10] and contribute to the edible coating color aspect. Similarly shown in statistical studies on the variable aroma of edible coating. The result of statistical analysis shows that the increase of liquid smoke addition can increase the preference for edible coating ($P<0.05$). The average score of aroma preferences ranged from 1 to 1.6 i.e. in the range close to the preference criteria. The high content of phenol and acetic acid in liquid smoke [6] gives the panoramic effect which is favored by the panelists as it increases the addition of the liquid smoke. Therefore, the addition of liquid smoke to the edible coating provides a new addition to the edible coating that is the smell of antioxidant-functioning smoke.

TABLE 1.
PANELIST RESPONSE TO EDIBLE COATING QUALITY
WITH ANTIOXIDANT FROM LIQUID SMOKE ADDITION

Variable	Treatment				
	A0	A1	A2	A3	A4
Color	1.2 [a]	1.4 [ab]	1.2 [a]	1.6 [b]	1.6 [b]
Aroma	1 [a]	1.2 [a]	1.4[ab]	1.4 [ab]	1.6 [b]

The level of chemical quality of edible coating smoke shown similar result. In Table 2, it shows that the increase of liquid smoke concentration has significant effect ($P <0.05$) on protein content. The tendency to increase the level of liquid smoke increases the edible protein content. This gives more added value, considering the addition of edible function that as well as antibacterial and antioxidant also provide added value of protein in edible. Increased protein content is thought to be due to the nature of the phenol that degrades the fat to give a portion of the increased protein percentage.

The content of edible lipid coating (Table 2) with an increase in liquid smoke concentration level was significantly different ($P<0.05$). Increased levels of liquid smoke tend to decrease edible coating fat content. The chemical properties of fat in gelatin from broiler chicken skin extract are non polar and dissolved by the addition of liquid smoke. This

is due to the high content of phenol in liquid smoke [6]. This phenol content has the potential to degrade edible fats through the antioxidation mechanisms of the phenol and fat interactions. This is evidenced by the decreasing average of ash content of edible coating along with the increase of liquid smoke concentration ($P<0.05$).

The result of statistical analysis showed the increase of liquid smoke concentration significantly increased the content of phenol in edible ($P<0.05$). This increase is thought to be caused by the high content of phenol in liquid smoke. According to [11], most of the compounds identified in the smoke component are phenol, acids, aldehydes, ketones and alcohol derivatives. This is supported also by [6] which states that the content of phenols in liquid smoke is very dominant and the content of phenol is indicative of the antioxidant properties in the fat fraction in gelatin-based edible coating of broiler chicken skin.

TABLE 2.
EDIBLE COATING CHEMISTRY QUALITY WITH ANTIOXIDANT FROM LIQUID SMOKE ADDITION

Variable	Treatment				
	A0	A1	A2	A3	A4
Protein	4.96 [a]	6.33 [c]	5.83 [b]	7.16 [d]	6.79 [d]
Fat	2.39[c]	2.12 [c]	1.50 [b]	1.39 [b]	1.10 [a]
Ash	0.18 [b]	0.11 [a]	0.13 [a]	0.16 [b]	0.12 [a]
Phenol	8.68 [a]	13.35 [b]	14.78 [c]	27.30 [d]	34.22 [e]

The next step is to test the morphology of quality in edible coating from the addition of liquid smoke through SEM test approach. The result of the observation in Fig. 1-5 shows that the formulation of edible coating with the main ingredient of gelatin from broiler chicken skin and glycerol and with the addition of liquid smoke at different level shows different morphology. Increased concentrations of liquid smoke tend to show the distribution of the formula components more evenly. Without the addition of liquid smoke, the unequal edible coating morphology (Fig. 3) and liquid smoke concentration up to 1.5-2% of the overall edible coating morphology of the components are evenly distributed. The main components in the aqueous smoke of acetic acid and phenol [6] and increased concentrations of liquid smoke can increase the content of phenol in edible coating (Table 2) and though to contribute positively in assisting the equality of all the components bound in the formulation.

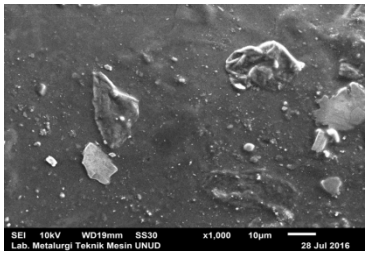

Fig 1. Edible Coating Without Liquid Smoke Addition

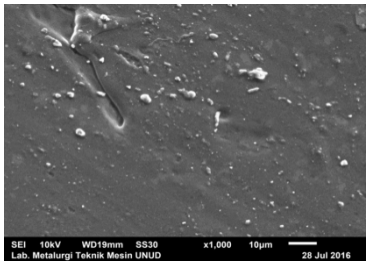

Fig 2. Edible CoatingWith 0.5% Liquid Smoke Addition

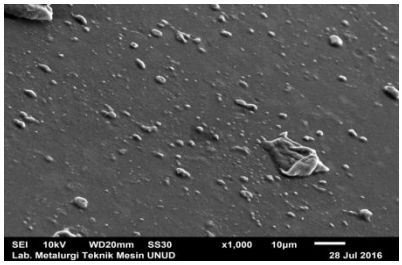

Fig 3. Edible CoatingWith 1% Liquid Smoke Addition

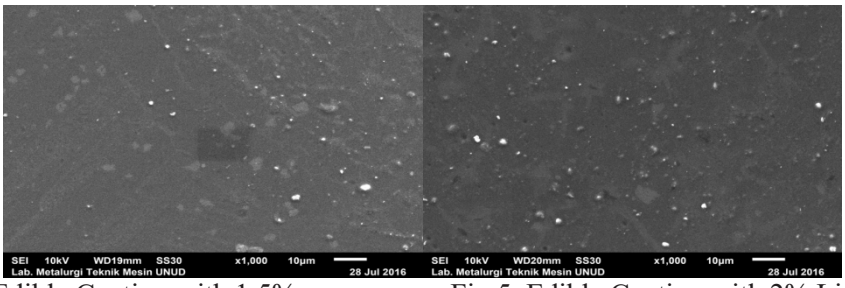

Fig 4. Edible Coating with 1.5% Adition Liquid Smoke Addition

Fig 5. Edible Coating with 2% Liquid Smoke Smoke Addition

IV. CONCLUSION

The study conclude that the use of liquid smoke as a source of antioxidants has provided an alternative to gelatin-based edible coating of broiler chicken skin feet. The concentration of liquid smoke added to this edible preparation with 2% received a positive response in the highest levels of both color and aroma as well as with the highest antioxidant potential (from the indicator of phenol content in edible coating).

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