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SHELF LIFE OF DODOL PACKED BY EDIBLE FILM

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Abstract. The aim of the study was to determine the shelf life of dodol packed by edible film. Dodol, food product made from a mixture of sugar and lipid, was studied by using packaging and without packaging. The edible film was used as packaging. The results showed that dodol packed by edible film had a significant effects on its water contents and total yeast and molds. These may extend the shelf life until 9 days.

1. Introduction

Dodol is one type of traditional food that is quite popular in Indonesia. Dodol is classified as a semi-wet food (Intermediate Moisture Food) which is generally made from raw materials glutinous rice flour, sugar merrah and coconut milk cooked until thick. Has a sweet taste and tasty with brown color and has a soft texture [1]. According to SNI 01-2986-1992, dodol is a food product made from flour sticky rice, coconut milk, and sugar with or without the addition of ingredients other allowable food which is processed until it becomes a semi-wet food chewy texture, has a sweet taste, can be eaten immediately and packaged with plastic primary packaging with small size and secondary packaging in the form of plastic or boxes. Based on the basic ingredients, dodol is grouped into 2, namely flour-based dodol, among others: rice flour, flour sticky rice, and dodol made from fruits [2]. For extending the shelf life of dodol, these will need the packaging.

Nowadays, there are many types and forms of packaging design, but most come from plastic-based packaging in which plastic has properties that cannot be deciphered biologically and are not environmentally friendly. So that other alternative packaging that is biodegradable is chosen, namely edible film. Edible film (thickness <254 μm) or sheet (thickness> 254 μm) is a stand-alone structure package that is formed separately from food and then superimposed or made in the form of sealed edible pouches on food, this packaging is biodegradable or can be decomposed biologically [3]. Edible film serves as a barrier (barrier) to the mass (humidity, oxygen, light, volatile gases, lipids, solutes), addictive carriers, vitamins, minerals, antioxidants, antimicrobials, preservatives, ingredients to improve the taste and color of packaged products and facilitate handling food and serves to protect food from physical, chemical and microbiological damage [4]. According to Robertson [3] edible film has several advantages compared to polymer-based petrochemical packaging such as being edible (not leaving no packaging waste), environmentally friendly, maintaining the organoleptic nature of food ingredients such as flavor, color and components in food, enhancing nutritional value to food, being single packaging for small sized products, being applicable for heterogeneous foods such as pizza,

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sweets and pies, convenient to be used for microencapsulation food flavoring and leavening agents. Edible films are made using edible compounds which come from various renewable sources. Edible film formulations use at least one component capable of forming a continuous and cohesive matrix, as a characteristic of polymeric materials [5]. The polymer used can be homopolymer, heteropolymeric or a mixture of both depending on the edible film made, can be from one type of polymer or from a polymer mixture [6]. Polysaccharides, proteins or lipids are used in making edible films or coatings in various forms (simple or composite materials, single layers or multilayer films). Polysaccharide polymers can be cellulose such as CMC, starch, chitosan, carrageenan and pectin. Protein polymers can be gelatin, sine and whey and lipid polymers can be acetyl triglycerides, waxes and resins. In addition to the polymer base material, additional ingredients are also added to make edible films consisting of two groups, namely additives to improve its functionalities such as plastilicizer, emulsifier and ingredients to improve the quality, stability, and safety of edible films such as antimicrobial, antimicrobial, nutritional, flavor and flavor ingredients dyes [7].To do so, by using edible film in food, it may enhance the shelf life by reducing the mold and yeast in food product.

There are many studies about edible film in food. However, it is still limited study about the shelf life of dodol packed by edible film. The aim of this study is to determine the shelf life of dodol packed by edible film.

2. Material and methods

2.1. Essential oil
Dodol was purchased from local market which is produced at first day.

2.2. Preparation of edible film with antioxidant
Alginate-based edible films were prepared by modification of the method used by Pavlath *et al*. [8]. Sodium alginate (1 g) was dissolved into 100 mL of distilled water and rotary shaking was done concurrently. As the alginate film was brittle, 0.4 mL of glycerol was added into the edible film solution. Vegetable filtrate or BHT was incorporated into the edible film solution at 30 % v/v of edible film forming solution. The solutions were cast onto 12 - 16 cm of polyacrylic plates followed by air drying at room temperature 24 h in UV laminar floor. The dry films obtained were peeled off and stored for evaluation.

2.3 Water content [8]
The mashed sample is weighed in 1-2 grams and then dried in an oven at 100-105 ^{o}C for 3-5 hours. The plates were weighed again after being cooled in a desiccator for 15 minutes. This was done many times until the weight of the constants was reached. Water content was recorded as %.

2.4. Total yeast and mold [9]
A total of 25 gram dodol packed by edible film was mixed with 225 ml sterilized water and homogenized by using stomacher bag. These was diluted to 10^{-1} to 10^{-5}. A total of 100 µL of aliquot was streaked plates onto Rose Bengal Agar Base (Himedia, India) and Potato Dextrose Agar (Merck, Germany) for yeast and mold. This was incubated at 25 °C for 5 days. Total of bacteria, yeast and mold was recorded as CFU/gram.

2.5 *Statistical Analysis*
By using t test (SPSS version 13.0), the differences of microbiological quality between dodol packed with edible film and control were determined at a significance level of $P < 0.05$.

3. Results and Discussion

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Dodol is a semi-wet product that is easily contaminated by mold . To do so, total mold and yeast will be an important parameter to determine the shelf life of dodol. Based on t test showed that there was significant difference between dodol packed by edible film and control during storage for 0 days, 3 days, 6 days and 9 days. All food ingredients have different water contents. Water content in food plays a role in determining the acceptability, freshness and durability of these foodstuffs [10]. Water content in food plays an important role in determining the shelf life of ingredients. A small water content will affect the shelf life of food, because it can inhibit the activity of microorganisms [11]. There were significant differences between the two treatment factors for dodol water content. Without the packaging of edible film, dodol has a relatively higher water content and experiences an increase in water content faster during storage compared to dodol packed by edible film (fig. 1). The initial water content of dodol on the 0th day was obtained a value of 17.71% which had fulfilled SNI 01-2986-1992, where the quality requirements of dodol were to have a maximum moisture content of 20%. The increase in water content during storage is caused by the absorption of water vapor from the environment [12]. Increased water content during storage can also be caused by the activity of microorganisms, where the activity of these microorganisms can affect the occurrence of physical, chemical, microorganism and organoleptic changes. The metabolism of microorganisms results in decomposition, one of which is carbohydrate breakdown. CO2 and H2O are the result of the breakdown of carbohydrates by microorganisms, especially aerobic microorganisms [1]. According to Rauf [12], high water content in food can be a sign that the water activity of the material is also high. But the water content does not absolutely determine the high or low water activity.

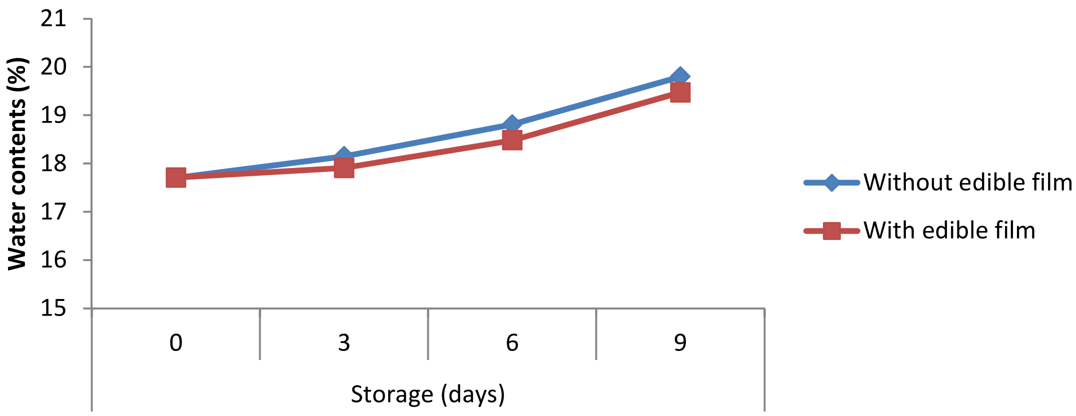

Figure 1. Water contents of dodol

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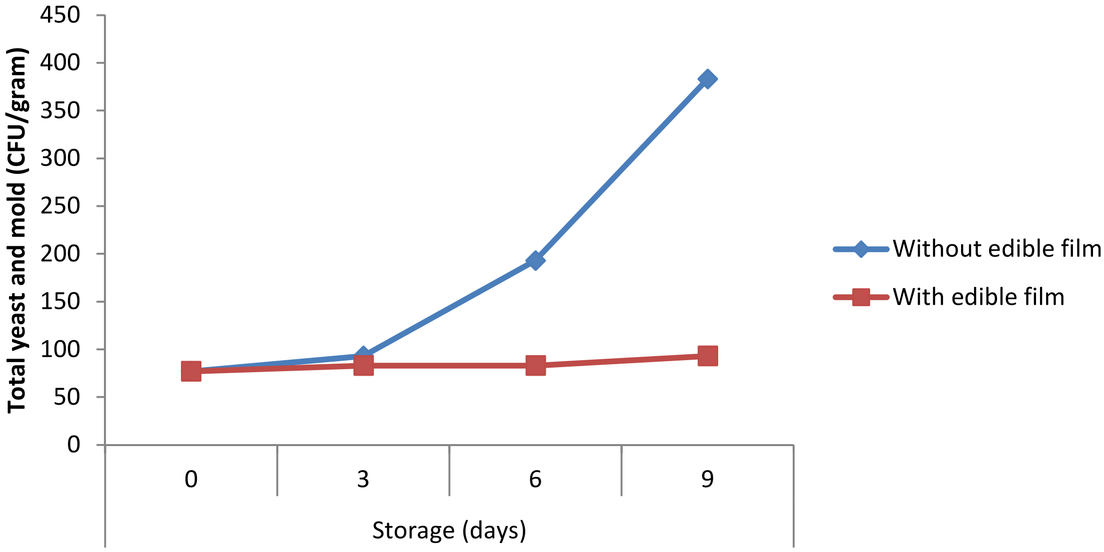

Dodol packed by edible film has a different total yeast and mold during storage because the activity of microorganisms is influenced by the moisture content of the material. The activity of these microorganisms determines the stability of food product [13]. Based on the test parameters of the moisture content in the previous discussion, it was found that the water content of dodol packed by edible film was relatively lower than the water content of dodol without packed by edible film. However total yeast and mold was not directly proportional to the result of water content. This is likely to occur because the water contained in the form of bound water. According Winarno [10], the water content in food that affects to the growth of microorganism was caused by activity water (*aw*). High water content in food can be an indication that the activity water of a food product might be high, but the high and low of *aw* is absolutely not affected by the water content of a food ingredient [12]. Dodol packed by edible film may reduce the growth of yeast and mold. These may extend the shelf life until 9 days due to reducing the decaying of nutrition in food products as a intrinsic factor of microorganism.

5. Conclusion

Dodol packed by edible film may reduce water content and the growth of yeast and mold which may extend the shelf life until 9 days.

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