Edible Film from Corn Cob and Plasticizer with Mixing Process

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Abstract. Plastic substitute material with biodegradable vegetable plastic in the form of edible film is an alternative material for vegetable plastics that can decompose naturally. The raw material for an edible film consists of corn cob flour and a mixture of plasticizers in the form of glycerol and sorbitol. The process of mixing edible film raw materials by means of dispersion, heating, printing, and drying. Variable corncob flour is 5-9 grams and the ratio of plasticizer glycerol-sorbitol is 0.25-4. These characteristics incorporate the esteem of malleable quality with the biggest esteem of 0.536 MPa and the littlest 0.066 MPa. The esteem of elongation with the biggest esteem of 21.4% and the littlest 4.1%, film thickness with the biggest esteem of 0.26 mm and the littlest esteem of 0.12 mm, and water vapor penetrability with the biggest esteem of 11.83 gr/m2 day and the littlest 8.86 gr/m2 day. The most excellent consumable film comes about was gotten at the proportion of glycerol-sorbitol plasticizer 1.0 and 7 grams of corn cob flour. Based on the characteristics of tensile strength, elongation, film thickness, and water vapor permeability, the results obtained to the requirements of edible films, but are still below the requirements of the Japanese Industrial Standard (JIS).

Keywords: Corn Cob, Edible Film, Plasticizer, Mixing Process

1 Introduction

Worldwide increment in the plastic generation is causing genuine natural issues, with can be since plastic is inalienably safe from disintegration. The edible film is elective to actually break down bundles, characterized as a lean polymer layer that acts as an obstruction to edible gas and dampness. Commonly utilized fixings within the generation of eatable movies drop into three categories: hydrophilic colloids, lipids, and composites [1]. Starch may be a polymer commonly utilized as a crude fabric within the make of consumable starch sheets. Starch is economical, reproducible, and has amazing physical properties, making it broadly utilized within the nourishment industry as a biodegradable film to supplant plastic polymers. The utilization of a single fabric within the generation of eatable movies has a few disadvantages, counting brittleness and unbending nature.

Subsequently, it is vital to include an extra fixing, an emollient. Plasticizers are known as added substances within the generation of eatable movies that offer assistance upgrade versatile properties. Consumable movies have ideal conditions in the event that the composition of the blend can deliver standard physical and mechanical test values [2]. The higher starch concentration used better the edible film. In their study, they used the best composition of cornstarch obtained. The cornstarch concentration is 3 %, the black turmeric juice is 7 %, and the edible film has a water vapor transmission rate of 0.50 gr/m2. Time, thickness 0.17 mm, tensile strength 7.90 N/cm2, elongation 24.44% [3]. In expansion to the concentration of the plasticizer, the sort of plasticizer utilized moreover contains a noteworthy impact on the properties of the eatable film. In their consideration, the kolang kaling fixing was utilized with plasticizers, glycerin, sorbitol, and polyethylene glycol. The most excellent treatment gotten is to utilize sorbitol at a concentration of 3 %. The coming about parameter values of 0.12 mm thick, water vapor porousness 4.34 gr/m^2 time, malleable quality 2.83 N/cm^2, and stretching 44.65 % [4].

The hypothesis of this study is that the composition of edible film ingredients such as corncob starch, sorbitol, and glycerin may affect edible film properties such as tensile strength, edible film elongation, and water vapor permeability. is. This study aims to characterize edible films made from corn cob starch. Then use the casting process to create the edible foil. Not as it was decided the composition of corn cob starch and plasticizer that can create eatable movies with the leading properties. The cob is the biggest portion of corn squander. Corn cobs contain 40-60 % cellulose, 20-30% hemicellulose, and 25-30 % lignin. The starch substance of corn cobs is 27.1 % [5]. starch could be a broadly utilized fixing within the nourishment industry as a

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biodegradable film planned to supplant plastic polymers since it is prudent, reproducible, and offers amazing physical properties [6]. The starch properties can be very strong against the foil, making it suitable for edible foil as a material. Edible film starch-based products have the weakness of poor water and moisture resistance because starch hydrophilicity can influence its soundness and mechanical properties [7]. Plasticizer-based non-volatile materials are included in film arrangement as hydrophiliccolloidsan arrangement to reestablish the adaptability of consumable movies. Commonly utilized plasticizers are glycerin, sorbitol, polyol (propylene glycol), polyethylene glycol, and oligosaccharides [8].

Based on the Japanese Mechanical Measures (JIS), the standard most noteworthy thickness of the consumable film is 0.25 mm, the slightest bendable quality is 0.392 MPa, the most prominent water vapor penetrability is 10 g/m2 days, and the prolongation is the slightest standard. 10 % [9]. The edible film is a thin layer that acts as food wrap and can be consumed. Edible film materials are relatively inexpensive, easy to disassemble, and the manufacturing process is very simple. Examples of the use of edible foil as candy wrappers, sausages, fruits, and dry soups [10]. Factors to consider when making edible films are temperature, plasticizer, and concentration of ingredients. Heat while mixing. This is done to achieve complete starch gelatinization. A temperature of 70 °C is used to make edible foil [11].

Plasticizers increment polymer portability hence increment the adaptability of consumable movies crude concentration materials feature an incredible impact on the physical properties of eatable movies in specific. Crude higher concentration fabric utilized, the thicker and more grounded the fabric [12]. Known as a hydrophilic plasticizer, glycerol is reasonable for including hydrophobic substances such as starch, pectin, gels, and proteins in molding fabric movies, glycerin acts as a plasticizer that increments the adaptability of the film [13].

From past thinks about consumable movies, this consider utilized starch from corn cob trimmings weighing 5-9 grams as crude fabric, and glycerin and sorbitol in a proportion of 0.25-4 as plasticizers. The edible film is delivered by a blending handle by scattering the crude materials, warming the blend, printing, and drying the edible film.

2 Research Method

The materials utilized in this think were corn cobs, H2O, carrageenan, NaOH, glycerol, and sorbitol. Making starch from corn cobs is done by cutting corn cobs into little pieces, and doused with NaOH for 12 hours to evacuate the lignin substance. The corncobs were washed with water and ground, the mash was pressed out with a channel cloth, and the filtrate was cleared out for one day to create starch stores. The starch accelerate is dried within the broiler to expel the dampness substance, after drying the starch is ground with a mortar until smooth, and at that point sieved so that the measure is homogeneous.

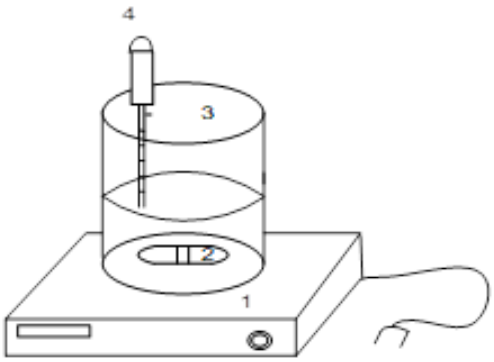

Fig. 1. Investigate apparatuses blending prepare consumable film from corn cobs.

Captions Caption:
1. Electric stove
2. Magnetic stirrer
3. Mixer tank
4. Thermometer

Starch from corn cobs was weighed with a weight of 5-9 grams. Starch from corn cobs was included with a blend of glycerol and sorbitol in a proportion of 0.25-4 and after that included with refined water until the arrangement come to 100 mL in a measuring utensil glass. The blend was mixed with an attractive stirrer with a revolution of 400 rpm, warmed to a temperature of ± 70 °C, and mixed for 20 minutes. Arrangement eatable film keeps mixing whereas cooling to room temperature to avoid discuss bubbles from shaping amid printing. Arrangement consumable film was printed on a glass plate and after that dried at 60 °C for 7 hours. After drying, the film was cooled to room temperature. The analysis was carried out using Autography performing a tensile test and recording the stress-to-strain as well as the highest point of the stress-strain curve, and performing water vapor permeability analysis by taking into account the initial weight and final weight of the sample.

3 Results and Discussion

Based on the results of research that has been carried out where, on the relationship between the ratio of glycerol-sorbitol to the thickness value of the edible film, it is found that the thickness value is quite fluctuating, especially at the starch weight of 5 gr and 6 gr. However, at a starch weight of 7 gr where the greater the glycerol composition and the smaller the sorbitol composition, the thickness value decreases. The value of edible film thickness is very unstable and is unequivocally impacted by human factors.

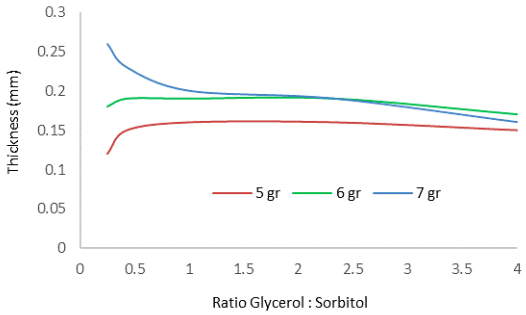

Fig. 2. Relationship between Ratio Adsorbent and Starch at Thickness.

The thickness result of the eatable film (see Fig. 2) where the most noteworthy thickness was found within the proportion of glycerol-sorbitol 0.25 and starch weight of 7 gr, which was 0.26 mm, and the least abdicate was at a glycerol-sorbitol proportion of 0.25 and a starch weight of 5 gr, which was 0.12 mm. Almost all thickness values edible film results of this study have met the standards based on Japanese Industrial Standard where is thickness edible film is stated that the maximum is 0.25 mm, but there is still one thickness of the edible film that does not match Japanese Industrial Standard namely the ratio adsorbent of 0.25 and feed starch of 7 gr. Then for the influence of starch weight on the thickness of the edible film, it can be seen that the more starch, the more prominent the esteem of the thickness of the consumable film. The increment within the concentration of the fabric within the suspension eatable film causes the entire sum of solids contained an unpalatable film to induce greater so that after the suspension book of scriptures film dried at that point consumable film what is gotten is thicker [5].

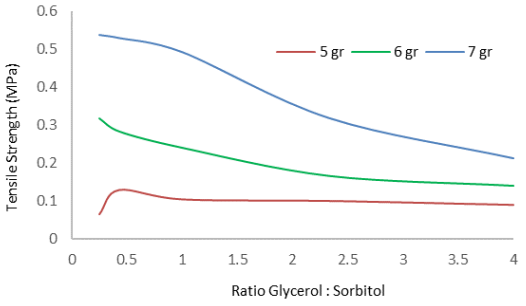

Fig. 3. Relationship between Ratio Adsorbent and Starch at Tensile Strength.

The results of the tensile strength (see Fig. 3), where the highest tensile strength is at the ratio of glycerol and sorbitol 3:7 and starch weight are 7 gr, which is 0.536 MPa. The lowest yield was shown in the ratio of glycerol and sorbitol 4 and starch weight of 5 gr, which was 0.09 MPa. Most of the tensile strength values edible film. The results obtained in this study do not meet the minimum standard for tensile strength values edible film based on the Japanese Industrial Standard namely 0.3923 MPa, where only the starch weight variable is 7 gr with a ratio of 0.25, 3:7, and 1 only meets the standard. Then for the influence of starch weight on the elongation of the edible film, it can be seen that the more starch, the smaller the elongation value of the edible film. The high concentration of corncob starch will increase the amount of film-forming polymer. Increasing the amount of polymer will reduce the voids in the gel formed on the film and the thicker and denser the film matrix is, the more elongation of the film will decrease [11].

The results of the elongation (see Fig. 4), where most of the percent elongation values in an edible film are still not compatible Japanese Industrial Standard that is at least 10 %, only on the variable weight of starch 5 gr that meets the standard. The highest yield was seen in the ratio of glycerol and sorbitol, which was 7:3 with a starch weight of 5 gr, which was 21.4 % and the lowest yield was seen in the ratio of glycerol

At that point for the impact of starch weight on the water vapor penetrability of eatable film, it can be seen that the more starch, the littler the esteem of the water vapor porousness of the eatable film. The tall concentration of corncob starch will increment the sum of the film-forming polymer. Expanding the sum of the polymer will diminish the voids within the gel shaped on the film. The thicker and denser the film network shape can diminish the rate of penetrability since it is troublesome for water vapor to enter [12].

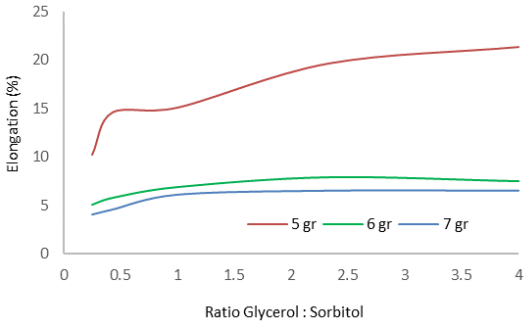

Fig. 4. Relationship between Ratio Adsorbent and Starch at elongation.

The result of water vapor permeability (see Fig. 5), where most of the water vapor permeability values of edible film produced in this study do not meet the minimum standard of water vapor permeability value for the edible film based on Japanese Industrial Standards below 10 gr/m2 days. The highest water vapor permeability was at the ratio of glycerol and sorbitol 0.25 and starch weight was 5 grams, which was 11.83 gr/m2 days, the lowest yield was 8.86 gr/m2 days [13].

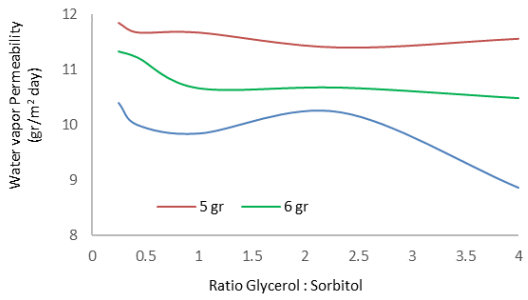

Fig. 5. Relationship between Glycerol-Sorbitol Ratio adsorbent and Starch at Water Vapor Permeability.

4 Conclusion

These characteristics incorporate the tensile strength of 0.536 MPa and the littlest 0.066 MPa, the elongation of 21.4 % and the littlest of 4.1 %, the thickness of 0.26 mm and the littlest of 0.12 mm, and water vapor porousness with of 11.83 gr/m2 day and the littlest 8.86 gr/m2 days. Where a few are beneath the Japanese Mechanical Standard (JIS) and existing speculations. The ideal comes about within the composition proportion adsorbent ratio of 5:5 with corncob starch of 7 gr.

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