Book of Abstracts

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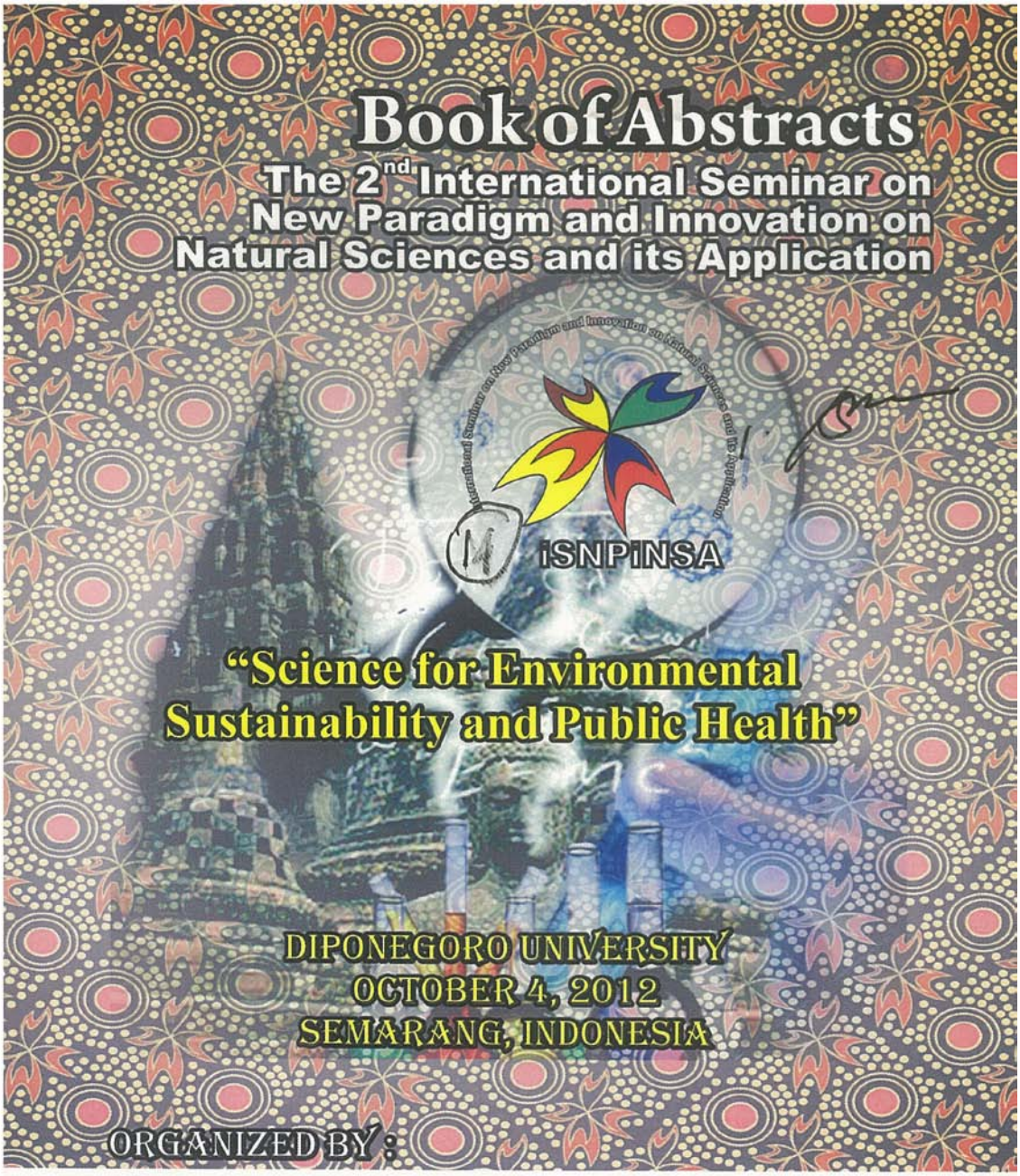

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PREPARATION PRELIMINARY STUDY OF BIODEGRADABLE PLASTICS BASED OF CASSAVA COMPOUNDS WITH ADDITIVES LIMONENE EXTRACTION OF ORANGE LEATHER

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ABSTRACT

Biodegradable plastic is a plastic material that is environmentally friendly because it is able to return to nature. In general, biodegradable packaging films is defined as packaging that is recyclable and can be destroyed by nature. Cassava starch can be an alternative biodegradable plastic raw materials. The manufacturing process is similar to the process of making plastics with the raw material of synthetic polymers. Biodegradable plastics are new breakthroughs to deliver maximum results, with the base material of cassava and the addition compound limonene, the thickness of relatively thin plastic, the stronger the attraction, elasticity longer. The purpose of this study was to determine the optimum conditions to produce biodegradable plastics with the compound limonene (additive) from the extraction of orange peel. Research conducted through three stages: (1) extraction of orange peel, (2) extraction of cassava starch, and (3) the manufacture of biodegradable plastics. Variable is an experiment conducted on susceptible starch concentration of 4-6% and 5-7% concentration of sorbitol. While the cooking temperature between 70-80^oC and the addition of an additive compound of orange peel extract as much as 15%. Of research can be seen that the concentration of cassava starch, sorbitol concentration and the concentration of limonene compounds influencing parameters tested. Percent extension treatment with the highest concentrations found in cassava starch 6%, 7% sorbitol concentration, and concentration of the compound limonene 15%. Relatively good condition or optimum in the manufacture of biodegradable plastics at 80^oC.

Keywords: biodegradable plastic, cassava starch, limonene, orange peel

INTRODUCTION

Background

Splendor of the issue of global warming (global warming) and the environment becomes a separate issue in this century. One of the important issues concerning the environment in the world or in Indonesia in particular is about the plastic waste. Increasing the amount of plastic waste has become a thing that can threaten the stability of ecosystems, given the currently used plastics are nonbiodegradable (plastic is not biodegradable). That is, provide development opportunities biodegradable plastic packaging.

Biodegradable plastic packaging is a new technology in the development of the industrial world. Biodegradable plastics can be made from natural polymers, one of which is starch. Plastic is known as PLA (Poly Lactic Acid). Poly Lactic Acid (PLA) is a polymer from a renewable resource derived from the esterification of lactic acid obtained by fermentation by bacteria by using a substrate starch or simple sugars. PLA has a heat-resistant properties, strong, and an elastic polymer.

With the requirement that the packaging used must be environmentally friendly, the manufacture of plastics from cassava biodegradible additive compounds with limonene from orange peel extract is one that can be promising. The existence of the compound limonene as an ingredient in the manufacture of plastics additives can improve the elasticity of the plastic biodegradible making it easier for degradable and environmentally friendly. Compound limonene contained in many of orange peel, which is 94% oil. Of the issue of biodegradable plastic is a good choice.

Most plastics are made from petroleum and is nonbiogradable. Therefore, the plastic is not considered environmentally friendly because it is not biologically degraded lands and will certainly contaminate the soil. There is a breakthrough new biodegradable packaging to provide maximum results for biodegradable plastics, which is the basic ingredient of cassava and the addition of the compound limonene, the thickness of relatively thin plastic, the stronger the attraction, elasticity longer.

The purpose of this study was to determine the optimum conditions to produce biodegradable plastics with additives compounds from the extraction of orange peel. The research was done by adding an additive compound of the extraction of orange peel to add a percent elongation, and thickness of relatively thin plastic.

The results of this study is useful for protecting the environment and information technology is the manufacture of biodegradable plastics made from raw cassava the additive compound of orange peel extract can be used for industrial activities.

METHOD

Limonene Extraction from Orange Skin

Orange rind washed thoroughly, and then soaked in a solution of NaHCO 3 for 10-14 hours (orange peel / kg soaked with 1 liter solution of NaHCO3). Chopped orange peel until measuring 0.3 to 0.5 cm. Once it is wrapped with a thick calico cloth and squeezed by means of screw presses, hydraulic presses or equipment. Then the emulsion is inserted into the vial decantation (the fraction of the water separator and oil emulsion). Fraction of oil that remains in the bottle decantation were centrifuged at. Orange peel oil was given anhydrous Na2SO4, and then churned. Each liter of oil was given with 1-3 g of anhydrous Na2SO4. After that, the oil is filtered to separate Na2SO4. Orange peel oil stored in dark glass bottles in a tightly closed in a place that is not hot. (Dinbakir. 2009)

Cassava Starch Extraction

Cassava tubers are peeled, washed thoroughly and soaked in 0.3% sodium metabisulfat for 1 hour. Grated to a coarse puree, then added water (to extract starch) with a ratio of 1:1. Further filtered with filter cloth and the result is called filtrate I. Obtained residue added water and filtered again where the result is called the filtrate II. Filtered (filtrate filtat I and II) is then deposited approximately 3 hours. Clear water is discarded and the precipitated starch was taken, dried in an oven at a temperature of 40 0C for 48 hours. Sediment that has been dry blended and sieved, the result is stored in a sealed container.

Plastics Additives manufacture with limonene

Appropriate treatment of starch extraction was dissolved in 35 ml of 98% ethanol and 100 ml distilled water. After the CMC was added 2.5 grams of plasticizer according to the treatment and substance, namely sorbitol. At this stage of limonene orange oil added as additives. The addition of additives as much as 15%. Stir until everything is mixed. After it is heated to a temperature of 80 0C while stirring for 15 minutes, then cooled to a temperature of 30 0C. Pencetakkan then performed on the glass plate to form a thin sheet. After that, stored in a refrigerator at a temperature of 15 0C for 2 x 24 hours. Conducted an analysis of the observed parameters, namely the thickness and percent extension.

Observation and Measurement Data

Elasticity Extension

Sheet film (sample) was taken and conditioned at RH and ambient temperature for 2 x 24 hours. Sample is held at both ends and pulled in opposite directions. Before the withdrawal, measured the length of the movie up to a long handle, called the initial (P1), while the length of the film after the withdrawal of so-called long end (P2), and calculated percent extension of the formula:

$$percent\ extension = \frac{P_2 - P_1}{P_1} \ x\ 100\%$$

Thickness of the film

Sheet film (sample) was taken and conditioned at ambient temperature and RH for 2 x 24 hours. Then the film sheet is taken from each treatment, and its thickness was measured using a digital micrometer.

stages of Implementation

Variable is an experiment conducted on susceptible starch concentration of 4-6% and 5-7% concentration of sorbitol. While the cooking temperature between 70-80 0C and the addition of an additive compound of orange peel extract as much as 15%.

Implementation of the instrument

Equipment used in research is squenching batch bioreactor. The tool is equipped with temperature control.

RESULTS AND DISCUSSION

The results indicate that biodegradable plastics manufacturing cassava starch concentration, the concentration of sorbitol, and the addition of compounds from the extraction of orange peel lemonen influencing parameters were observed. His influence can be explained as follows:

variables	Cassava starch concentration (%)	concentration of sorbitol (%)	Concentration of the compound limonene (%)	T (^{0}C)	percent Extension	Plastic thickness (mm)
I	4	5	15	70	0	0.01
				80	1.07	0.01
II	5	6	15	70	0.35	0.012
				80	1.42	0.011
III	6	7	15	70	0.71	0.014
				80	1.42	0.014

From the table above can be seen that the concentration of cassava starch, sorbitol concentration and the concentration of limonene compounds influencing parameters tested. Percent extension treatment with the highest concentrations found in cassava starch 6%, 7% sorbitol concentration, and concentration of the compound limonene 15%. Relatively good condition in the manufacture of biodegradable plastics at a temperature of 80^{0}C.

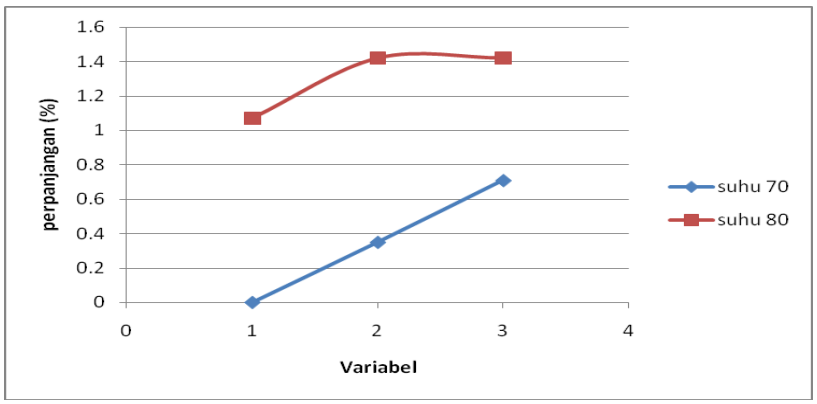

Figure 1. Focus on Renewal GrafikPengaruh Percent

The higher concentration of cassava starch, sorbitol concentration and the addition of an extension of the resulting percent increase. This is due to the increasing concentration of cassava starch, the gelatinization process that occurs when cooking the better. Sorbitol at a concentration of 7% was obtained percent elongation higher than the concentration of 5%. This is because the ratio of starch and water is large enough, the starch molecules form a network with water molecules trapped inside, forming a viscous gel and sorbitol as a plasticizer is a substance produced edible films more flexible and not rigid extension of the percent increase. The relationship between the effect of the interaction of cassava starch concentration and the concentration of sorbitol to the percent extension can be seen in the picture above.

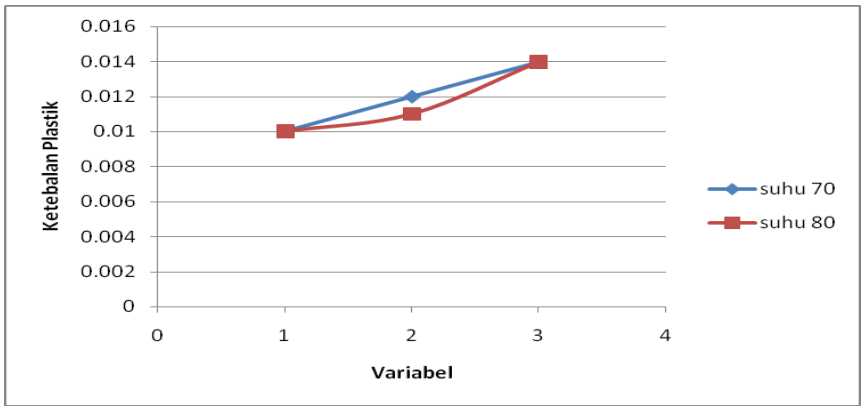

Figure 2. Effect of concentration on thickness charts Plastics

The higher concentration of starch and sorbitol concentration increases the thickness of the plastic. The increase follows a linear line as figure 2. This is caused by increasing concentrations of cassava starch and sorbitol concentrations, the total solids contained in the solution is also growing. The amount of solids contained in the solution is also more and more and causing the higher thickness. Also, it can be seen of Figure 3 the following:

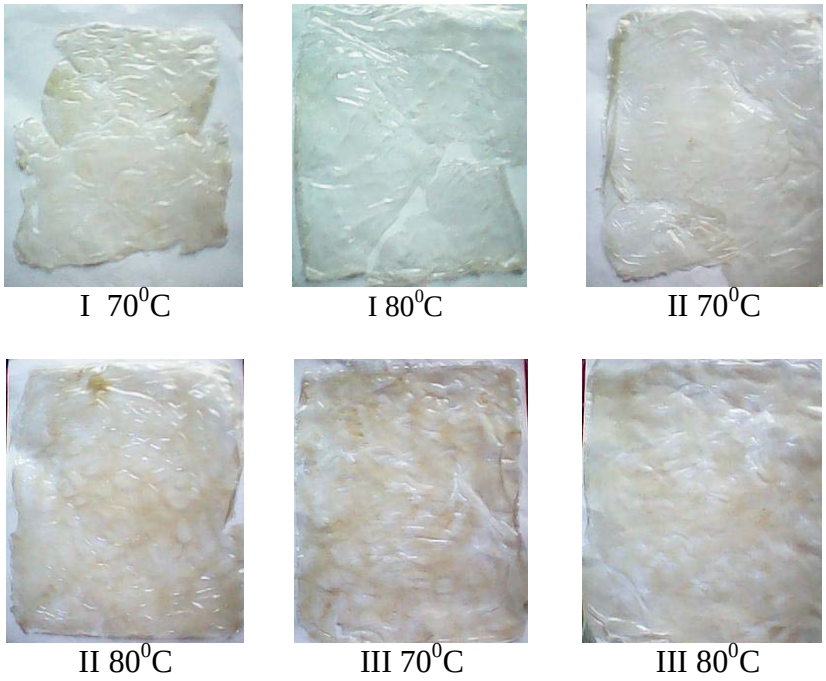

Figure 3. Biodegradable plastics

CONCLUSIONS AND RECOMMENDATIONS

From the study it can be concluded that the concentration of cassava starch, sorbitol concentration and the concentration of limonene compounds influencing parameters tested. Percent extension treatment with the highest concentrations found in cassava starch 6%, 7% sorbitol concentration, and concentration of the compound limonene 15%. Relatively good condition in the manufacture of biodegradable plastics at 80^{o}C.

Need further study to the measurement of technical data in order to complete the laboratory design and operation of processes that include the concentration of the materials used and the relatively good condition with a variable temperature process on Sequenching Batch Bioreactor.

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