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RESEARCH ARTICLE

WASTE UTILIZATION OF CASSAVA LEATHER AND DOSE PLASTIZER GLYCEROL AS BIOPLASTICS PACKAGING FOOD AND ITS EFFECT ON PHYSICAL QUALITY AND FOOD MICROBIOLOGY

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ABSTRACT

The use of plastic packaging is already a requirement, such as packaging or protective and food wrappers used in a relatively long time. Almost all cases are associated with PVC can have adverse effects on health, because of the reaction of one substance with other materials such as wrappers materials and contents resulted from the use of additives through diffusion and migration. Bioplastics can be used as food packaging, to reduce the risk arising from the use of health (Darni *et al*., 2008). Based on the nature of the protection that the packaging must be able to defend the food of the influence of gas, light, moisture. Bioplastics can be described by nature within 6 months. Decomposition can occur due to natural factors and activity of microorganisms. Purpose of the study was to determine the effect of cassava peel and glycerol as bioplastic packaging food for physical and microbial quality of food. The addition of glycerol variations in the manufacture of bioplastics in order to obtain a more flexible and elastis plastic. (Bayu *et al*., 2008) Bioplastics also have a resistance to water and air to be able to protect food. Based on the research, that bioplastics have surface morphology and resistance to varying water. Conclusion of the study is There is the effect of the use of bioplastics on the physical quality dodol, there plastizer effect of glycerol in the manufacture of bioplastics made from leather cassava starch to total bacterial leather dodol, glycerol is used more and more the higher the total bacteria, and a dose of 3 ml Glycerol plastizer that can prevent bacterial contamination of the most high.

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INTRODUCTION

Plastic packaging today can't be separated from everyday life. Migration of substances from material monomer petroleum-based plastics into food could not be prevented. Migration monomer affected by temperature or pH of the food and food processing. The higher the temperature, the more monomers can migrate into the food. (Mimin Nurminah *et al*., 2002) The use of plastic packaging is already a requirement, such as packaging / protective and food wrappers used in a relatively long time. Almost all cases are associated with PVC (Poli Vinyl Chloride) can have adverse effects on health, because of the reaction of one substance with other materials such as packaging materials and contents resulted from the additive through diffusion and migrasi. (Zhang and Han, 2006) At room temperature, with a maximum contact time, small molecular weight compounds can enter into the food freely, both derived from the additive and plastizer. Migration monomers and polymerization auxiliary substances, in certain levels can be dissolved into the solid food or liquid oily or not oily liquid. Bioplastics are environmentally friendly plastic types, this type of plastic can be broken down by fungi or microorganisms in the soil (biodegradable plastic, so it will reduce the negative impact caused by synthetic plastics. Bioplastics are plastics that can be renewed because of its constituent compounds derived from plants such as starch, cellulose, and lignin and animal as casein, protein and lipid. (Tri Nurhayati, 2012; Averous, 2004; Darni *et al*., 2008; Krochta and Johnston, 1997; Zhang and Han, 2006) Bioplastics can be used as food packaging, to reduce the risk arising from the use of health. (Darni*et al*., 2008) Nonbioplastik. Based on the nature of the protection that the packaging must be able to defend the food of the influence of gas, light, moisture. Bioplastics can be described by nature within 6 months. Decomposition can occur due to natural factors and activity of microorganisms. The addition of glycerol variations in the manufacture of bioplastics in order to obtain a more flexible plastic and elastis. (Bayu *et al*., 2008) Bioplastics also have a resistance to water, air to be able to protect food. Beradasarkan research, that bioplastics have surface morphology and hold to varying water. In Darni research, and colleagues about the making bioplastics from

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banana starch and gelatin with glycerol Plastizer using a dose of 3 ml, 4 ml and 5 ml, and the study of the barrel Rizqonia Hillan that affix to plastizernya dose as much as 2%, 3%, 4% and 5%, of the research both produce bioplastics which have pores that are very tightly, making the plastic is very good for food packaging. Dodol is food from West Java Indonesian. Dodol is one kind of special snacks from Indonesian, which are commonly packaged using non-biodegradable plastic. In general lunkhead sold in places open, the storage environment are not eligible for health food, this is one factor in the migration of plastic packaging on dodol. The use of bioplastics can be used as a safe alternative packaging, but bioplastics resistance to environmental conditions will affect the quality of the storage place dodol. Dodol is often sold in stores souvenirs typical of West Java with a 2-week storage time and storage space vary both temperature and humidity. (Ningrum *et al*., 2010)

MATERIALS AND METHODS

Tools and materials

The materials used in the study were leather cassava starch (12.5 gram), distilled water (25 ml), Glycerol (3 ml, 4 ml, 5 ml) and the acid additive derived from eating vinegar (vinegar) about 5 ml, Na OH as required.

Design Research

The method used was a completely randomized design, with three treatment doses of glycerol (3 ml, 4 ml, 5 ml). The formulation used in the manufacture of plastics, namely cassava starch composition leather: glycerol: distilled water in the ratio of each is 12,5gram: 25 ml: 3 ml or 4 ml or 5 ml and about 5 ml vinegar. All material is stirred, blended dough was then heated to form a gel and drops of NaOH until the mixture turns from acid to alkaline. Furthermore, the material is dried at temperature 80 ° C.

RESULTS AND DISCUSSION

Effect of Plastizer gliserol on cassava leather based bioplastic

Biodegradable Plastic Composition Based on preliminary research using the composition of the materials used cassava starch composition leather: distilled water in the ratio of each is 12.5 grams: 25 ml, then added glycerol 3 ml or 4 ml or 5 ml and 5 ml of vinegar as much because of the material additional acid from vinegar by 5 ml of making the composition of glycerol changed, due to the acidic nature of the material will affect the content of amylopectin in starch.

The addition of vinegar in the right amount of gel is able to make a more homogeneous solution, but excessive provision would inhibit gelatinization time, making it difficult aqueous solution and printed. The addition of glycerol were varied influences the physical properties of gelatin, the more glycerol were added causing the lower the viscosity of the paste. With the composition of glycerol 4 ml and 5 ml of different plastic sheets which are produced in accordance with the characteristics of plastics in general, ie smooth surface, translucent brownish color, elastic, not easily torn. While the use of glycerol produced 3 ml plastic characteristics in which the surface is smooth, translucent brownish color, elastic, easy to tear.

Effect of glycerol Plastizer on cassava leather based bioplastic as packaging of the physical quality of food

Physical quality of the dodol after packed with starch-based bioplastic with plastizer glioserol cassava leather can be seen in the table below:

Physical quality dodol on day 10 (ten) are packed by using bioplastics from cassava starch leather without glycerol on quality control changes the direction that is not good that lunkhead decreased by changing the physical quality dodol become rancid smell and the texture changes into a liquid dodol. Physical quality dodol on day 10 (ten) are packed by using bioplastics from starch cassava leather with 3 ml, 4 ml and 5 ml Glycerol is dodol not change the smell and texture. Based on the results of Friedman test, test results obtained with $p < 0.001$ means that there are significant differences between bioplastics with Glycerol plastizer dose of the physical quality dodol.Rancid on dodol shows there has been a breakdown of fat in lunkhead. Fat dodol damaged, marked a change in smell and taste rancid on dodol. (Tajul Iflah *et al*., 2012) Damage to the lunkhead fat can be caused due to the ability of the packaging that does not protect dodol so that it comes in contact with air dodol. Besides damage to the dodol fat can be caused by the activity of microorganisms in dodol. Another cause is by no contens glycerol in bioplastic packaging dodol, the packaging does not have the ability to absorb water from food and from external / environmental. This is causing the smell and texture dodol changes or damage.

Effect of cassava starch and plastizer leather Glycerol as bioplastic packaging to total bacteria on dodol

Effect of cassava starch and palstizer leather Glycerol as bioplastic packaging dodol on the quality of total plate count dodol seen from the number of colonies that grew on dodol. Bivariate statistical test used was ANOVA statistical test., Can be seen in the following table:

Table 1. Effect of cassava starch and plastizer leather Glycerol as bioplastic packaging of food on the physical quality lunkhead (Observation day 10)

Organoleptic test	Control (without gliserol)	Dose gliserol		
		3ml	4ml	5ml
Odour	Smell rancid	dodol not smell rancid, unkhead smelling brown sugar	dodol not smell rancid, unkhead smelling brown sugar	dodol not smell rancid, unkhead smelling brown sugar
Teksture	Dodol become less sticky and more dilute	Chewy and sticky like dodol in general, and texture dodol better than the conditions at the time of dodol packed	Chewy and sticky like dodol in general, and texture dodol better than the conditions at the time of dodol packed	Chewy and sticky like dodol in general, and texture dodol better than the conditions at the time of dodol packed

Table 2. Effect of cassava starch and plastizer leather Glycerol as bioplastic packaging for total plate count on dodol

Dose Gliserol	n	Mean (SD)	Min - max	Sig Levene test	P value
0 ml	6	573,5000 (30,55323)	545 - 623		
3 ml	6	164,6667 (25,64891)	145 - 212	0,941	< 0,001
4 ml	6	320,6667 (31,75951)	287 - 367		
5 ml	6	364,1667 (34,77020)	300 - 398		

Based on the results of ANOVA test found a significant effect of dose difference Glycerol as plastizer on leather cassava starch bioplastic to total bacteria dodol. Total bacterial smallest (145 colonies / gram dodol) contained in dodol packaged using cassava peel based bioplastic with 3 ml of glycerol, whereas the largest total bacteria (623 colonies / gram dodol) contained in lunkhead packed with bioplastics without glycerol. From this study it can be seen that the greater number of the total bacterial glycerol increasingly. For determine the concentration where the difference in total bacterial dodol ANOVA test followed by post hoc test that Bonferoni test. The result can be seen in the following table:

Table 3. Results of Post Hoc influence plastizer dose glycerol leather cassava starch bioplastic to Totalbacterial dodol

Dose Gliserol	P value
0 ml with 3 ml	< 0,001
0 ml with 4 ml	< 0,001
0 ml with 5 ml	< 0,001
3 ml with 4 ml	< 0,001
3 ml with 5 ml	< 0,001
4 ml with 5 ml	0,144

Plastizer dose of glycerol in the leather starch bioplastic packaging dodol from cassava as there are significant differences in group 0 ml Glisrol with 3 ml of glycerol group, 4 ml of glycerol and 5 mi Glycerol to total bacteria dodol with $p < 0.001$, while the group that did not show a difference to total bacteria dodol ie 4 ml glycerol group with 5 ml of glycerol with $p = 0.144$.Addition plastizer cause a decline in intra-molecular force along the polymer so as to improve fleksibilitas. (Darni *et al*., 2008) The more glycerol is added, the more hydrophilic bioplastics, so more doses of glycerol means more water vapor is absorbed by bioplastics. This happens because there are three hydroxyl groups which results in the increased absorption of water on plastic. (Darni *et al*., 2008)On the use of glycerol 4 ml and 5 ml, bioplastics can absorb water from the outside of the food in an amount more because bioplastics more hydrophilic. Water vapor contains a number of contaminants that may contaminate food. With the amount of water vapor absorbed by bioplastics so the more bacteria will contaminate the packaging that may contaminate food that is packaged and will affect the quality of the total bacterial dodol.

Conclusion

There is the effect of the use of bioplastics on the physical quality dodol, there plastizer effect of glycerol in the manufacture of bioplastics made from cassava starch to total bacterial leather dodol. glycerol is used more and more the higher the total bacteria, and a dose of 3 ml Glycerol plastizer that can prevent bacterial contamination of the most high.

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