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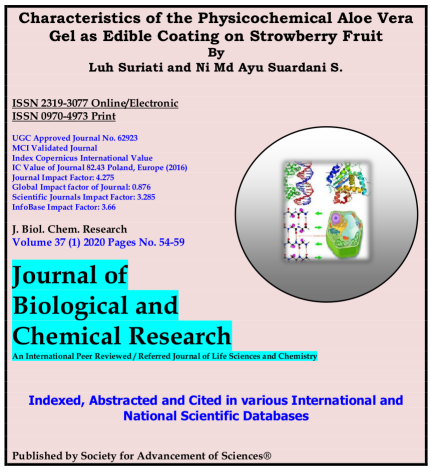

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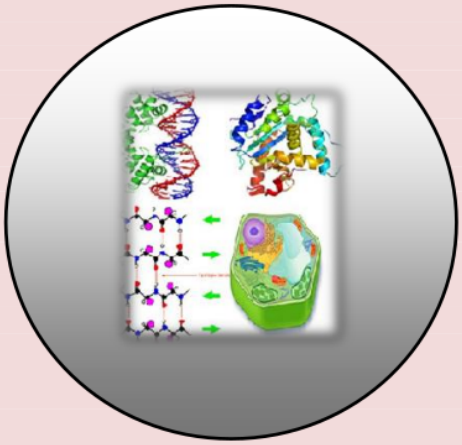

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RESEARCH PAPER

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Characteristics of the Physicochemical Aloe Vera Gel as Edible Coating on Strowberry Fruit

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ABSTRACT

The usage of biodegradable and sustainable packaging has come into attention since the past few decades as an effort to reduce packaging waste. On a landmark fruit, the edible application layer is used in order to reduce the occurrence of loss of moisture, improve appearance, acts as a barrier to the exchange of gases, as well as having functions as an antifungal and antimicrobial. In addition to extending shelf life can be eaten these many layers are used such as it does not endanger human health, can be eaten as well as easy to untangle nature. One of the natural ingredients that can be used such as a layer of edible is Aloe Vera. From the results obtained that the weight without warming treatment gel stored at cool temperatures is relatively constant, while to gel without or with the treatment of warming that is stored at room temperature a little decline. A drastic reduction invisible on the gel with the saved warming treatment in cold temperatures. Aloe gel good shaped pieces that are stored at room temperature has decreased the weight but that is stored on the cold temperatures are relatively stable. Moisture gels are cut from leaves of Aloe Vera that are stored at cool temperatures relatively stable compared with the stored at room temperature. The longer it is stored at room temperature, the moisture content of Aloe Vera gel. pH gel which consists of pieces of decline during storage, whereas stored at cold temperature has increased up to day 5 after it declined again. pH Gel that is stored at room temperature ranges from relatively stable at pH 2, while being stored at cold temperature has increased. The results of the statistical analysis of research data on the application of Aloe Vera gel Strawberry fruit that includes variable moisture content, vitamin C levels and texture analysis using data obtained costat program that third variable observations show the difference that is not real.

Keywords: Characteristic, Physicochemical, Aloe Vera Gel, Edible Coating and Strowberry.

INTRODUCTION

Fruits are a source of vitamins, minerals, and fiber that has nutritional benefits which are very good for the health of the body. Along with the changing times, public awareness of the importance of health and nutritional value of the food they consume. This increase can be seen from the increasing demand for high-quality fruit, i.e. have a good appearance, relatively durable, and not quickly wither and rot during storage. The fruit quality can only be met by having good post-harvest handling including attempts to extend the level of freshness.

There are various ways that can be done to maintain the quality and inhibiting damage to fruits among others by packaging, storage modification with low temperature and by applying preservatives such as the edible coating on the fruits. Edible coating very potential to increase the shelf life of fruits due to the theoretical deployment edible coating will form a coating that is capable of acting as a barrier to prevent moisture loss, are permeable to certain gases, as well as controlling the migration of water-soluble components that could cause pigmentary changes and nutritional components in fruits (Krochta, *et al*., 1994). In addition, preservatives also act as antioxidants, which will suppress the reaction that occurs upon contact with oxygen, food, rays, heat and some metal so as to prevent the onset of rancidity and the emergence of black smudges on the food products.

The number of dangerous preservatives in the market raises concerns on the public to use it, where the impact posed a very high risk of health. Improved power saves fruit using natural preservatives in order to avoid the effects of the chemicals are still very uncommon. Some natural ingredients containing the enzyme oxidase as an antioxidant can be used as edible coating particularly on direct fruit is eaten without peeling his skin and very quick damaged fruit such as strawberries, grapes, yellow and so on. One of these natural ingredients is Aloe Vera. Aloe Vera useful part is the aloe vera gel obtained from the leaves of the parenchyma chain (Suriati, 2000). Aloe Vera gel can make layers such as wax so it will still keep the quality of Strawberry fruit leather. Beside that Aloe Vera gel also has several advantages including raw materials that are easily obtained, the process is simple, a short processing time. Aloe Vera gel does not affect taste or flesh of the fruit, natural and safe for the environment. Suriati (2018) adds that the content of Aloe Vera gel is very complex as polysaccharide, sugar reduction, tannins, organic acids, minerals, proteins etc. Beside that Aloe Vera gel containing glucomannan which according to Magnuson (1991) has the ability to keep humidity the skin of the fruit. Aloe Vera gel also contains a variety of compounds that are antimicrobial and bioactive can heal the wound so that the network deployment is expected in Aloe Vera gel as the edible coating was able to maintain the quality and prolong the shelf fruits. The application of Aloe Vera gel as edible coating has been tried previously on the grapes with the use of Aloe Vera gel which is dissolved with water (Valverde, *et al*., 2005). Krochta, *et al*., 1994 adding applications edible coating with the use of basic ingredients polysaccharides widely used primarily on fruit and vegetables because it has the ability to act as a selectively permeable membrane against CO2 gas exchange and O2 so it can extend shelf life due to the respiration of fruits and vegetables is reduced. Based on this needs to be done further research presumably about treatment type and concentration of the addition of a filler that is right against the physicochemical Aloe Vera gel characteristics so that it can keep the rheology Aloe Vera gel as edible the coating will be applied to the handling of post-harvest fruits especially strawberry. This research aims to study the characteristics of the physicochemical Aloe Vera gel as edible coatings in terms of the type and concentration of the addition of fillers, that will be applied to the handling of post-harvest fruit strawberry so have time to save.

MATERIALS AND METHODS

Research using Randomized Complete Design (RAL) with two factors and repeat 3 times. Factor 1 types of Fillers on Aloe Vera gel consists of Ascorbic acid (P1), potassium sorbat (P2), and calcium chloride (P3). Factor 2 Retention that is 1 minutes (W1), 2 minutes (W2), 3 minutes (3). Each treatment was repeated as many as 3 times so that the retrieved 45 units of the experiment. Observations were made against shrink weights, changes color, texture, total dissolved solids, pH, and total microbial.

RESULTS AND DISCUSSION

Reduced Weight of Aloe Vera Gel

Based on the results of the research done to see that weight Aloe Vera gel without warming the stored on the cold temperatures are relatively constant. This is because the storage at cold temperatures cause the activation of the enzyme decreases so that the oxidation process and the outbreak of more small gel networks, thus losing weight due to long retention can be avoided (Ramachandra, *et al*., 2008). As for gel without or with the warming that is stored at room temperature a little decline. A drastic reduction invisible on the gel with the saved warming treatment in cold temperatures.

This is because the storage at room temperature influences the loss of some components of the gel due to evaporation. The results showed that the maximum stability of the polysaccharide of Aloe Vera gel at 70 ° C, the temperature will decrease at a temperature higher or lower (Ramachandra *et al*., 2008). Whereas the weights advance reply gel is heated and added citric acid and then stored at cool temperatures on the 6th day of storage dropped dramatically.

The Color of The Gel of Aloe Vera

Aloe Vera gel without the warming that is stored at room temperature on day 4 is already Brown, this is caused due to contact with oxygen so that reaction Browning. The leaves are processed shortly after the start of harvest occurs the decomposition matrix degradative gel, due to a natural enzyme reaction in the presence of oxygen (Ramachandra, *et al*., 2008). Two hours after the extraction if the gel is exposed to air or light then the color of the gel will turn pink and the next will be darker (Suriati, 2000). The color change has little relation to the effectiveness and stability of the gel. Some of the products the user psychologically unable to accept the color change. Therefore, it is simple but efficient processing that needs to be developed.

Aloe Vera gel by heating with open containers stored at room temperature more quickly change color (day 3) compared to the gel is stored at cold temperatures. This is because the aloe vera gel contains carbohydrates i.e. glucomannan and contact with oxygen as well as supported by room temperature storage spur change process colors (Suriati, 2018). On the oxidation of carbohydrates, usually, cause changes of color and flavor. The color change that occurs is usually Brown or Sorrel and can also be gray or yellow (Stuckey, 1981). The oxidation of carbohydrates by various types of enzymes such as peroxidase and catalase reaction often called Browning enzimatis. To prevent this reaction is usually done warming up for inactivate enzyme. Enzymatic Browning reaction depends on oxygen levels and the pH of the medium.

The degree of Acidity (pH) of Aloe Gel

The degree of acidity of the aloe vera gel which is deposited at room temperature ranges from relatively stable at pH 2, while being stored at cold temperature has increased. An increasing number of acidic or low pH values during storage is also possible due to microorganisms activity which can be a component of carbohydrates convection acid. At pH too low there will be an awful lot of carboxylic ion-neutral, so no style deny will consequently happen decrease viscosity. Viscosity is a measure of the relative to the movement of the fluid resistance of the parts.

Viscosity Aloe Vera Gel

The purpose of warming at 80oC is to reduce or suppress the activities of phenolase are very instrumental in the changing nature of the physicochemical immobilization Aloe Vera gel. The longer the warming gel viscosity of the resulting greater. This is because the longer the warm up then the greater the amount of water evaporated. The water that is in the gel immobilization mechanically. The gel has a variation on the degree of hardness, elasticity, and fragility, that it all depends on the type and concentration of the ingredients of the gel-forming, salt content, pH and temperature.

Aloe Vera gel nature unstable and very easily influenced by air, light, heat, and microbes. The longer storage, Aloe Vera gel viscosity decrease. This is because the longer the retention of the greater the chance of fluid out of the three-dimensional structure of the gel, which is highly correlated with a decrease in pH that occurs in Aloe Vera gel. Liquefaction involves dismantling the cross-bonding gel by involving chains of polymers of carbohydrates (Glicksman, 1984). In addition, some gels during storage or release of liberation events show medium dispersed spontaneously even at high humidity and low temperatures. The gel is stored at cold temperatures also experienced a decrease in activity, despite the loss of its activity is getting low. Loss of activity caused by enzymatic activity after separate leaves from the tree. This means although stored on cold temperatures will also cause a loss of biological activity.

Moisture Aloe Vera Gel

Aloe Vera Gel consists of approximately 99.5% water and 0.5 – 1% solid material compound of a variety of compounds including the compound that is soluble in water and soluble in fats, vitamins, minerals, enzymes, polysaccharides, phenolic compounds and organic acids (Hamman, 2008).

From the results obtained that the moisture content of Aloe Vera gel which is deposited at room temperature tend to increase until day 3 and dropped back on day 4. While the gel is stored at cool temperatures prevail instead.

Application of Edible Coating on Strawberry Fruit

Preservation techniques of fruit and vegetables with the use of edible coating actually already done a long time ago. On fruits and vegetables, edible coating application is used to reduce the occurrence of loss of moisture, improve appearance, acts as a barrier to the exchange of gases, as well as having functions as an antifungal and antimicrobial. In addition, to extend shelf life, an edible coating is widely used because it does not harm human health, can be eaten as well as easy to untangle nature. One of the natural ingredients that can be used as an edible coating is Aloe Vera.

Aloe Vera useful part is the gel which is obtained from the leaves of the parenchyma tissue section containing compounds such as a complex polysaccharide, glucomannan, reduction of sugar, tannins, organic acids, minerals, proteins and so forth (Suriati, 2018). Aloe Vera gel can create layers, does not affect the taste, safe for the environment, cheap and easy to come by, has a natural structure making it easy to be applied. But the disadvantage is the nature of the gel rheology easily become diluted, so that should be added to maintain the consistency of the gel treatment. This research is expected to generate manufacturing edible coating formulation of the exact Aloe Vera gel so that later can be applied at post-harvest handling process the fruits in the community.

Table 1. Water Content, Levels of Vitamin C and The Texture Strawberry Fruit with Edible Coating.

	Water Content	Vitamin C	Texture
P1W1	93,27	25,96	3,32
P1W2	93,29	24,07	3,79
P1W3	95,21	24,36	3,41
P2W1	93,31	20,41	3,55
P2W2	91,58	24,08	3,27
P2W3	92,58	28,45	4,12
P3W1	91,48	19,65	3,01
P3W2	90,74	23,56	3,76
P3W3	93,89	23,77	3,53

Moisture Content of Strawberry Fruit

Statistical analysis using a complete Randomized Design (RAL) with two factors. The first factor is the type of filler materials (P) which include 3 level treatment namely Ascorbic acid, potassium, and calcium chloride. As for the second factor is the time of immersion fruit strawberries in an edible coating which consists of three levels of treatment that is 1 minute, 2 minutes and 3 seconds. From the results of the analysis using costat obtained that treatment type of fillers and their interaction and immersion time shows no real difference against variable moisture content. This is likely because all fillers have the same function as a barrier to water vapor and moisture exchanges so that the moisture content of the fruit a lot anyway. Similarly, the immersion time of the fruit on the edible coating does much to affect water content of fruit strawberries possibly because edible coating acted only on the surface of the material is not up to the cell network the fruit so that the water levels were relatively constant

From the test results indicate that the error Duncan't 3.3689, free 18 degrees with their significance level of 5%, LSD 1, 8178 shows at the treatment this type of filler materials (P) glycerol (P3) has the highest water content then the acid treatment Ascorbic (P1) and lastly potassium sorbate (P2). While the treatment time of immersion (W) Strawberry fruit has the highest water content obtained from 1-minute immersion treatment (W1), then 2 minutes (W2) and the lowest is 3 minutes by immersion (W3). But the two treatments showed no real differences are visible from the notation.

Levels Vitamin C of Strawberry Fruit

Statistical analysis use Costat obtained that treatment type of fillers and their interaction and immersion time shows no real difference against the variable levels of vitamin C fruit strawberries. This is likely because all fillers have the same capabilities as an antioxidant and are able to prevent the exchange period so that the levels of vitamin C fruit relatively similar. Similarly, the immersion time of the fruit on the edible coating does not give different effects against the levels of vitamin C fruit strawberries. This is possible because edible coating acted on the surface of the fruit as a barrier/barrier not to enter into the cell network so that the fruit does not contact with oxygen so that the oxidation process of Ascorbic acid can be avoided. With levels of vitamin C is relatively constant. From the test results indicate that the error Duncan't 11, 3241, 18 free degrees with their significance level of 5%, LSD showed at the treatment 3.33337 types of filler materials (P) glycerol (P3) have the highest levels of vitamin C then the treatment potassium sorbate (P2) and Ascorbic acid (P1). While the treatment time of immersion (W) Strawberry fruit that has the highest levels of Vitamin C obtained from 1minute immersion treatment (W1), then 2 minutes (W2) and the lowest is 3 minutes by immersion (W3). But the two treatments showed no real differences are visible from the notation.

The Texture of Strawberry Fruit

A statistical analysis of the data by using a type of treatment that acquired costat fillers and immersion time and their interaction suggests the differences are not really against the variable levels of the texture of fruit strawberries. This is likely because all fillers have the same capabilities as a deterrent that is capable of preventing the exchange period so that the composition and the stubbornness of the fruit are relatively fixed. Similarly, the immersion time of the fruit on the edible coating does not give different effects against the texture of the fruit of the strawberry. This is possibly because edible coating with different time still have the same capabilities in protecting Strawberry fruit from the process of transpiration, dehydration, oxidation and so forth, so that the water content, bioactive compounds and other components in the network of cells of the fruit and the stubbornness of the fruit until the fruit texture relative constant. From the test results indicate that the error Duncan't 0.2387, free 18 degrees with their significance level of 5%, LSD 0.4838 shows at the treatment this type of filler materials (P) glycerol (P3) has the best texture and then potassium treatment sorbate (P2) and Ascorbic acid (P1). While the treatment time of immersion (W) Strawberry fruit that has the best texture retrieved from immersion treatment 2 minutes (W2), then 1menit (W1) and the lowest is 3 minutes by immersion (W3). But the two treatments showed no real differences are visible from the notation.

CONCLUSIONS AND SUGGESTIONS

The conclusions of this research sare the aloe vera gel with warming and stored at cool temperatures until day 5 relatively stable, as seen from the variable weight shrinkage, color, pH, viscosity and moisture content. While the gel is stored at room temperature decrease began day 2. Aloe Vera gel should be stored at cool temperatures with a sealed container. The best Aloe Vera gel characteristics as edible coating can be applied at post-harvest handling fruits. The results of the statistical analysis of research data on the application of Aloe Vera gel Strawberry fruit that includes variable moisture content, vitamin C levels and texture analysis using data obtained costat program that third variable observations show the difference that is not real. Further research needs to be done about the combination of filler with higher concentrations as well as the distance between the longer immersion time treatment.

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