Application of Edible Coating on Rimau Gerga Lebong Orange (RGL Orange) at Room Temperature Storage

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ABSTRAK

Salah satu komoditi jeruk unggulan Propinsi Bengkulu adalah Jeruk Rimau Gerga Lebong (Jeruk RGL). Buah Jeruk RGL memiliki penampilan fisik yang kurang menarik. Untuk memperbaiki penampilan fisik pada buah segar dapat dilakukan dengan memberikan *edible coating,* yaitu lapisan memberikan efek mengkilat dan bersih. Beberapa bahan dasar yang digunakan sebagai *edible coating* pada buah jeruk segar adalah karagenan dan lilin lebah. Penelitian ini bertujuan untuk mengetahui perubahan mutu pada buah Jeruk Rimau Gerga Lebong (Jeruk RGL) dengan pemberian edible coating pada penyimpanan suhu kamar. Hasil penelitian menunjukan bahwa penggunaan *edible coating* berbahan dasar lilin lebah dengan konsentrasi 2 % mampu mempertahan kesegaran Jeruk RGL pada suhu kamar paling baik dibandingkan dengan *edible coating* berbahan karagenan dan penggunaan plastik wraping. Selama 16 hari penyimpanan pada suhu kamar, pemberian *edible coating* berbahan lilin lebah mengalami penyusutan bobot 15.34 %, pH 4.33, TPT 11.167 °Brix dan Vitamin C 2.89 mg/5 ml sampel.

Kata Kunci : Jeruk RGL, *edible coating,* lilin lebah, karagenan, suhu kamar

ABSTRACT

One of orange commodity in Bengkulu Province is Rimau Gerga Lebong Orange (RGL Orange). The RGL orange has a less attractive of physical appearance. To improve the physical appearance of the fresh fruit can be done by providing the edible coating. Some basic materials that are used as edible coatings on fresh fruit are carrageenan and bees wax. This study aimed to determine changes in the quality of RGL orange with the provision of edible coating at room temperature storage. The results showed that the use of edible coating made from beeswax with a concentration of 2% is able to retain the freshness of RGL orange at room temperature. The characteristics of RGL orange at the 16th day storage are weight loss 15.34%, pH 4.33, TPT 11.167 ° Brix and Vitamin C 2,89 mg / 5 ml sample.

Key words : RGL Orange, edible coating, bees wax, caragenan, temperature room

INTRODUCTION

Gerga orange fruit is one of the commodity potential of Rimbo Pengadang Village, District Lebong, Bengkulu Province, Indonesia. Assessment through the Director General of Horticulture since 2011 Rimau Gerga Lebong Orange (RGL Orange) prioritized in national development. RGL Orange has competitive advantages, such as : 200-350 gram-sized fruit, fruit throughout the year, and the levels are high enough juice (BPTP Bengkulu, 2012). According Pancawarman (2012), RGL orange has a huge potential market because the demand for this RGL Orange Fruits reach 100 tons / month.

Based on the research results of Rambe and Ivanti (2015) RGL Orange has some weakness in terms of quality fresh fruit, those are : the fruit skin mottled, dirty, not clean and the color of the fruit is not attractive. Saragih's research (2015) also mentions that customer satisfaction between RGL Orange against Citrus imports, loss the attributes of the physical appearance of the color and cleanliness, although the attributes of flavor, freshness and price actually able to compete. The low quality of the product causes the RGL orange public appeal to buy or consume to decrease. Less interestingly RGL orange in physical appearance, because the skin of the fruit is not shiny. This is due to the fruit skin rapidly shrinking due to water evaporation.

To improve the physical appearance of the RGL orange is to provide edible coating on the surface of the fruit skin. The purpose of applying edible coating is a layer inhibiting changes undesired at the product during storage, inhibits microbial growth, the oxidation of fats and pigments, weight loss and absorption of off flavors (Tyburcy *et al.*, 2010). The applying of edible coatings on fresh fruit not only extend the shelf life of products but also improve the physical appearance. Besides that the edible coating is an environmentally friendly packaging techniques (Misir, 2014).

The research result of Porta, et al (2013) states that the applying of edible coatings on fresh cut fruits able to prevent browning and texture changes. In other applications edible coating with beeswax based material wich concentration 12%, effectively able to extend the shelf life of Citrus var Siam Keprok Banjar at storage temperature of 5 ° C (H. Hasan, 2014). In the study of De Moraes, et al (2012), the application of edible coating made from sodium alginate decline weight loss on William Pears and reduce pH. The addition coatings can reduce mold infections, weight loss and discoloration on the strawberries (Nadim et al, 2015).

Based on the research that has been done, the edible coating is able to extend the shelf life of fresh fruit. It is based on the ability of edible coating to maintain the freshness of the fresh fruit. Therefore, it is necessary to study on the application of edible coating on RGL Orange. Through the application of edible coating is expected to reduce fruit weight loss during storage, so it can improve physical appearance RGL orange.

MATERIALS AND METHODS

Preparation Fruits Sample

The RGL oranges were used in this study is the fresh fruits. Fruits taken directly from RGL orange orchards in the Rimbo Pengadang Village, Lebong District of Bengkulu Province, Indonesia. Harvesting is done in January 2015. The fruit sorting by maturity, size (diameter 82-85 mm), weight (180-203 g), and no physical damage or microbial infection. And than RGL oranges cleaned using a soft cleaning cloth and dried.

Materials were RGL oranges, carrageenan, gliserol, asam stearat, aquades, Natrium benzoat, indikator amilum, NaOH, phenolftalein 1% dan iod 0,01 N, bees wax, trietanolamin, asam oleat, and aquades, plastic wraping.

Preparation of Beeswax

Bees wax emulsion is as follows :

1. Beeswax weighed as much as 120 grams is placed in pot A and 840 ml of distilled water is placed in a pot B, then both heated until the temperature reaches 90-95 ° C while both continue stirring.
2. After reaching a temperature of 90-95 ° C, 20 ml oleic acid put into the pot A while triethanolamine 40 ml put into the pot B.
3. Once mixed, the solution is cooled until the temperature reaches 65°C, stirring constantly. The mixture from the pan and put in a saucepan, stirring constantly until the mixture all material reaches the optimum temperature (38-40°C)
4. Further dilution of 2% with comparison Emulsion formula beeswax 12% : distilled water = 1: 5 (Widayati, 2015).

Research Design

The study was conducted using a completely randomized design. The treatments were given in this study are based on the best treatment in the preliminary study that has been conducted by : Widayati (2015); Rohana, (2015); and Prihantoro, (2015). The treatments are :

A : carrageenan 1% and gliserol 0,5 %

B : lilin 2 %

C : Cling wrap plastic

D : control (RGL orange without any treatment

The repetitions in each treatment was performed three times repetition. Observations were made on the storage room temperature (25-29°C) for 16 days.

Variable Observations

The variable observations are weight loss, total solubles solid, titratable acidity and ascorbic acid. Determination of weight loss following the formula :% weight loss = ((initial weight-final weight) / initial weight) x 100. Observations of chemical qualities, that are a total solubles solid, titratable acidity and ascorbic acid following the procedures in the research Nasution (2012).

Data analysis

The data were analyzed in qualitative description.

RESULTS AND DISCUSSION

The Characteristics of RGL Orange Fruits.

The RGL orange is one of tangerine fruit group. This fruit has big size and weight as mentioned in Table 1.

Table 1. The Characteristics of RGL Orange Fruits

No.	Parameters	RGL orange*	Siam Madu Citrus**	Tangerin Fruit (Batu 231)***	Valensia Citrus****
1	Weight average (gram)	185,565	±200	120,68	-
2	Skin thickness (mm)	3.97	-	-	-
3	Diameter (mm)	85	50-70	-	-
4	Skin color	Yellow green	Yellow green	Yellow green	Yellow green
5	Texture	0.0074 mm/gr/dt	0.30-0.55 kg/mm2	2.42	-
6	Total Solubles Solid (0Brix)	11	9-11	11.0	7.6
7	Ascorbic Acid (mg/100 gr)	289.02	60.23	38.21	86.74
8	Titratable Acidity (%)	0.59	0.11	0.52	0.84
9	pH	4.17	-	5.4-5.5	-

Sumber :*Widayati, 2015 **Napitupulu (2010), ***Wijadi and Winarno (1987) in Handoko *et al.* (2008), ****Broto *et al.* (1990) in Handoko *et al.* (2008)

In addition to the superior in terms of size and weight, RGL orange also have advantages in terms of taste. The value of total solubles solid at 11 ° Brix and titratable acidity of 0,59% indicates RGL oranges have a sweet taste and fresh. This is consistent with the results of research of Saragih (2015) states that the RGL oranges have advantages in taste attributes.

Weight Loss

Figure 1 showed weight loss of RGL orange during storage at temperature room. Weight loss is one of important quality at fresh fruit. Based on research knowed that application of edible coating reduce wight loss during storage at 16 days. Subtrats and water loss during storage at fresh fruit causes weigth loss (Pantastico, 1989). The percentage highest weight loss was observed in cling wrap plastic, that is 31.984 % on 16^{th} day of storage. It caused by permeability cling wrap plastic is not compatible to wrapping RGL orange during storage 16 days, so the transpiration rates increased. The use of cling wrap plastic at RGL orange can improve appearance, but can not prevent transpiration rates. Figure 2 showed RGL orange with all treatments.

The percentage lowest weight loss was observed in application edible coating based beeswax material in 2 % concentration, that is 15,341 %. The percentage weight loss of RGL orange uncoated is 18,558 %. According to H. Hasan, et al (2014), the application of edible coating acts as a semi permeable membrane resist the flow of O_2, CO_2, and H_2O from in environmental to out environmental of the coat. The research of Sakhale and Kapse (2012) states that the application of edible coating on tangerine citrus reducing weight loss significantly during storage.

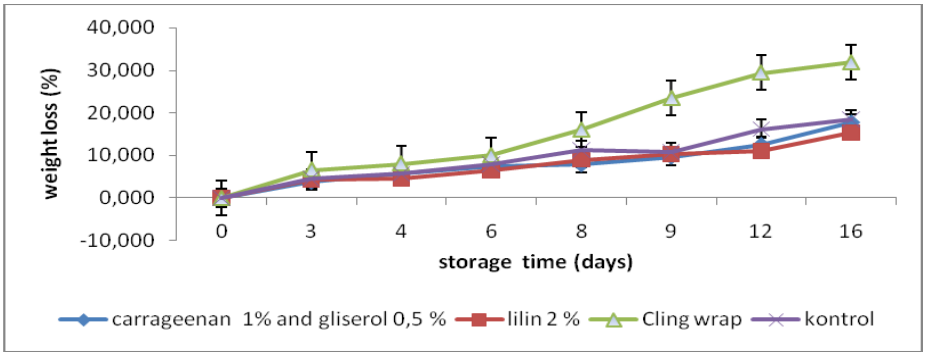

Figure 1. Weight Loss at RGL Orange

Figure 2. RGL Orange in all treatments

Titratable Acidity

Figure 3 showed titratable acidity on RGL Orange during storage 16 days. Based on researched titratable acidity on RGL Orange has trend decrease. This result is also reported for other citrus varieties, such as tangerine citrus (Citrus reticulata) var. Siam Banjar (H. Hasan *et al*., 2014); Chokun, Fremont and Batu 55 (Muthmainnah *et al*., 2014).

According toWills *et al*. (1981) titratable acidity of fresh fruit will increase until maturity stage reach, and will decrease as the rate of fruit ripening. The lowest percentage titratable acidity on 16th days was observed at application edible coating based on caragenan, that is 0,587 %. The highest percentage titratable acidity was observed on RGL orange uncoated, that is 0,819 %. According to Burton (1985), the decline of titratable acidity caused by acid used as energy resource.

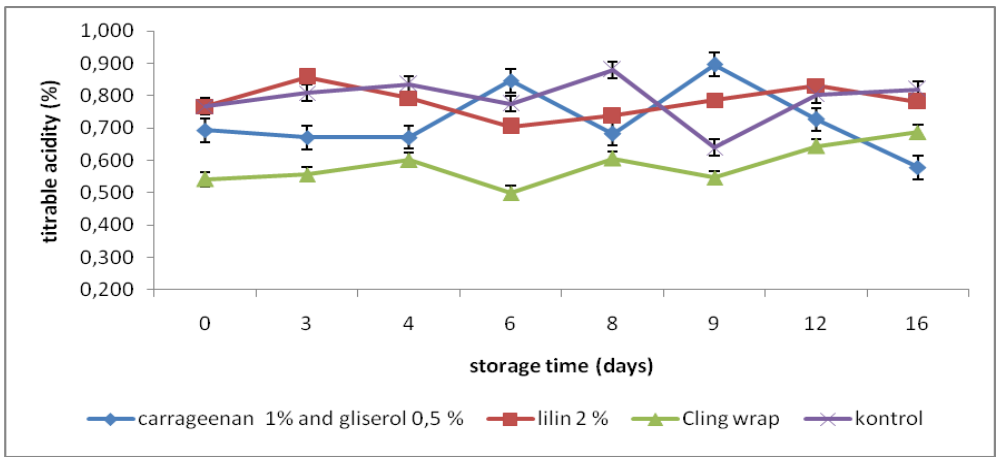

Figure 3. Titratable Acidity at RGL Orange

Total Soluble Solid

Based on research, Total Soluble Solid on RGL orange was stable during storage at temperature room (Figure 4). The application of cling wrap plastic at RGL orange has caused the total soluble solid decreased at 16th day., that is 8,50°Brix. Sunarmani *et al.* (1996) states if respiration rate more dominant than degradation cell and starch, the total soluble solid will decrease. These results indicate that application of edible coating on RGL orange not hamper the process of hydrolysis of carbohydrates into glucose and fructose compound during storage.

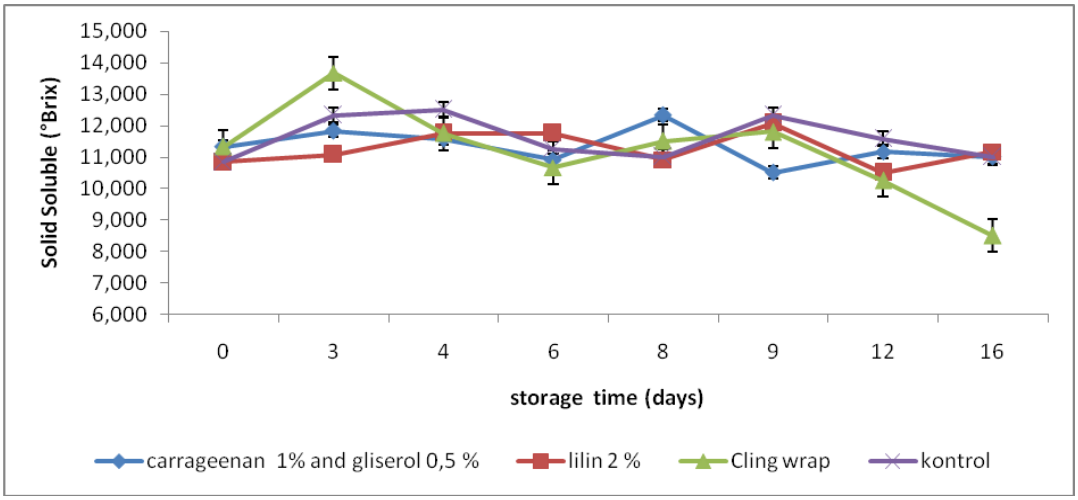

Figure 4. Total Soluble Solid at RGL Orange

Ascorbic Acid

Figure 5 showed the ascorbic acid changes at RGL orange during storage. Based on picture known ascorbic acid was observed decline during 16 days storage at room temperature. The highest value ascorbic acid at the 16th day storage was observed on the application edible coating based on karegenan material, that is 4,943 mg/5 ml sample. The lowest value ascorbic acid at the 16th day storage was observed on the uncoated RGL orange fruit, that is 2,981 mg/5 ml sample. These results are consistent with previous research, which stated that ascorbic acid in fresh fruit will decrease during storage (Cortez-Mazatán *et al*., 2011; Hasan *et al.*, 2014). According to Lee and Kader (2000) loss of ascorbic acid will be faster with the higher temperatures and longer storage.

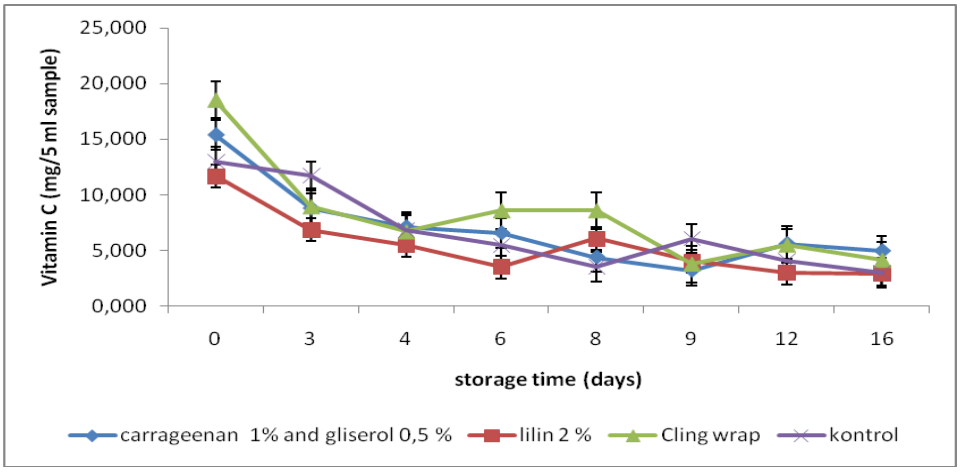

Figure5. Ascorbic Acid on RGL Orange

CONCLUSIONS

Based on the results of the research showed that the application of edible coating on fruits RGL Orange able to improve the physical appearance of the fruit during the 16 days of storage at room temperature, with a reduction in weight loss. The application edible coating made from carrageenan 1% and 0.5% glycerol can suppress weight loss of 2% when compared with the control. While the provision of edible coating made of beeswax 2% can reduce fruit weight loss of 4% when compared with the control. Applications edible coating made of beeswax 2% to maintain the quality of RGL orange during 16 days of storage at room temperature, with the result: weight loss 15.341%, titratable acidity 0.781%, total soluble solid 11.167 ° Brix and Ascorbic Acid 2.891 mg / 5 ml sample.

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