Effect of Concentration of Ca (Oh) $_2$, Type Ingredients Natural Preservatives on the Quality and Old Save Nira Kelapa

Rifda Naufalin[1] and Tri Yanto[1]
[1] Lecturer of the Faculty of Agriculture, University of General Sudirman Purwokerto,
Correspondence: rnaufalin@yahoo.co.id
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ABSTRACT

Coconut sap is the raw material for processing brown sugar. The characterstics of sap coconout is easyly damaged Because the nutrition of its content is good substarte for the microbial growth. The fermentation occurrs from the tapping process until the preparation of cooking brown sugar. As a result, the fermentation that decreases the quality of the sap. An effort is done to solve Reviews These problems by adding preservatives or laru in the process of tapping in a stable concentration. This study Aimed at: 1) Determining the effectiveness of lime to maintain the quality of coconut sap; 2) Determining the effectiveness of various types of natural preservatives to maintain the quality of coconut sap; 3) Determining influences of storage duration to the quality of coconut sap; 4) Finding the best treatment combination to maintain the quality of coconut sap. The research applied a randomized block design with two replications. The Analyzed factors were the concentration of lime (K, w / v), 0% (K0), 2% (K1) and 4% (K2); types of natural preservatives (J, 1.5% w / v), without material natural preservatives (J0), mangosteen rind (J1), tangerine ind (J), tangerine leaves (J3), guava leaves (J4) and clove leaf (J); storage duration (L), 0 hours (L0), 4 hours (L1) and 8 hours (L2). The results Showed that: 1) Provision of lime Effectively maintained the quality of coconut sap; 2) Provision of the natural mangosteen rind, cloves leaves and guava leaves preservative Effectively maintained the quality of coconut sap. Provision of the natural tangerine and tangerine rind preservative leaves were not effective to maintain the quality of coconut sap; 3) Storage duration affected the quality of coconut sap. The longer storage the caused the lower quality of coconut sap. Provision of laru (lime and natural preservative) Might inhibit damage to the coconut sap; 4) The combination of 2% lime and mangosteen rind was the best treatment to maintain the quality of coconut sap.

Key word: coconut sap, fermentation, natural preservatives, storage duration.

INTRODUCRION

Coconut sap is the raw material in the manufacture of palm sugar. Sugar palm print easily damaged, either at the raw material handling, processing and post-processing. Materials handling less precise will complicate the process of treatment and can lead to failure. Therefore, it is necessary to the preservation process during the storage process sap, which during the tapping process to date will be processed into palm sugar.

Pickling is usually done by the farmers are giving sap laru on the container vessel or Pongkor. Laru is made of Ca (OH) 2 combined with mangosteen rind or jackfruit wood chips. Preparation of Ca (OH) 2 does not have a standard concentration of fixed, based only on the approximate power of farmers, so that it becomes one of the causes of instability juice quality. It is thus very important to have treatment on the concentration of Ca (OH) 2 to get a good quality and stable juice.

Availability of mangosteen rind experienced the limitations of the current extreme weather resulting in lower productivity. Similarly jackfruit wood also limited because of the way to get it to cut down trees. Therefore the need for treatment of types of natural preservatives that have the potential as a preservative juice are easily available and cheap.

Natural preservatives contain antimicrobial compounds derived from plants.

Research on antimicrobial compounds derived from plants have been carried out, among other things on the skin of the mangosteen fruit (Noviardini 2010), fruit peel tangerines (Feriyanto 2009), leaves tangerines (Widyarto 2009), guava leaves (Adnyana et al., 2004) and clove (Kusniati, 2009) ,

This study aims to: 1) determine effectiveness of Ca (OH) 2 in maintaining the quality of coconut sap; 2) determine the effectiveness of the provision of various types of natural preservatives in maintaining the quality of coconut sap; 3) look for the best treatment combination in maintaining the quality of coconut sap. This research is expected to provide benefits: 1) obtain information regarding the effectiveness of Ca (OH) 2 and various types of natural preservatives in maintaining the quality of coconut sap; 2) obtaining a natural preservative alternatives besides mangosteen rind, so as to overcome the lack of availability of mangosteen rind; 3) to develop science and technology, especially on coconut sap.

RESEARCH METHODS

1. Tools and materials

The materials used in this study is the coconut sap, Ca (OH) 2, the skin of the mangosteen fruit, fruit peel tangerines, tangerine leaves, guava leaves, clove, boiled water and distilled water. The equipment used in this study consisted of a cabinet dryer, digital pH meter (Hanna) and hand refractometer (Atago).

2. implementation Research

a. Reviewing methods of making laru

The new method of making laru done in two stages. The first stage is the manufacture of natural preservative powder (leather mangosteen fruit, fruit peel and leaves tangerine, guava leaves and clove). Natural preservatives dried using a dryer cabinet broken 50 ° C until dry, then blended into a powder for about 3 minutes and sieved with 60-mesh sieve. The second phase is manufacture laru. Limestone dissolved in hot water of approximately 100 ° C to form limestone slurry. Furthermore, a number of natural preservative powder mixed with lime and added pureed boiled water to 100 ml. The solution was allowed to stand overnight and is ready for use as laru.

a. Assessing comparison laru composition, concentration and timing of administration laru laru

Laru made with a concentration of 5% (w/v), which is composed of a mixture of lime and natural preservative with a ratio of 4: 1.5. Giving laru done after the sap is tapped with the terms of sap still good quality so that it can be observed a decrease in quality during storage. Nira was tapped for 5 hours without laru a pH from 6.39 to 7.51. Furthermore, the sap is poured into a plastic cup and given laru as much as 2% (v / v) so that the concentration of each treatment laru be homogeneous. Thus long been tapping 5 hours and laru concentration of 2% (v / v).

b. Sample preparation sap

Sap has been tapped for 5 hours is filtered and put in a plastic cup. Then laru (lime treatment concentration and type of natural preservative) 2% (v / v) is inserted into the sap in accordance with the treatment and ready for measurement.

c. Sap sample measurement

Measurement of sap to variable chemical and organoleptic carried out at time 0, 4 and 8 hours. Furthermore, the measurement data is analyzed.

3. Experimental design

The experimental design used in this

study is a randomized block design with 54 combination treatment and each treatment was repeated 2 times so obtained 108 experimental units. Factors that try is the concentration of Ca (OH) 2 (K, w / v), 0% (K0), 2% (K1) and 4% (K2); types of natural preservatives (J; 1.5% w / v), with no natural preservatives (J0), mangosteen rind (J1), fruit peel tangerines (J2), leaves tangerines (J3), guava leaves (J4) and clove (J5); long shelf (L), 0 h (L0), 4 hours (L1) and 8 hours (L2).

4. The parameters observed

Variables observed and measured in this study is the variable chemical and organoleptic coconut sap. Chemical variables include the degree of acidity (pH) were measured using a digital pH meter and sucrose concentration (% brix) using a hand refractometer. Organoleptic variables include clarity, aroma typical of the juice, sour smell and taste sweet.

5. Data analysis

Data obtained from the study were analyzed variance (F test) at 5% and if the analysis shows their diversity, then followed by Duncan's Multiple Range Test (DMRT) and regression (Hanafi, 2004). Organoleptic test data were analyzed with nonparametric tests when Friedman and shows the influence of treatment, then followed by Multiple Comparisons test at 5% level.

RESULTS AND DISCUSSION

1. The degree of acidity (pH)

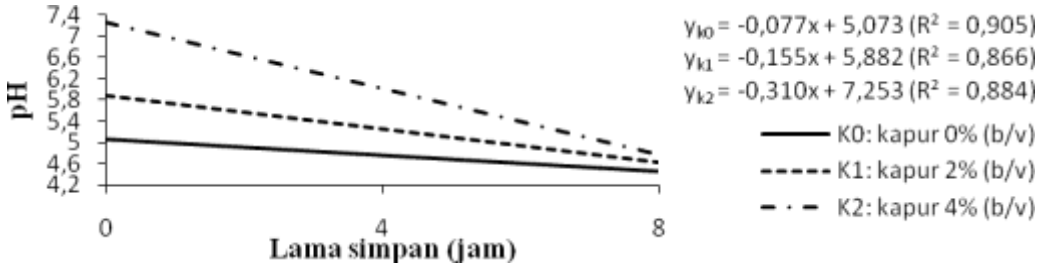
Giving Ca (OH) 2 immediately give different pH in the early storage. This is presumably due to the higher concentration of Ca (OH) 2 used the OH- ions are released more and more. The relationship between the concentration of Ca (OH) 2 and a long shelf against sap pH is presented in Figure 1.

pH sap produced by K1 and K2 after being stored for 4 hours and 8 hours higher than K0, but very sharp decrease in pH K2 that tends to approach on a long shelf K1 pH 8 hours. This is presumably because the pH of K2 at the beginning of the storage approaching optimal pH for the activity of bacteria and fungi destroyer sap so that the fermentation process is faster than K1 K2. Fermentation produces acids that result in decreased sap pH. Thus the concentration of Ca (OH) 2 2% had the highest number in maintaining optimum pH of sap. According to Frazier and Westhoff (1978), most bacteria grow optimally in near-neutral conditions, but some of them there that grows optimally at slightly acidic conditions, while the mold has a wider pH range of yeast and bacteria.

K1 can save the use of Ca (OH) 2 and is expected to produce palm sugar color better than K2. Giving Ca (OH) 2 is too much palm sugar allowing quality decreases due to the higher pH of the juice that can produce palm sugar color darkening. Manap (1995) states that one of determining the quality of coconut sugar is its color. Coconut sugar color is determined by the initial pH of sap. Coconut sugar is made from the juice with a pH of 6 or less will produce palm sugar with a light brown color yellowish. Juice with a pH of about 7 will produce palm sugar with a dark brown color darkening with increasing pH of the juice.

J1 giving sap pH higher than J0 at the beginning of storage. J1 can increase the ability of Ca (OH) 2 in releasing OH- ions so that the pH of the resulting higher. Treatment in addition to J1 produce sap pH lower than J0. This is presumably because these treatments has a pH low enough so

that it can reduce the ability of Ca (OH) $_2$.



Picture 1. The relationship between the concentration of Ca (OH) 2 and the old store on the pH of sap.

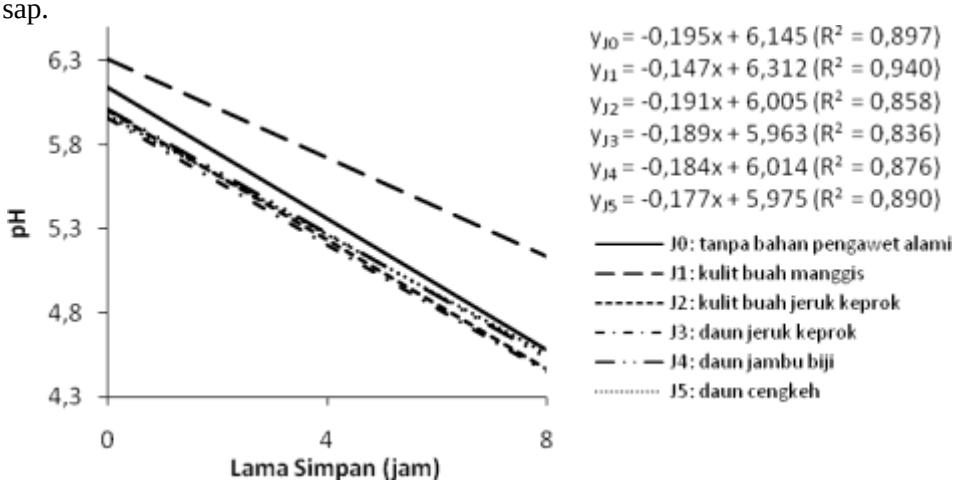


Figure 2. The relationship between the type of natural preservatives and long shelf on the pH of sap

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J2, J3, J4 and J5 produce sap pH lower than J0 after being stored for 4 hours and 8 hours. This indicates that treatment-treatment can not maintain the pH of the juice during storage. This was presumably because the antimicrobial compound treatments can not inhibit microbial activity destroyer roomie. According to Jay (1996), the use of preservatives depends on the type of food and generally made by combining one another, because these substances have different effectiveness against microbes.

J1 produce sap pH higher than J0 after being stored for 4 hours and 8 hours. J1 decrease in pH also tend to be more gentle than J0 to J1 can inhibit damage roomie well. This is presumably because the J1 has a high antimicrobial activity against microbes destroyer roomie. Qosim (2009) states that the skin of the mangosteen fruit contains antimicrobial compounds that are not owned by other natural preservatives, are compounds xanton. Xanton compounds include mangostin, mangostenol, mangostenon A, mangostenon B, trapezifolixanthone, tovophyllin B, alpha mangostin, beta-mangostin, garcinon B, mangostanol, flavonoids epicatechin and gartanin.

2. Sucrose levels

Effect of treatment concentration of Ca (OH) 2 to the sucrose content of sap are presented in Figure 3. Average levels of sucrose juice resulting from the treatment concentration of Ca (OH) 2: 0% (K0), 2% (K1) and 4% (K2), respectively is 14.19; 14.64 and 14.39. K1 and K2 produces a higher sucrose content than K0, however K2 produces a lower sucrose concentration of K1, K2 that can not maintain the quality of the juice better than K1. It is thought to relate to the pH of the juice as shown

by Figure 1. K2 produces sap pH near the pH optimum for the activity of bacteria and fungi destroyer sap, resulting in decomposition of sucrose more than K1.

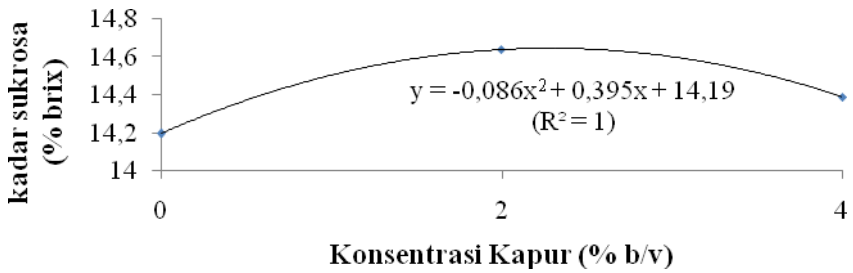

Figure 3. Effect of treatment concentration of Ca (OH) 2 to the sucrose content of the juice.

Effect of treatment concentration of Ca (OH) 2 to the sucrose content of sap to follow the equation y = -0,086x2 + 0,395x + 14.19. The equation shows the concentration of Ca (OH) 2 2% is not a treatment that produces the highest sucrose concentration. The highest sucrose concentration is expected to be obtained from the administration of Ca (OH) 2 was 2.3%.

Figure 4 shows levels of sucrose at different storage beginning. It is anticipated by administration of Ca (OH) 2 can increase the total dissolved solids sap so the index of refraction readable by a refractometer be increased. The higher the concentration of Ca (OH) 2 then increase the refractive index, but K2 provides a lower sucrose concentration of K1. This is presumably because the juice has been fermented beginning after administration of Ca (OH) 2. The fermentation speed were related to the pH of the juice after by Ca (OH) 2. As shown in Figure 1 at the start of storage, K2 produces sap pH near the pH optimum for the activity of bacteria and fungi destroyer sap. The fermentation process is faster than K1 K2 so that the levels of sucrose K2 immediately reduced at the beginning of storage.

K2 produces a lower sucrose concentration of K1, K1 and K2 but decreased during the same sucrose concentration storage. This is not in accordance with Figure 1 showing sucrose that decomposes at more than K1 K2 so that a lower pH than K1 K2 sharper, but in Figure 4 K2 showed a decrease in sucrose concentration equal to K1. Decreased levels of sucrose causes the refractive index to decline, but the decrease in sucrose concentration suspected K2 simultaneously with the formation of mucus fermented pretty much. The slime formation can increase the refractive index so as if a decrease in sucrose concentration as much as K1 K2.

K0 have elevated levels of sucrose during storage. It is suspected that the sucrose concentration value K0 generated is not an increase in sucrose concentration, but an increase in total dissolved solids so that the index of refraction that is readable by a refractometer be increased. The increase in total dissolved solids, presumably because K0 damage during storage, the decomposition of sucrose to acids and slime fermented. That phenomenon shows the weakness of the refractometer as a measure of the levels of sucrose (% brix) in coconut sugar industry. According Gautara and Wijandi (1975), sap damage characterized by taste sour, frothy and slimy.

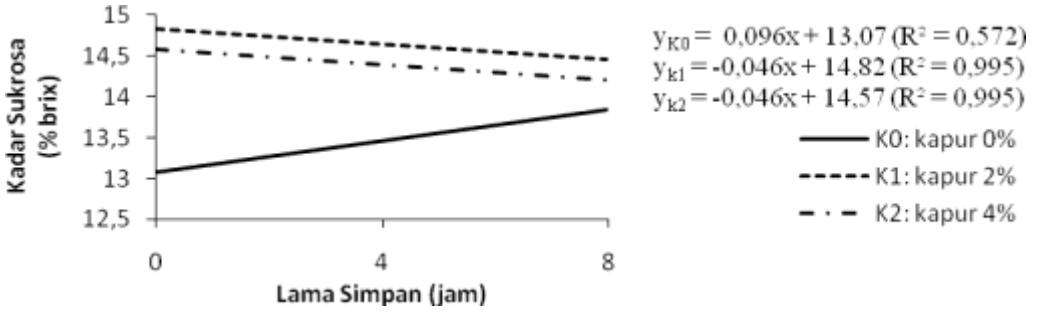

Figure 4. The relationship between the concentration of Ca (OH) 2 and a long shelf against the sucrose content of the juice.

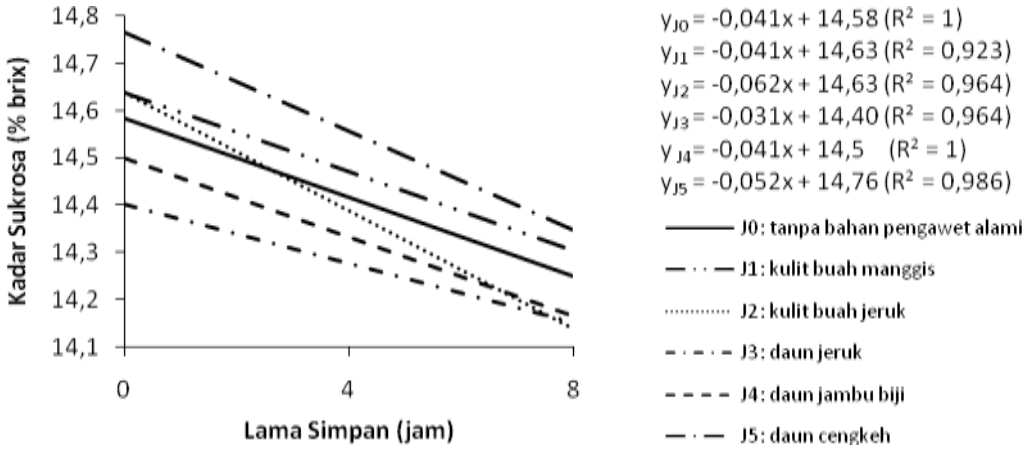

Figure 5. The relationship between the type of natural preservatives and long shelf against the sucrose content of sap.

Sucrose content of each treatment varies at the beginning of storage. The differences are not thought to be caused by changes in the levels of sucrose, but due to the refractive index of sap readable by a refractometer. Refractive index difference is apparently due to the amount of antimicrobial compound extracted from each of the different preservatives. Polarity level of antimicrobial compounds contained in each different preservatives, so the ability of water to extract these compounds are also different.

The amount of antimicrobial compound extracted J2 quite a lot but the levels of sucrose produced after storage of 4 hours and 8 hours experienced a sharp decline. This demonstrates the ability of the compound J2 antimicrobials are not effective in inhibiting microbial activity destroyer roomie. J3 and J4 produce sucrose concentration lower than J0 during storage so it is not effective in maintaining the sucrose content of the juice.

The amount of antimicrobial compounds most widely J5 among other treatments. J5 produce a higher sucrose content than J0 after storage of 4 hours and 8 hours, but the J5 decreased sucrose concentration sharper than J1. This shows the ability of antimicrobial compounds in J5 less effective in inhibiting microbial activity destroyer roomie.

J1 decreased sucrose levels that align with J0 during storage. Nonetheless J1 produces a higher sucrose content of J0 to J1 can inhibit sap damage. J1 also can maintain the quality of the juice is better than J5 because J1 decreased sucrose concentration slighter than J5, so that the amount of sucrose that decomposes less. This is presumably because J1 antimicrobial compounds have the ability to inhibit microbial activity

destroyer sap better than J5.

Okafor (1978) in Priyambodo (2002) suggests that the microbes that contaminate coconut sap of a group of bacteria that is Brevibacterium, Serratia, Streptococcus, and Klebsiella, while the group of yeast is Saccharomyces, Schizosaccharomyces, *Zygosaccharomyces*, Pichnia, Candida, Torulopsis and Endomycosis. Priyambodo (2002) also reported a destructive yeast coconut sap is Torulaspora delbrueekii, Saccharomyces cerevisiae and Schizosaccharomyces pombe.

Coconut sap can also be contaminated by fungi. Child (1974) in Suryandari (2001) states that the isolated microbes that contaminate coconut sap obtained by fungi such as Monilia, *Aspergillus niger* and *Penicillium glaucum*. Suryandari (2001) also reported a destructive fungus coconut sap is *Penicillium* sp, *Aspergillus* sp and *Curvularia* sp.

3. variable Appearance

a. Clarity

The higher the concentration of Ca (OH) 2 is used then the score the higher the clarity of the juice. After being stored for 4 hours K0, K1 and K2 decreased score of clarity, respectively of 0.77; 0.55 and 0.57. K1 and K2 decreased score clarity smaller than K0. This suggests the use of Ca (OH) 2 can inhibit the breakdown of sap. The decrease score clarity allegedly because the fermentation process that causes some sucrose breaks down into substances impurities. Substances such impurities dissolved in the sap and shaped white mucus, thereby reducing the score clarity cloudy juice. Gautara and Wijandi (1975) states that the sap damage characterized by taste sour, frothy and slimy. Scum and slime formation causing the clarity of the juice is reduced.

The average treatment types of natural preservatives decreased lucidity score during storage. After being stored for 4 hours, J0, J2, J3, J4 and J5 produce the same relative clarity score, while the J1 produce clarity score higher than other treatments. This shows the J1 can inhibit damage to the juice for 4 hours. After being stored for 8 hours, J1 produce clarity scores highest, followed J5 and J4, while J2 and J3 produces scores relative clarity equal to J0. It shows effective in inhibiting damage J1 roomie. J5 and J4 new looks pretty effective after a long shelf 8 hours.

b. Typical aromas Nira

After being stored for 4 hours K0, K1 and K2 decreased the typical aroma score roomie, respectively of 0.54; 0.56 and 0.51. K1 and K2 decreased the distinctive aroma score sap relatively equal to K0. This suggests the use of Ca (OH) 2 is ineffective in inhibiting the breakdown of sap for 4 hours. Decrease distinctive aroma score sap K0, K1 and K2 after being kept for 8 hours, respectively 0,45; 0.32 and 0.19. K1 and K2 seen to be effective in inhibiting new roomie damage after being stored for 8 hours due to decreased score a distinctive smell of sap smaller than K0. K2 is more effective than K1.

The average treatment types of natural preservatives decreased score a distinctive smell of sap during storage. After being stored for 4 hours, J0, J2, J3, J4 and J5 produces a distinctive aroma score sap relatively equal, whereas J1 sap produces a distinctive aroma score higher than other treatments. This shows the J1 can inhibit damage to the juice for 4 hours. After being stored for 8 hours, J1 produce clarity scores highest, followed J5, while J2, J3 and J4 produces scores relative clarity equal to J0. It shows effective in inhibiting damage J1 juice for 8 hours, while the

new J5 looks quite effective in inhibiting the breakdown of sap after being stored for 8 hours.

Aroma sap thought to be caused by the chemical composition contained therein. Suwardjono (2001) stated roomie good nutrients for microbial growth, sucrose (carbohydrate) as the C source for microbial activity, amino acids as a source of N and vitamins as a growth factor. Nira good for coconut sugar is processed into juice with an optimal pH of 6.5 to 7, a high sucrose concentration, clear color and sweet taste and smell typical of fresh or juice.

c. odor Acid

After being stored for 4 hours K0, K1 and K2 decreased the sour smell score, respectively of 0.59; 0.54 and 0.27. K1 is ineffective in inhibiting the breakdown of sap during 4 hours due to decreased score sour smell relatively the same with K0, K2 while effectively inhibit the damage of sap during 4 hours due to decreased score sour odor smaller than K0. The decrease score sour smell K0, K1 and K2 after being kept for 8 hours, respectively by 0.56; 0.52 and 0.59. K1 and K2 decreased the sour odor score relatively equal to K0. It shows K1 is ineffective in inhibiting the formation of acid odor during storage, while K2 is only effective in maintaining the quality of the juice to 4 hours.

The average treatment types of natural preservatives decreased scores acid odor during storage. After being stored for 8 hours, J1 produce sour odor scores highest, followed J5, while J2, J3 and J4 produce sour odor scores were relatively similar to J0. It shows effective in inhibiting damage J1 juice for 8 hours, while the new J5 looks quite effective in inhibiting the breakdown of sap after being stored for 8 hours. Sour smell easily detected if the juice has been fermented. According Jatmika et al. (1990), the fermented sap occurs in three phases: 1) change sucrose into glucose and fructose; 2) fermentation of glucose and fructose to ethanol and CO2; 3) changes in the ethanol to acetic acid. Lutony (1993) add the juice fermentation process caused by yeasts *Saccharomyces sp.* and acetic acid fermentation caused by Acetobacter sp.

d. Sweetness

Sap storage for 4 hours K0, K1 and K2 decreased score of sweetness, respectively, 0.95; 0.64 and 0.66. K1 and K2 decreased score sweetness smaller than K0. This suggests the use of Ca (OH) 2 is effective in inhibiting the breakdown of sap for 4 hours. Scores sweetness vary due to differences in the initial sweet taste score. The decrease score sweetness K0, K1 and K2 after being kept for 8 hours, respectively of 0.28; 0.49 and 0.25. K1 and K2 decreased score sweetness greater than K0 so ineffective in inhibiting the breakdown of sap to 8 hours. Thus the effect of Ca (OH) 2 is only effective up to 4 hours.

The average treatment types of natural preservatives decreased score of sweetness during storage. After being stored for 4 hours, J0, J2, J3, J4 and J5 generates scores the same relative sweetness, while the sweet taste J1 produce a score higher than other treatments. This shows the J1 can inhibit damage to the juice for 4 hours. After being stored for 8 hours, J1 produces a sweet taste score the highest, followed by J5 and J4, while J2 and J3 produces scores relative sweetness equal to J0. It shows effective in inhibiting damage J1 juice for 8 hours, while the J5 and J4 new looks quite effective in inhibiting the breakdown of sap after being stored for 8 hours. Sardjono et al. (1985) state fermentation reaction on coconut sap will turn sucrose into ethanol and CO2, then will oxidize ethanol to

acetic acid and water. The reduced sucrose causes coconut sap sweetness is reduced.

CONCLUSION

Giving Ca (OH) 2 2% is known to maintain the quality of coconut sap up to 4 hours. Mangosteen rind has the highest effectiveness in maintaining the quality of coconut sap during storage. In addition, clove leaves and guava leaves also have a pretty good effectiveness in maintaining the quality of coconut sap. Combination administration of Ca (OH) 2 2% and mangosteen rind is the best treatment in maintaining the quality of coconut sap.

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