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Use of Crude Extract Water–Soluble Polysaccharides of Durian (*Durio zibethinus* Murr) Seeds as Stabilizer for Pineapple Juice Production

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Abstract

The purpose of this study was to know the effect of crude extract durian seeds using on pineapple juice during storage and to know the appropriated concentration of crude extract of durian seed to product the pineapple juice with good properties and high preference. The research was done in two steps. The first step was extraction of processing crude extract water-soluble polysaccharide of durian seed. The second step was application of crude extract water-soluble polysaccharide of durian seed on pineapple juice. The experimental design used completely randomized design two factors of nested pattern (Nested Design). The first factor was concentration of crude extracts (0; 0.05; 0.10; 0.15 and 0.20 %) and the second factor was storage time at room temperature (0, 1, 2 and 3 week). The best concentration of crude extract water soluble polysaccharides of durian seeds to product the pineapple juice was 0.10%. The pineapple juice had 0,10% by 54,67 mp of viscosity; 0,00 of °Brix stability; pH 5.01; Hue value by 76.173 (Yellow Red); Chroma 19.80; and the sensory properties were preference of color, aroma, taste, stability, and overall were 3.56; 3.40; 3.56; 3.60; and 3.84 (like to very like) respectively.

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1. Introduction

Durian (*Durio zibethinus* Murr.) Is one kind of tropical fruit that is very popular in Indonesia. Generally only used on the fruit, bark and seeds discarded, causing the waste is high enough (Rukmana, 1996). Total weight of the fruit durian consists of three parts: the first part of the fruit flesh around 20-35%; The second seed about 5-15%; and the rest of the weight of the skin, which reached 60-75% of the total weight of the fruit (Fortunately, 2008). Durian seeds contain a lot of mucus that is odorless and tasteless and soluble in hot or cold water. The main component of mucus is phosphatides, proteins, carbohydrates and water. Mucus in the seeds of durian is a water-soluble polysaccharide (WSP) which has the properties are soluble in polar solvents so that the extraction of WSP can be done using water or distilled water as a solvent extraction (Amien et al., 2007; Evans, 2013).

Crude extract WSP from durian seeds were extracted using water that is precipitated with ethanol. Crude extract WSP from durian seeds contain L-rhamnosa, glucose, D-galactose in the ratio 3: 9: 1 and PLA fresh durian seeds do not contain galaktomanan (Amien et al., 2007). Crude extract WSP from durian seeds contains carbohydrates, protein in the form of hydrocolloids that can be used as an emulsion stabilizer (Dicki, 2013). WSP is a water-soluble dietary fiber is defined as components in plants that are not degraded enzymatically into sub-sub unit so that the unit can not be absorbed by the stomach and small intestine (Trowel, 1976). The content of crude extract WSP from durian seeds has the potential to be used as an alternative source of food additives in the food industry in order to achieve the expected quality in terms of viscosity, stability, texture, and appearance (Anggraeni, 2013).

Pineapple (*Ananas comosus* (L.) Merr) is the fruit of plants such as shrubs are widely cultivated in tropical and subtropical areas with yellow flesh (Jilani, 2013). Pineapple production in Indonesia increased from 2010 through 2013 is 1,406,445 tons, 1,540,262 tons, 1,781,899 tons and 1,837,159 tons (Central Bureau of Statistics, 2013). Pineapple fruit has a sweet taste to slightly sour refreshing. The economic value lies in his pineapple plants. Besides pineapple is consumed as fresh fruit, can also be processed into a wide variety of processed foods and beverages. Fresh pineapple fruit can not be stored longer, because it has a high water content of 90% and \pm 7 days shelf life at a temperature 21,11°C. Pineapple fruit damage can be caused by physiological factors, physical, khemis, and microbiological that can lead to decreased quality of pineapple fruit so that the necessary diversification of processed pineapple products in order to provide added value pineapple. One alternative is to diversify pineapple with pineapple processing into juice, pineapple juice nature that is both stable and does not undergo precipitation. To maintain the stability of the juice necessary to add a stabilizer. One stabilizer that can be used to stabilize the pineapple juice is a crude extract WSP from durian seeds.

2. Materials and methods

2.1. Implementation of research

The research was done in 2 stages. First step is the manufacture of crude extract WSP from durian seeds. The second stage is the stage of primary research, namely the use of crude extract WSP from durian seeds in the manufacture of pineapple juice.

2.2. Making the crude extract WSP from durian seeds

Durian seeds are washed and peeled to clean. Seeds that have been clean destroyed using a blender with distilled solvent is added to the comparison between materials with a solvent that is 1: 2 to become Slurry. Then do the filtering process using a filter cloth. The filtrate obtained was centrifuged using a centrifuge at a speed of 4500 rpm for 20 minutes. Of the process is obtained precipitate and supernatant were then separated. Once that is done the coagulation process supernatant using 97% ethanol with the ratio between the supernatant and ethanol by (1: 4) and allowed to stand for 30 minutes so that the resulting crude extracts WSP from durian seeds moist. Crude extract WSP from durian seeds wet then dried using an oven with a temperature of 50°C for 24 hours. Then do the milling and sieving to a size of 40 mesh, to obtain a crude extract WSP from durian seeds of dried.

2.3. Manufacture of Fruit Pineapple

Pineapple is old and well peeled, cleaned up (removal of the eye and the heart), and washed with clean water, then do the cutting. Then blanching using blanching steam at a temperature of 70-75°C for 10 minutes, then carried out the destruction of the flesh of the fruit in a blender with the ratio of ingredients: water is 1: 4. Then filtered and added sugar in the ratio of sugar: the material is 1: 5. The addition of crude extract PLA durian seeds as much as 0%, 0.05%, 0.10%, 0.15% and 0.20%. Followed by heating at a temperature of 80-85°C for 15 minutes accompanied by stirring gently to dissolve the sugar and WSP. Furthermore, the packaging in bottles using 140 ml volume, then carried exhausting at a temperature of 70-75°C, bottle closure and pasteurisation at a temperature of 70-80°C for 30 minutes. Do storage for 21 days and made weekly observation.

2.4. Design study

The design study used was a randomized block design nested (Nested Design) with two factors, namely the concentration of crude extract WSP from durian seeds and storage time. Crude extract WSP from durian seeds concentration used is P0 (0%), P1 (0.05%), P2 (0.10%), P3 (0.15%) and P4 (0.20%). Storage for 3 weeks old were 0 weeks, 1 week, 2 weeks and 3 weeks. Outcome data were analyzed using analysis of variance, if there is a noticeable difference done by LSD (Least Significant Difference). The data were presented in tabular form, and to facilitate the interpretation of the data graphed. Parameter Observation The parameters observed in this study include: Viscosity (AOAC, 1995), Stability (Mulyono, 1997), pH (Apriyanto, 1989), Hue and Croma (Hutching, 1999) and Organoleptic Test (Mabesa, 1986)

3. Results and discussion

3.1. Viscosity

Viscosity indicates the level of viscosity of a product. The higher the viscosity of the product, the more viscous the product. Based on the analysis of variance with test level α of 5% is known that the use of the crude extract WSP from durian seeds very significant effect on the viscosity of pineapple juice on all treatments during storage. Viscosity pineapple juice for 3 weeks of storage ranged from 35.13 to 94.76 mp can be seen in Fig. 1.

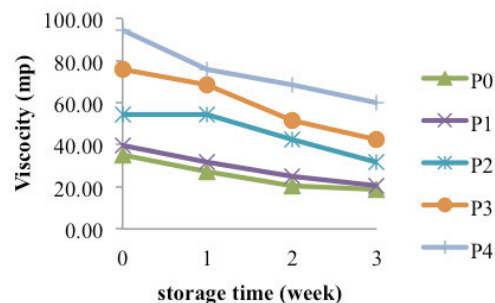


Figure. 1. Viscosity value pineapple juice for 3 weeks at various concentrations of crude extract WSP from durian seeds.

Fig. 1 shows that the higher the concentration of the crude extract WSP from durian seeds viscosity increasing pineapple juice. This is presumably because when the crude extract WSP from durian seeds is dissolved in water and heated to form a gel. Crude extract from durian seeds contain pectin and protein which may result in the formation of gel (Dicki, 2013). Gelation occurs because water-soluble polysaccharide molecules undergo long brown motion, the molecules collide or intersect each other, and interact via the bond between molecules (Evans, 2013). Increased viscosity due to stabilizing crude extract WSP from durian seeds more then the gel formed will be more and more and lead to increased viscosity.

During storage the viscosity of pineapple juice a low of at P0 (without the addition of crude extract WSP from durian seeds) at week 3 that 0.3156 mp, while the highest viscosity at P4 (0.20%) at week 0, ie 1.6072 mp, crude extract WSP from durian seeds are able to maintain viscosity during storage pineapple juice 3 weeks. In the treatment of the addition of crude extract WSP from durian seeds viscosity decreases during storage as resulting from the ability of microbial fermentation results in degrading the content of crude extract WSP from durian seeds are pectin and proteins into simpler compounds that pineapple juice becomes thinner and its viscosity decreases (Pratama, 2009).

3.2. Stability

Pineapple juice stability is measured by the difference between total solid bottom and top. The smaller the difference between the total solids then the juice is more stable. Based on the analysis of variance with test level α of 5% is known that the use of the crude extract WSP from durian seeds in treatment P0 (control) and P4 (0.20%) very significant effect on the stability of pineapple juice during storage, while in treatment P1 (0.05 %), P2 (0.10%), and P3 (0.15%) effect no significant effect on the stability of pineapple juice during storage. The stability of pineapple juice with the addition of crude extract PLA durian seeds at various concentrations with storage for 3 weeks ranged from 0.00 to 0.633 °Brix, can be seen in Fig. 2.

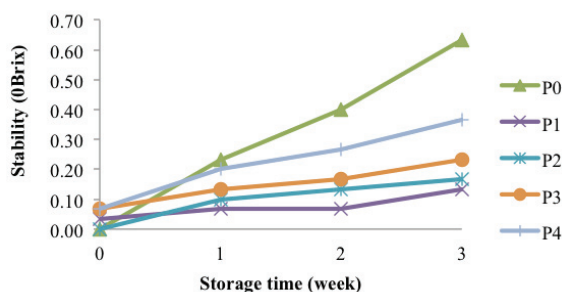


Figure 2. Value stability pineapple juice for 3 weeks at various concentrations of crude extract WSP from durian seeds

Figure 2 shows that the addition of crude extract WSP from durian seeds in treatment P1 (0.05%) to P4 (0.20%) can improve the stability of pineapple juice. While on treatment P0 (control) have low stability. It is caused by a crude extract WSP from durian seeds can increase the viscosity of pineapple juice pineapple juice so that stability increases because the particles that are in pineapple juice is difficult to settle. According to Stokes law that the velocity of a particle is inversely proportional to viscosity, so that the greater the viscosity of a fluid, the more difficult a fluid flow and the harder an object moves in the fluid (Tipler, 1998).

Crude extract WSP from durian seeds is a carbohydrate component that can form three-dimensional gel network is strong, thus making the water trapped in it and make the pineapple juice to be stable. During storage pineapple juice shows that the control treatments as well as treatments additional crude extract WSP from durian seeds decreased stability. This is presumably due to the compactness of a three-dimensional gel network crude extract WSP from durian seeds decreased, so that the particles are trapped pineapple juice in a three-dimensional network of crude extract WSP from durian seeds out and resulted in the stability of pineapple juice decreases.

The influence of the storage time on stability of pineapple juice at week 0 showed significantly affect pineapple juice, but in week 1 to 3 shows a very significant effect on pineapple juice. That is because the crude extract WSP from durian seeds is able to increase the stability of pineapple juice, but as long as the storage stability of pineapple juice decreased.

3.3. pH value

Measurement of pH value is one of the parameters to determine changes in the level of acidity of a product (Winarno & Wirakartakusumah, 1974). Juice product that has a high acidity level (pH 4.5-5) can be pasteurized at a temperature between 160-165°F or 71,1-73,9°C (Crueess, 1971). Based on the analysis of variance with test level α of 5% is known that the use of the crude extract WSP from durian seeds in treatment P0 (control) very significant effect on the pH of pineapple juice during storage and the treatment of P1, P2, P3, and P4. Effect no significant effect on pH sari pineapple fruit during storage. pH on addition of crude extract WSP from durian seeds applications durian seeds in the manufacture of pineapple juice with storage for 3 weeks ranged from 4.09 to 5.14 can be seen in Fig. 3.

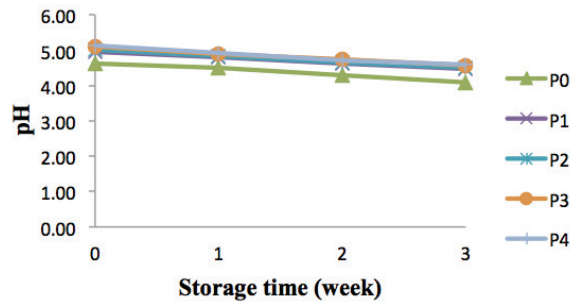


Figure 3. pH pineapple juice for 3 weeks at various concentrations of crude extract WSP from durian seeds

Fig. 3 is known that the pH value of pineapple juice is getting increased in line with the addition of crude extract concentration crude extract WSP from durian seeds. Compared with controls pineapple juice with the addition of crude extract WSP from durian seeds have higher pH values, it is because the crude extract WSP from durian seeds has a pH of 7, which if added to the pineapple juice has a higher pH value. pineapple juice pH decreases with the length of storage. This is presumably due to a decline in the connective power between the stabilizer and fruit juice due to the carboxyl group attached to the solution of fruit juice will decrease during storage. PH decrease is also due to the presence of pectin compounds which split into galacturonic acid which is derived from galactose (Winarno, 2004).

The influence of the storage time of the pH pineapple juice at weeks 0 indicates highly significant effect on pineapple juice, and at week 3 showed significantly affect pineapple juice, and at weeks 1 and 2 showed no real effect on pineapple juice. That is because the crude extract WSP from duran seeds able to increase the pH value of pineapple juice, but during storage of pineapple juice pH decreased.

3.4. Color (Hue, and Chroma)

Color is one of the most important components for a food product. Color is also often associated as a factor that describes the level of freshness, ripeness, purchasing power, and the safety of a product (Dewayani et al., 2002). Based on the analysis of variance with test level α of 5% is known that the use of the crude extract WSP from durian seeds are not real effect on the value of Hue pineapple juice on all treatments during storage. Hue value in the addition of crude extract WSP from durian seeds applications in the manufacture of pineapple juice with storage for 3 weeks ranged from 76.13 to 76.38 which are in color Yellow Red (YR). The more the addition of crude extract WSP from durian seeds then angle the higher the color obtained which leads to a brownish yellow color. This is presumably because the crude extract WSP from durian seeds can serve as protection during the heating process (Thermoprotecting), so the color of the juice is not damaged. While the cause of the color of pineapple juice brownish due to the components of carbohydrate and pteoin that can cause browning reaction (Maillard reaction). During storage shows that the value of Hue from pineapple juice decreases. This is because during storage carotenoid pigment is affected by low pH conditions so that the carotenoid pigments decreases and causes the color to fade pineapple juice (Meiliana, 2014).

Based on the analysis of variance with test level α of 5% is known that the treatment P0 (control) significantly affect color intensity values (Croma) pineapple juice and the use of the crude extract WSP from durian seeds in treatment P1 (0.05%), P2 (0, 10%), P3 (0.15%) and P4 (0.20%) did not affect significantly affect color intensity values (Croma) pineapple juice. Color intensity (Croma) pineapple juice with storage for 3 weeks ranged from 19.53 to 19.82 can be seen in Fig. 4.

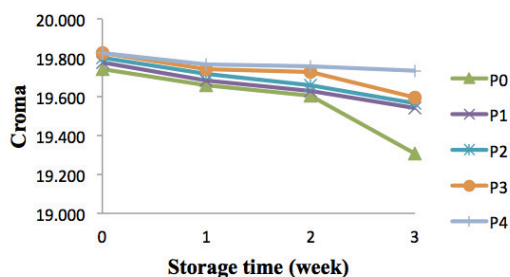


Figure 4. Intensity of Color (Chroma) pineapple juice for 3 weeks at various concentrations of crude extract WSP from durian seeds

Fig. 4. Intensity of Color (Chroma) pineapple juice for 3 weeks at various concentrations of crude extract from durian seeds Based on Fig.4 compared to control pineapple juice were added to the crude extract WSP from durian seeds tend to have color intensity is high and shows the more the addition of crude extract WSP from durian seed then higher color intensity. At P4 treatment (0.20%) is pineapple juice which has the best color intensity values. This is presumably because the crude extract WSP from durian seeds were added to pineapple juice can serve as protection during the heating process, causing the color of pineapple juice has a high color intensity. Stability in pineapple juice also influences the intensity of color, where the more stable pineapple juice has a high color intensity as well.

4. Nature Appearance

4.1. Color

Based on the analysis of variance to test 5% α is known that the use of the crude extract WSP from durian seeds are not real effect on the favorite color of pineapple juice. A value of the color of pineapple juice with the addition of crude extract WSP from durian seeds can be seen in Fig. 5.

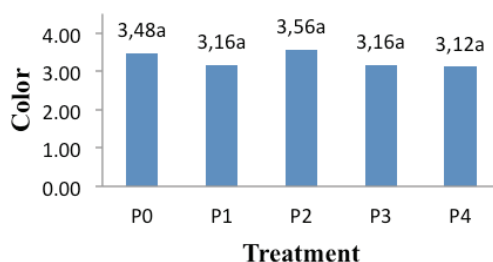


Figure 5. Color Value on pineapple juice with the addition of WSP treatment at various concentrations. Description: Data followed by the same letter show no significant at 5%

Fig. 5 can be seen that the value of the color preferences to the highest pineapple juice pineapple juice with the addition of crude extract WSP from durian seeds of 0.10% (P2) and the lowest by the addition of crude extract WSP from durian seeds 0,20% (P4). So that the color of fruit juices preferably has a value of 76.15 Hue being that which has the corner leads to a yellow color and the intensity of the colors that are namely 19.80.

4.2. Aroma

Based on the analysis of variance to test 5% α is known that the use of the crude extract WSP from durian seeds are not real effect on the aroma of pineapple juice. A value aroma pineapple juice with the addition of crude extract WSP from durian seeds can be seen in Fig. 6.

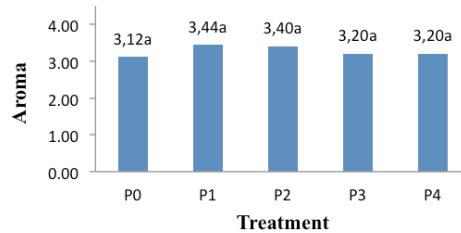


Figure 6. Aroma value on pineapple juice with the addition of WSP treatment at various concentrations. Description: Data followed by the same letter show no significant at 5%

Fig. 6 can be determined based on the value of A scent of pineapple juice between 3.12 to 3.44 (rather like to like). A value of the highest aroma pineapple juice with the addition of crude extract WSP from durian seeds in treatment P1 (0.05%) and the lowest by the addition of crude extract WSP from durian seeds in treatment P0 (control).

4.3. Stability

Based on the analysis of variance to test 5% α is known that the use of the crude extract WSP from durian seeds significantly affect the stability of pineapple juice. A value stability of pineapple juice with the addition of crude extract WSP from durian seeds can be seen in Fig. 7.

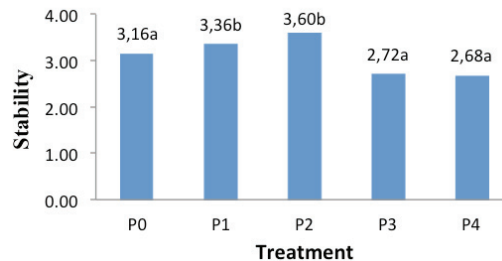


Figure 7. stability value on pineapple juice with the addition of WSP treatment at various concentrations. Description: Data followed by the same letter show no significant at 5%

Fig.7 can be seen that the value of stability A pineapple juice between 2.68 to 3.60 (do not like to rather like it). A value of the highest stability of pineapple juice with the addition of crude extract from durian seeds in treatment P2 (0.10%) and the lowest by the addition of crude extract WSP from durian seeds in treatment P4 (0.20%). This is presumably due to the stability of pineapple juice in treatment P2 (0.10%) showed stable appearance so favored, while in treatment P4 seen the deposition so that the appearance of pineapple juice look ugly so unpopular.

4.4. Flavor

Based on the analysis of variance to test 5% α is known that the use of the crude extract WSP from durian seeds are not real effect on the taste of pineapple juice. Value A sense of pineapple juice with the addition of crude extract WSP from durian seeds can be seen in Fig.8.

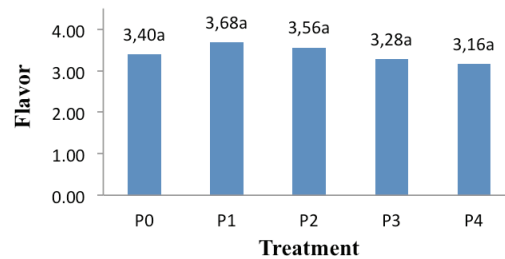


Figure 8. Flavor value on pineapple juice with the addition of WSP treatment at various concentrations. Description: Data followed by the same letter show no significant at 5%.

Based on Fig.8 can be seen that the value of flavor of pineapple juice between 3.16 to 3.68 (rather like to like). A value of the highest sense of pineapple juice with the addition of crude extract WSP from durian seeds in treatment P1 (0.05%) and the lowest by the addition of crude extract WSP from durian seeds in treatment P4 (0.20%). It is suspected pineapple juice preferably one that has a slightly sour taste because of the higher addition of crude extract WSP from durian seeds have a high pH value or flavor that is not too acidic.

4.5. Overall

Based on the analysis of variance to test 5% α is known that the use of the crude extract WSP from durian seeds significantly affect the overall favorite pineapple juice. Overall value on pineapple juice with the addition of crude extract WSP from durian seeds can be seen in Fig. 9.

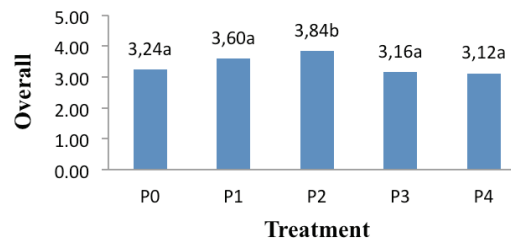


Figure 9. Overall value in pineapple juice with the addition of WSP treatment at various concentrations. Description: Data followed by the same letter show no significant at 5%

Fig. 9 can be seen that the overall value on pineapple juice between 3.12 to 3.84 (rather like to like). Overall value of the highest overall pineapple juice with the addition of crude extract WSP from durian seeds in treatment P2 (0.10%) and the lowest by the addition of crude extract WSP from durian seeds in treatment P4 (0.20%). So the overall favorite of the pineapple juice is determined by the stability and color preferences.

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