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Analysis of the Degradation of Nutritional and Bioactive Components of Purple Sweet Potato during Drying into Flour Using Cabinet Dryer.

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ABSTRACT

Sweet potato has the potential to be developed as a source of raw material for making flour to substitute the use of wheat flour. The sweet potatoes used in this study as flour were sweet potatoes with purple flesh. Processing of purple sweet potato into flour can be done through the drying process. The purpose of this study was to evaluate the effect of the temperature used in the cabinet dryer on the rate of degradation of the nutritional components and bioactive components of purple sweet potato during the flouring process. Purple sweet potato is cleaned and made into chips with a size of ± 2 mm and then dried in a cabinet dryer. The variables in this study were temperature (50 ºC, 55 ºC, 60 ºC) and drying time (1, 2, 3, 4, 5, 6, 7, 8 hours). Each treatment was repeated 3 times and observed for water content, total sugar, reducing sugar, beta-carotene, anthocyanins, polyphenols, and antioxidant activity. Data were analyzed using a Completely Randomized Factorial Design followed by Duncan's Test. The results showed that temperature and drying time had a significant effect on the nutritional and bioactive components of purple sweet potato during the drying process. A temperature of 60 ºC can be recommended as one of the temperatures used to dry purple sweet potatoes with a drying time of 5 hours. At this temperature and drying time, the anthocyanin content and antioxidant activity still have their biological properties. The characteristics of purple sweet potato slices in this treatment were 9.62% water content, 0.84% total sugar, 0.52% reducing sugar, 0.74% beta-carotene, 25.25% anthocyanins, 4.93% polyphenols, and 2.29% antioxidant activity.

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INTRODUCTION

Sweet potato (*Ipomoea batatas*) is one of the crops that are widely available in Indonesia. The sweet potato commodity is worth considering in supporting flour-based food diversification programs because it has good nutritional content, relatively short growing age, high production. The soft texture of sweet potatoes with high water content is easily damaged by mechanical influences. Processing sweet potatoes into flour is one of the efforts to preserve sweet potatoes. In addition, this effort is also an increase in the usability of sweet potatoes so that they can be utilized as raw materials for the food industry.

Sweet potato has a high carbohydrate content, which is 22.4% starch, 2.4% sugar, and 1.6% dietary fiber (Syamsir and Honestin, 2009). This content causes sweet potatoes to be potentially developed as a source of raw material for making flour to substitute the use

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of wheat flour, so that the utilization of wheat flour can be reduced. Sugars that make up sweet potatoes include maltose, sucrose, fructose, and glucose. In addition, sweet potatoes also contain oligosaccharides consisting of stakiose and arabinose, where these two oligosaccharide components have the potential to be developed as components that can be utilized by beneficial microflora in the gastrointestinal tract.

The food fiber content of sweet potatoes is also quite high. The main food fiber components found in purple sweet potatoes are pectin, hemicellulose, and cellulose. The presence of starch components, oligosaccharides, and high food fiber components in sweet potatoes makes this food commodity have a glycemic index that can be categorized as moderate and even low. Food ingredients that naturally have a moderate to low glycemic index will also produce derivative products with low carbohydrate digestibility and a low glycemic index.

Sweet potatoes used in this study as flour are sweet potatoes with purple flesh. This type of sweet potato has a high anthocyanin content. Anthocyanins are pigments that form purple color. The high anthocyanin content makes the purple sweet potato flour produced have naturally attractive color characteristics and also has functional value for the body. In addition, sweet potatoes also have bioactive components such as polyphenols that can act as natural antioxidants.

The processing of purple sweet potato into flour can be done through the drying process. The drying process will cause a reduction in the water content contained in food ingredients. In addition to water content, nutritional and bioactive components contained in sweet potatoes will also undergo a reduction process, so poor drying can cause a high reduction in nutritional components and important bioactive components of purple sweet potatoes. Drying using a *cabinet dryer* is one of the efforts to control the reduction of nutritional components and bioactive components of purple sweet potato during pressing. Drying with a *cabinet dryer* allows the drying temperature to be well controlled. Therefore, it is necessary to analyze the degradation of nutritional and bioactive components of purple sweet potato during drying into flour using a *cabinet dryer*. The purpose of this study was to evaluate the effect of temperature used in the *cabinet dryer* on the degradation rate of nutritional components and bioactive components of purple sweet potato during the flouring process.

MATERIALS AND METHODS

Materials and Tools

The main material used in this research is purple sweet potato. Other materials used were distilled water, glucose, maltose, amylose, pure starch, ethanol (95%, 80% and 10%), petroleum ether, acetone, NaOH (25% and 1 N), 1 N acetic acid, iodine solution, HCl (25%, 4 M and 0.1 N), KOH, DNS reagent, Na phosphate buffer 0.05 M and 0.01 M pH 6.9 and pH 7, sodium acetate buffer 0.1 M pH 5.2 and pH 6.0, and 0.4 M pH 4.75, HCl-KCl buffer 0.05 M and 0.1 M (pH 1.5), cellulose filter 0.45 µm, and Whatman filter paper No. 41. 41. The equipment used in this study were *cabinet dryer*, analytical balance, *disk mill*, *freezer*, *refrigerator*, oven, centrifuge, spectrophotometer, pH meter, *waterbath*, micropipette, and glassware.

Research Methodology

Purple sweet potatoes are sorted and then washed. After that, the sweet potatoes were weighed, the skin was peeled and washed again. Sweet potatoes were sliced with a thickness of ± 2 mm, then sweet potatoes were weighed for the purpose of analyzing the nutritional content and content of the initial bioactive components. Sweet potato slices were soaked in 0.3% Na-metabisulfite solution for 5 minutes, then drained and set aside for testing nutritional content and bioactive content. Sweet potato slices were then dried in a *cabinet dryer*. Drying temperature became the treatment variable in this study. The temperature used consisted of 3 variations, namely 50°C, 55°C, and 60°C. Drying was carried out for ± 6 hours or until dry. During the drying process, testing of changes in nutritional content and bioactive components was carried out every 2-hour interval. After drying, the dried sweet potato slices were ground using a *disc mill* and sieved. Sweet potato flour was packed in plastic packaging and *sealer*. Subsequently, the purple sweet potato flour was analyzed for nutritional content and bioactive components.

Analysis Method

The analytical methods used in this study were analysis of water content (AOAC, 2005), reducing sugar content (Sudarmadji et al. 1997),

total sugar (Dubois et al. 1956), anthocyanin content based on pH differences (Shi et al., 1992), betacarotene content (AOAC, 2005), polyphenol content (AOAC, 2005), and antioxidant activity (Molyneux, 2004).

Trial Design

This research will use a completely randomized design (CRD) factorial pattern. The treatment variable in this study is the temperature of the *cabinet dryer* used during the processing of purple sweet potato into flour. The temperature used in this study consists of 3 levels, namely 50°C (A1), 55°C (A2), and 60°C (A3). Each temperature variation will measure the degradation of water content, nutrient content, and bioactive components according to the observation interval during the test time.

Data Analysis

Data processing is based on the results of the analysis requirements test, namely the data used is only normal and homogeneous data. Furthermore, data that meet the requirements are analyzed using analysis of variance (ANOVA). If significantly different, it was followed by Duncan's test at the 95% level ($\alpha = 0.05$). Data were processed using IBM SPSS 21.0 software.

RESULTS AND DISCUSSION

Water Content

One of the food components that must be considered in processing is water content because it affects the durability of food during the storage process (Tobri, 2006). According to Sudarmadji et al (1997) water is an important component in food ingredients because water can affect the appearance, texture, and flavor of food. Moisture content is one of the most important characteristics, because it affects the appearance of texture, flavor and determines the freshness and durability of food (Sakidja, 1989). The effect of drying temperature and drying time is presented in Figure 1.

The results showed that the initial moisture content of purple sweet potato increased after soaking in sodium metabisulfite solution. The moisture content decreased since drying was carried out for 1 hour in a cabinet dryer, both at temperatures of 50 ºC, 55 ºC, and 60 ºC. The results showed that the moisture content decreased faster at a drying temperature of 60 ºC. The decrease in moisture content in purple sweet potato slices continued until drying for 6 hours. The results of the analysis of variance showed that the interaction between temperature and drying time gave a very significant effect on the decrease in water content of purple sweet potato slices.

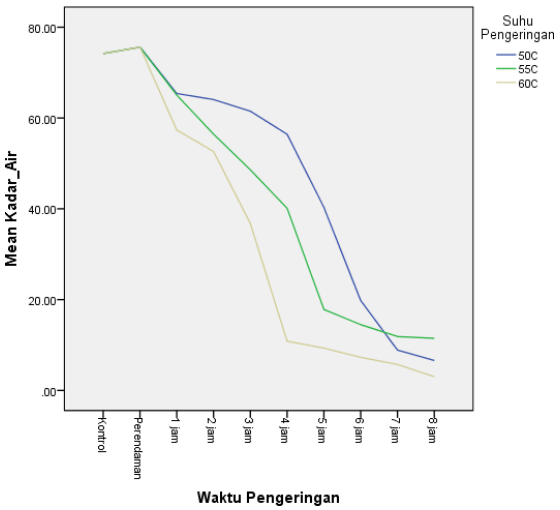

Figure 1. Relationship between Drying Temperature and Drying Time on Moisture Content of Purple Sweet Potato Slices

Duncan's further test results show that the water content of purple sweet potato slices dried at 60 ºC has the lowest water content value when compared to the water content of purple sweet potato slices dried at 55 ºC and 50 ºC. The difference in moisture content is due to the difference in heat temperature received by each slice of purple sweet potato. The temperature of 60ºC produced higher heat energy than the other two temperature treatments which caused the release of water content in the purple sweet potato slices to be faster. However, the three treatments showed a similar trend of decreasing water content.

The moisture content of purple sweet potato slices increased after soaking in 0.3% sodium metabisulfite solution. However, the increase in moisture content in purple sweet potato slices was not significant compared to the initial moisture content of purple sweet potato slices. A significant decrease in water content began to be seen since the first hour of drying, the water content decreased by 11.59% compared to the initial water content of purple sweet potato slices. This decrease did not change significantly until the second hour of drying. Significant changes in water content again occurred from the third to the sixth hour of drying, namely a decrease in water content of

48.74% when compared to the water content of purple sweet potato slices drying the first hour. The huge change from the first hour to the sixth hour of drying, both at temperatures of 50 ºC, 55 ºC, and 50 ºC, is due to the fact that in this condition the water in the food material released comes from free water or water that is physically bound to the food material. Free water and water that is physically bound in foodstuffs are very easy to release due to the heat given because these two types of food water do not have strong bonds in foodstuffs.

The moisture content of purple sweet potato slices since the seventh hour of drying did not change significantly, when compared to the moisture content of purple sweet potato slices dried up to the sixth hour. Significant changes only occurred again at the eighth hour of drying, at this time the moisture content of purple sweet potato slices became lower when compared to the moisture content of purple sweet potato slices dried at the sixth hour. At this drying time, the decrease was slower, compared to the rate of decrease in moisture content at the beginning of drying. In the sixth to eighth hour of drying, the type of food water released by the given drying temperature is chemically bound water, which is type II water. Type II water is water that is bound between water molecules and water molecules in the material that form stronger chemical bonds. This type of water is more difficult to evaporate than free water and physically bound water. At this drying, the moisture content of the purple sweet potato slices has reached a good moisture content for storage.

Drying purple sweet potato slices in a cabinet dryer should only last 6 hours of drying when using a temperature of 60 ºC, but for temperatures of 50 ºC and 55 ºC, the drying time used is sufficient for up to 7 hours of drying. If the drying time is increased, it is feared that the water content released will be type I water, which is water that binds complexly with macromolecular compounds in foodstuffs. The release of type I water correlates with a decrease in the macromolecular complex compounds in the food, because the more macromolecular compounds that are degraded by heat, the more type 1 water and type 2 water bonds can be released. This change also indicates that major changes have occurred in other nutritional components contained in the purple sweet potato material. The moisture content of purple sweet potato slices dried at 60 ºC for 6 hours reached 6.99%, while the moisture content of purple sweet potato slices dried at 50 ºC and 55 ºC for 7 hours were 8.72% and 12.77%. The three values of moisture content produced at this time have met the requirements to prevent mold growth in dried processed products during storage. Toxin-producing molds can grow well during storage on foodstuffs with moisture content conditions that reach up to 13%.

Betacarotene Content

Betacarotene is a compound classified as a carotenoid. This compound is included as provitamin A which is also a pigment that gives orange color to plants. Changes in betacarotene content in purple sweet potato slices during drying can be seen in Figure 2**.**

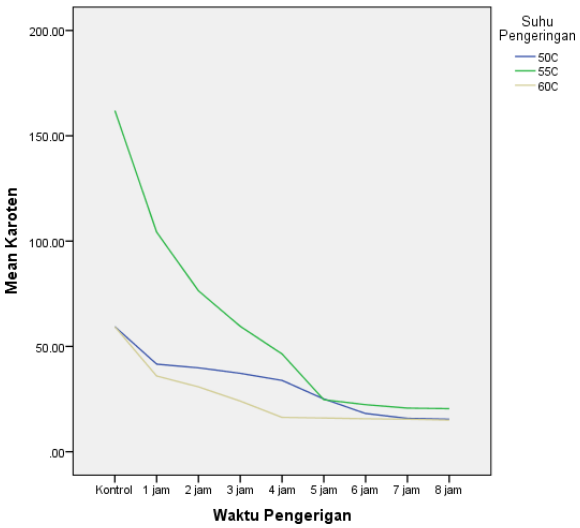

Figure 2: Relationship between drying temperature and drying time on the betacarotene content of purple sweet potato slices

The beta-carotene content of the purple sweet potato slices decreased during the drying process. The three drying temperature treatments gave the same trend of decreasing betacarotene content. The decrease in betacarotene continued to occur until the drying time of 8 hours, but the highest decrease in betacarotene content occurred from the drying time of 1 hour to 5 hours. After 5 hours of drying time, betacarotene still decreased but the decrease in betacarotene was not like at the beginning of drying. The results of the analysis of variance showed that the changes in betacarotene content of purple sweet potato slices during drying were strongly influenced by the interaction between the drying temperature treatment and the drying time applied.

The results of Duncan's analysis showed that the lowest betacarotene content in purple sweet potato slices was found in the 60 ºC drying temperature treatment, while the highest betacarotene content was found in 50 ºC purple sweet potato slices. During drying, the data showed that the betacarotene content decreased significantly since the drying time reached one hour. The significant decrease of betacarotene content in purple sweet potato slices continued until the drying time reached 5 hours. After 5 hours of drying, the beta-carotene content of the purple sweet potato slices remained unchanged. However, the beta carotene content of purple sweet potato slices after 6 to 8 hours of drying was not significantly different.

Temperature has the potential to reduce beta carotene levels in purple sweet potato. The beta carotene content of purple sweet potato slices dried at 60 ºC was the lowest when compared to the other two drying temperature treatments. This correlates with the heat provided by the 60 ºC temperature, at this drying temperature, the heat energy provided is higher compared to the other two drying temperatures. The higher heat causes the oxidation process on the purple sweet potato slices to also occur faster. This has an impact on the decrease in beta-carotene content in purple sweet potato slices because beta-carotene compounds are one of the non-polar compounds and are very easy to oxidize. In addition, the decrease in betacarotene content found in purple sweet potato slices can also be caused by the ability of this compound to act as an antioxidant compound. During drying, oxidation of the constituent components in the purple sweet potato slices can give rise to compounds that are free radicals. However, further activity of the free radical compounds formed during oxidation due to drying can be inhibited through chemical bonding performed by beta-carotene which also acts as a natural antioxidant. When beta-carotene acts as an antioxidant, the structure and functional properties of beta- carotene also change. This structural change is also one of the main factors that cause the betacarotene content in purple sweet potato slices to decrease during drying.

Anthocyanin Content

Anthocyanin levels are one type of natural antioxidant that forms the basis of red, purple, and blue color pigments in plants, especially in coppeng fruit which has natural anthocyanin content (Jiao et al., 2012). Anthocyanins can dissolve in water, chemically all anthocyanins are derivatives of flavylium cations which are the basic structure of anthocyanidins (Timber Lake and Bridle, 1997). Anthocyanins are used as natural colorants, especially in food products because many synthetic dyes are known to be toxic and carcinogenetic (Francis, 1999). The anthocyanin content of purple sweet potato slices during drying can be seen in Figure 3.

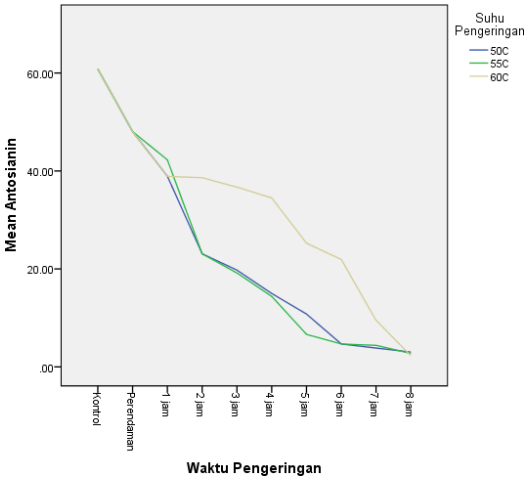

Figure 3. Relationship between Drying Temperature and Drying Time on Anthocyanin Content of Purple Sweet Potato Slices

The anthocyanin content of purple sweet potato slices has occurred after the soaking process in sodium metabisulfite solution. This decrease continued after the purple sweet potato slices were treated with drying. Changes in anthocyanin content of purple sweet potato slices continued to occur until the drying time of 8 hours where the trend of anthocyanin decrease had a similar trend for the three drying temperature treatments given, namely 50 ºC, 55 ºC, and 60 ºC. The results of the analysis of variance showed that the interaction between drying temperature and drying time gave a very significant effect on changes in anthocyanin content in purple sweet potato slices.

The results of Duncan's analysis showed that the anthocyanin content of purple sweet potato slices dried at 60 ºC was higher than the anthocyanin content of purple sweet potato slices treated at 50 ºC and 55 ºC. In addition, the results of data analysis also show that the anthocyanin content of purple sweet potato slices has decreased significantly. A significant decrease has occurred during the processing process, namely the soaking process using sodium bisulfite. The decrease in anthocyanin

levels continued significantly from 1 hour to 7 hours of drying. The 8-hour drying time showed that the anthocyanin levels had no significant changes.

The anthocyanin content of purple sweet potato slices has decreased significantly since soaking using sodium metabisulfite. Anthocyanins include flavonoid compounds that are polar compounds (soluble in water). Its water-soluble nature causes the anthocyanin compounds contained in purple sweet potato to dissolve in the soaking water which causes a decrease in the anthocyanin content of purple sweet potato slices. During the drying process, anthocyanin levels decreased significantly, a significant decrease in anthocyanin levels occurred up to a drying time of 7 hours. This also correlates with the evaporation of water that occurs. During the drying process, the water content of purple sweet potato slices is evaporated, the evaporation of water causes the reduction of polar or water-soluble compounds in purple sweet potato slices, including anthocyanins. However, the anthocyanin content of purple sweet potato slices dried at 60 ºC was higher than drying at 50 ºC and 55 ºC. At 60 ºC, the anthocyanin content was more stable, probably influenced by sodium metabisulfite added during soaking. Sodium metabisulfite has a low pH, so it can increase the stability of anthocyanins. In addition, at higher temperatures, sodium metabisulfite can turn into sodium sulfite and sulfur dioxide which causes an influence on anthocyanin stability compared to lower temperatures.

Polyphenol Content

Total polyphenols are phenolic compounds that play a role in preventing oxidation events. Measurement of total polyphenols from food ingredients can be done by measuring polyphenol content using Prussian blue (Kahkonen, et al., 2001). Polyphenol content is measured by staining method with Folin Ciocalteu (Povilaatyte and Venskutonis, 2000). Changes in polyphenol content in purple sweet potato slices during drying are presented in Figure 4.

The polyphenol content of purple sweet potato slices has been seen since immersion in sodium metabisulfite solution. The polyphenol content of purple sweet potato slices continued to change during the drying process, where the decrease in polyphenol content was very large until the drying time of 4 to 5 hours. After this drying time, the decrease in polyphenol content in purple sweet potato slices still occurred, but the decrease was not much different from the previous drying time. This phenomenon occurred for all drying temperature treatments used, namely both at 50 ºC, 55 ºC, and 60 ºC. The results of the analysis of variance showed that changes in polyphenol content of purple sweet potato slices during drying were not influenced by interaction factors, but only by the single variable of drying temperature and the single variable of drying time.

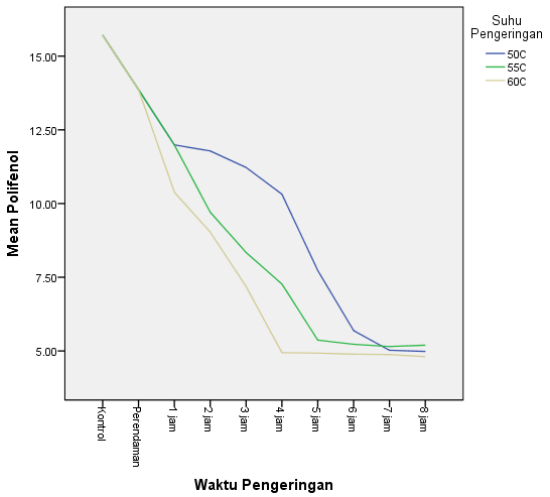

Figure 4. Relationship between Drying Temperature and Drying Time on Polyphenol Content of Purple Sweet Potato Slices

Duncan's test results showed that the polyphenol content contained in purple sweet potato slices with drying treatment at 60 ºC was lower than the polyphenol content of purple sweet potato slices dried at 50 ºC. During the drying process, the polyphenol content of purple sweet potato slices decreased significantly. The decrease in polyphenol content is not yet visible during soaking with sodium metabisulfite, a significant decrease in polyphenol content occurs since the purple sweet potato slices are dried for 1 hour. The decrease in polyphenol content continued significantly until 5 hours of drying. The polyphenol content of purple sweet potato slices that have been dried for 6 to 8 hours has not changed significantly.

The polyphenol content contained in purple sweet potatoes consists of polar compounds and non- polar compounds. Polyphenol compounds are compounds that are very easy to oxidize. Higher temperatures,

namely 60 ºC, produce higher heat energy that triggers higher oxidation to occur. High oxidation causes the degradation of natural polyphenol compounds in purple sweet potato slices, both polar and non-polar. Polar polyphenol compounds are also affected by water evaporation. At 60 ºC, water evaporation occurs faster, this causes polyphenolic compounds that are polar will also be reduced due to water evaporation.

The decrease in polyphenol content in purple sweet potato slices is also influenced by oxidant compounds produced at higher temperatures. At high temperatures, these conditions trigger polyphenolic compounds to act as antioxidants to minimize the potential harm of oxidant compounds produced by heat oxidation of purple sweet potato slices during drying. Oxidant compounds formed during oxidation will cause polyphenolic compounds to bind to the oxidant compounds formed. High temperatures result in the formation of higher oxidant compounds than lower temperatures, the more oxidant compounds produced, the more polyphenol compounds that bind to these oxidant compounds, resulting in changes in polyphenol structure. This is one of the main factors of polyphenol compounds in purple sweet potato slices dried at 60 ºC more reduced.

Antioxidant Activity

Food antioxidants are substances that function as free radical inhibitors by inhibiting the formation of radicals that have the potential for autooxidation. Antioxidant test is to measure antioxidant activity through the effect of antioxidants in controlling the oxidation process. Coppeng fruit plant (*S. cumini L*) is thought to have high antioxidant content (Azimah et al., 2014). According to Wang et al., (1997) Antioxidant activity is positively correlated between anthocyanin levels with several types of anthocyanins, namely cyanidin, delfinidin, malividin, peonidin, and pelargnidin. The antioxidant activity of purple sweet potato slices during drying can be seen in Figure 5.

The antioxidant activity of purple sweet potato slices changed during drying. At the beginning of drying, the antioxidant activity decreased. However, after drying for 1 hour to 5 hours, the antioxidant activity in the purple sweet potato slices increased. Each drying temperature treatment gave a different increase in antioxidant activity. The increase in antioxidant activity at 60 ºC drying temperature occurred after 1 hour drying time, followed by an increase in antioxidant activity in purple sweet potato slices dried after 2 hours at 55 ºC, while in the 50 ºC drying temperature treatment, antioxidant activity increased after drying for 5 hours. The results of the analysis of variance showed that the interaction between drying temperature and drying time had a significant effect on changes in antioxidant activity in purple sweet potato slices.

Duncan's further test results showed that the antioxidant activity of purple sweet potato slices treated with drying at 60 ºC produced higher antioxidant activity than the antioxidant activity of purple sweet potato slices dried at 50 ºC and 55 ºC. During the processing process, the antioxidant activity of the purple sweet potato slices had decreased significantly during soaking. The antioxidant activity of purple sweet potato slices decreased significantly again after 1 hour of drying. The decrease in antioxidant activity of purple sweet potato slices continued to decrease although it was not significantly different when compared to drying at 1 hour. After the purple sweet potato slices were dried for 8 hours, the antioxidant activity increased significantly when compared to the antioxidant activity of purple sweet potato slices dried for 2 to 5 hours, but the antioxidant activity of purple sweet potato slices produced at this time was not different from the antioxidant activity of purple sweet potato slices dried for 1 hour.

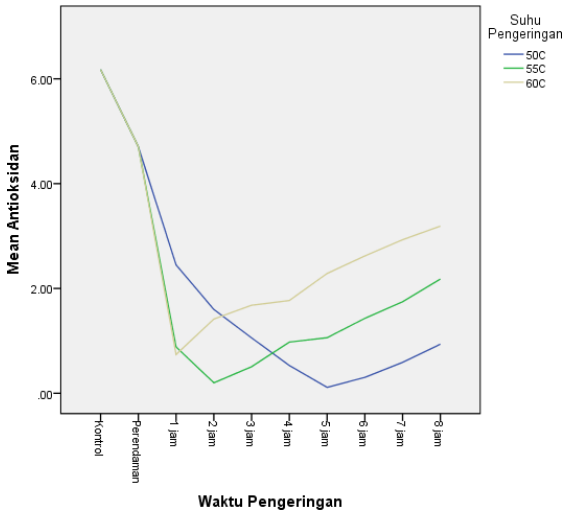

Figure 5. Relationship between Drying Temperature and Drying Time on Antioxidant Activity of Purple Sweet Potato Slices

The antioxidant activity of purple sweet

potato slices decreased since the soaking process. This decrease is positively correlated with the decrease in anthocyanin content which is the main pigment of purple sweet potato. Anthocyanins are polar antioxidant compounds. Anthocyanins during soaking experience a significant decrease because they dissolve in the soaking water. The dissolution of anthocyanins in the soaking water causes the anthocyanin levels in the purple sweet potato slices to also be reduced so that the antioxidant activity of the purple sweet potato slices also decreased significantly.

The decrease in antioxidant activity of purple sweet potato slices during drying is closely related to the decrease in betacarotene, anthocyanin, and polyphenol levels of purple sweet potato slices. These three compounds are compounds that act as natural antioxidants found in purple sweet potato. The decrease in the content of these three compounds during the drying process causes a decrease in the antioxidant activity of the purple sweet potato slices. Interestingly, it was found that at 8 hours of drying, the antioxidant activity of the purple sweet potato slices increased significantly when compared to the antioxidant activity of the sweet potato slices dried at 2 to 5 hours, although this increase was similar to the antioxidant activity of the purple sweet potato slices dried at 1 hour. The increase in antioxidant activity of the purple sweet potato slices after 8 hours of drying is thought to be due to the presence of intermediate compounds formed during the drying process caused by the non-enzymatic browning reaction, the Maillard reaction. Maillard reaction is a reaction that occurs between reducing sugars and amino acids or proteins to form a slightly brownish color. During the Maillard reaction, the reaction will produce intermediate compounds that can act as antioxidants. The compounds formed during the Maillard reaction are thought to play a role in increasing the oxidant activity of purple sweet potato slices after 8 hours of drying.

The antioxidant activity of purple sweet potato slices dried at 60 ºC was highest when compared to other drying temperature treatments. In this study, there were three factors related to antioxidant activity, namely betacarotene content, polyphenol content, and anthocyanin content. The antioxidant activity of purple sweet potato during drying was more influenced by anthocyanin factor than betacarotene and polyphenol content. The betacarotene content and polyphenol content of purple sweet potato slices during drying were lowest when compared to other drying temperature treatments. However, the anthocyanin content of purple sweet potato slices dried at 60 ºC was the highest when compared to other drying temperature treatments. The anthocyanin content of purple sweet potato slices at 60ºC drying temperature was the highest, so it was concluded that the antioxidant activity in purple sweet potato slices was more influenced by anthocyanin content than polyphenol content and betacarotene content. Anthocyanin is one of the main pigments of purple sweet potato so that the antioxidant potential of this commodity is strongly influenced by anthocyanin content.

CONCLUSION

The conclusion of this study is that the temperature and drying time have a significant effect on the nutritional components and bioactive components of purple sweet potato during the drying process. The temperature of 60 ºC can be recommended as one of the temperatures used to dry purple sweet potato with a drying time of 5 hours. At this temperature and time, the nutritional and bioactive components of purple sweet potato can still be maintained, even in terms of functional, anthocyanin content and antioxidant activity this treatment still has its biological properties. The characteristics of purple sweet potato in this treatment are moisture content of 9.62%, total sugar 0.84%, reducing sugar 0.52%, beta-carotene 0.74%, anthocyanin 25.25%, polyphenols 4.93%, and antioxidant activity 2.29%.

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