The Effect of Purple Sweet Potato and Green Bean Formulations on Solubility, Rehydration Power and Rehydration Time of Breast Milk Complementary Food

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The effect of purple sweet potato and green bean formulations on solubility, rehydration power and rehydration time of breast milk complementary food

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Abstract

The purpose of this researched was to determine the effect of variation of purple sweet potato and green bean on the physical quality of solubility, rehydration power, and rehydration time and to find the most formulations of purple sweet potato flour and green bean flour to produce the best instant breast milk complementary food. This study used 5 treatments and 4 replications with variations in the formulation of sweet potato flour and green bean flour, namely T1 with a ratio of 50%: 50%, T2 with a ratio of 60%: 40%, T3 with a ratio of 70%: 30%, T4 with a ratio 80%: 20%, and T5 with a ratio of 90%: 10%. The raw materials used are purple sweet potato flour, green bean flour, milk powder, and refined sugar. The results showed that the variation of purple sweet potato and green bean formulation had a significantly effect on solubility, rehydration power and rehydration time. The best treatment was T3 with a ratio of 70% purple sweet potato flour: 30% green bean which produces solubility of 12.25%, rehydration power of 2.62 ml / g, and rehydration time of 149 seconds.

Keywords: complementary food, solubility, rehydration power, rehydration time

Introduction

Infancy is a very important period as a golden period of growth and development. Age 0-11 months the baby experiences a period of rapid growth and development until it reaches a peak at the age of 24 months. This golden period can be achieved optimally supported by proper nutritional intake from birth. During this time breastfeeding alone is not sufficient for the energy needs needed so that it needs another energy source, namely complementary food for breast milk.

Breast milk complementary food for baby is an additional food other than breast milk which is given to babies for the first time at 6 months of age. Complementary food for baby has a very important role to fulfill the nutritional needs of infants other than breast milk, so that Complementary food for baby must be made from ingredients that are high in nutrients (Kuswanto and Widanti, 2018). Generally, people know 2 types of complementary food for baby, namely traditional Complementary food for baby and modern MPASI (manufacturer). Traditional Complementary food for baby (homemade) is made traditionally with makeshift equipment. Traditional Complementary food for baby processing, although cheaper, often does not meet the principles of sanitary hygiene, which allows the contamination that causing diarrhea in infants (Zulfa and Rustanti, 2013). Modern complementary food for baby is made by utilizing technology and adapted to existing standards. Modern complementary food for baby produces food that is relatively more hygienic and practical to serve. The manufacturer's complementary food for baby formulation is also adjusted to the baby's Nutrition Adequacy Rate (RDA). It's commonly found in the form of instant baby porridge.

Indonesia is an agrarian country with a lot of potential local food. Sweet potato (*Ipomea batatas L*) is a local food that is abundant in availability, also the fourth highest source of non-rice carbohydrates after rice, corn, and cassava. The texture of sweet potatoes is soft and has a high amylose content so that it is good at absorbing water. Good water absorption makes the time of serving instant products more efficient, but the sweet potato protein content is quite low so that other ingredients need to be added. Other foods that are high in protein and easy to mix are green beans. Green beans are a good source of energy, protein, vitamins, minerals and dietary fiber. Complementary food for baby in instant form besides being nutrient-dense and can be retained properly must also have good physical characteristics. Solubility, rehydration power and rehydration time are the most important and interrelated characteristics of instant food

Materials and Methods

Materials

The materials used are purple sweet potato, green beans, banana, sugar, milk powder. The equipment used are ovens, grinders, measuring instruments (scales and measuring cups) and supporting devices (containers, blenders, aluminum foil, 80 mesh sieves, pans, stoves, and pans). The tools used for physical analysis consisted of oven, water bath, analytical scales, centrifuge "Scilogex MX-5", erlenmeyer, measuring flask, measuring cup.

The experimental design used in this research was mono factor Completely Randomized Design (CRD) with 5 treatments, namely the difference in instant Complementary feeding formulation with variations in the concentration of sweet potato flour and green bean flour namely T1 = 50:50, T2 = 60:40, T3 = 70:30 , T4 = 80:20 and T5 = 90: 100. Each treatment is 4 times repetitions.

The instant complementary food making process begins with the covering of purple sweet potatoes and green beans. The convergence of purple sweet potato refers to Lestari et al., (2017). Sweet potato peeled and washed. Sweet potato sliced with a thickness of 2 mm. The sweet potato slices are dried 65˚C for 6 hours. The dried sweet potato slices are cooled at room temperature. The dried sweet potato slices are ground until smooth. Sweet potato flour is then sifted with an 80 mesh sieve until it is homogeneous.

The process of shedding green beans by soaking green beans in water (comparison 1: 3) for 18 hours so that the epidermis peels. Green pea seeds then cleaned the areca skin until clean and then washed again. The green bean seeds that have been removed from the areca skin are then dried in an oven at 65ºC for 4 hours. Dried green bean seeds are blended and sifted with 80 mesh sieves.

Instant Complementary food preparation by mixing ingredients namely purple sweet potato flour, green bean flour, banana flour, refined sugar, and powdered milk with dry mixing method. Instant Complementary feeding solubility analysis refers to the method of Kainuma et al., (1967), rehydration power was analysis by referring to the Beuchat method [4], re-hydration time is tested by referring to the Yoanasari (2003) method.

Results and Discussion

Solubility

Solubility test results the instant complementary food can be seen in Figure 1. The formulation of purple sweet potato flour and green bean flour gave a significant effect on the solubility value (P <0.05). The solubility produced is not low and not much different in each treatment. Instant Complementary food solubility is influenced by the drying method, in this study the drying method is done the same so that the solubility results are not much different.

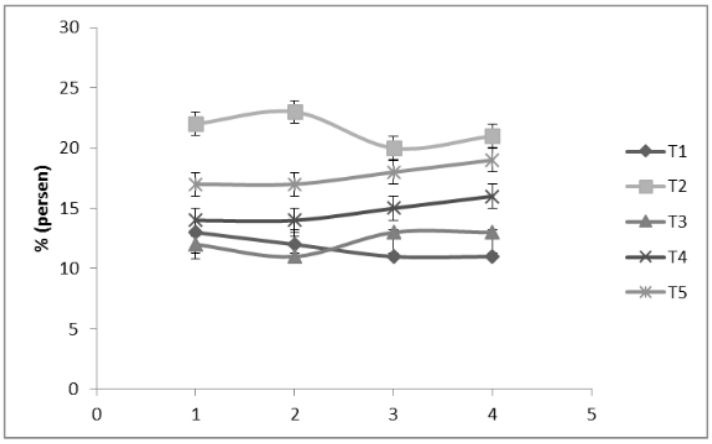

Figure 1.The solubility of Instant complementary food with difference formulation of purple sweet potato flour and green bean flour.

The drying technique affects the solubility of the flour. This study uses the same drying technique on each material so that the difference in solubility value between treatments is not too high. Instant Complementary food with the composition of green bean flour which tends to increase tend to have higher solubility than others. The higher solubility is due to the protein content in ingredients that contain lots of amino acids. This is in accordance with the opinion of Winarno (2002) which states that the higher the protein content, the higher the solubility of the material.

The low solubility produced is also caused by the material processing method prior to shedding. The preliminary treatment before the oven ingredient in this study was blanching. Blanching of the material causes a change in the composition of the amino group of the material. This is in accordance with the opinion of Prabasini et al. (2013) which states that the low solubility is influenced by blanching treatment which affects the nature of amino groups making up proteins. Proteins that contain a lot of amino acids with hydrophobic groups have their solubility in water is less good compared to proteins that contain a lot of amino acids with hydrophilic groups.

The instant Complementary food produced should have a low solubility so that it fits the needs of the baby. This is in accordance with the opinion of Ardhianditto et al. (2013) which stated that instant Complementary food should have low solubility so that it is not too thick and easily swallowed by the baby. So it can be concluded that the Complementary food i produced instantly in this study can be well received by the baby and according to the needs of the baby because it has low solubility.

Power of rehydration

Power of rehydration test results the instant complementary feeding can be seen in Figure 2.The analysis of statistic showed that different treatments with variations in composition affected the power of rehydration (P <0.05). The more sweet potato composition added tends to produce instant complementary food with higher rehydration power. The type of base material and chemical composition in instant food making affect the rehydration power of an instant product produced. Purple sweet potato flour contains more amylopectin compared to green bean sweet potato flour. The high rehydration power of instant complementary food is influenced by the content of amylose and amylopectin in each flour. The ratio of amylose and amylopectin affects the binding ability of water.

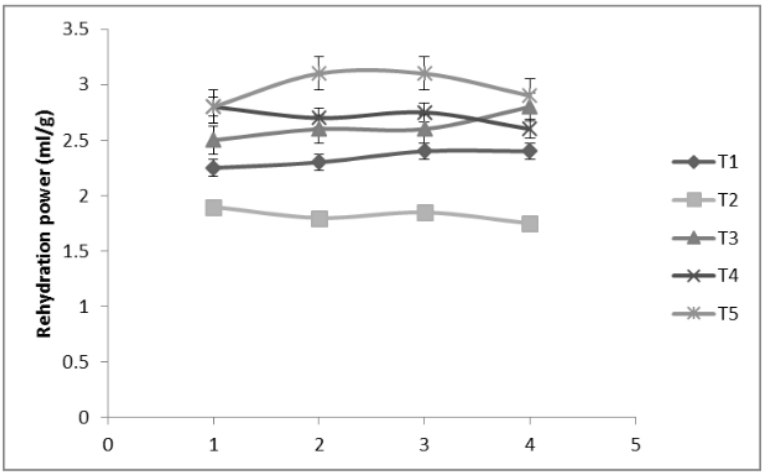

Figure 2. The Rehydration power of Instant complementary food with difference formulation of purple sweet potato flour and green bean flour.

In instant products, it is expected to have high rehydration power. The higher the power of rehydration, the higher the ability of the product to absorb water. The instant complementary food produced has a low rehydration value, so the ability to absorb water is also low. Even though it has a low rehydration power, instant complementary food is produced according to the needs of the baby. Low rehydration power makes instant complementary food products absorb water a little so that the resulting viscosity is low, and the texture is not too thick. The complementary foods in infants should not be too thick so that they are easily swallowed by babies. Low rehydration power is also affected by instant complementary food solubility. The instant complementary food solubility produced tends to be low so the rehydration power is also low.

Time of Rehydration

Time of rehydration test results the instant complementary food can be seen in Figure 3. The differences formulation of purple sweet potato flour and green bean flour in each treatment had an effect on the time of rehydration (P <0.05). Time of rehydration increases with increasing concentration of purple sweet potato flour, so the ingredients used in making instant complementary food affect the rehydration time. This is in accordance with the opinion of Muthoharoh and Sutrisno (2017) which states that the duration of absorption of instant porridge water is strongly influenced by the size and distribution of powder particles, the process of mixing the ingredients, and the composition of the constituent materials. The ability to absorb water in purple sweet potato flour is higher than that of green flour, so that when brewed with instant complementary food with a higher formulation the concentration of purple sweet potato flour has a higher rehydration time because it needs more stirring. This is in accordance with the opinion of Marta and Tensiska (2016) which states that stirring is one way to accelerate the process of water absorption in instant baby porridge.

The resulting rehydration time tends to be longer than the time of brewing on commercial solids. According to research conducted by Ismayanti and Harijono (2015), it was shown that commercial instant complementary feeding rehydration time was less than 1 minute, making it easier and more practical. The high rehydration time is caused by the instant complementary food processing method, in this case drying. This study used the dry mixing method and no drying again after mixing. This allows the absorption of moisture after the drying process, so that the water content rises. Materials with more water content or absorbing water will inhibit the rehydration process. This is in accordance with the opinion of Potter (1980) which states that food containing more water has less porosity so that the diffusion of incoming water when

the rehydration process will be slower. As a result the time of absorption of water into the material takes longer, when the rehydration rises.

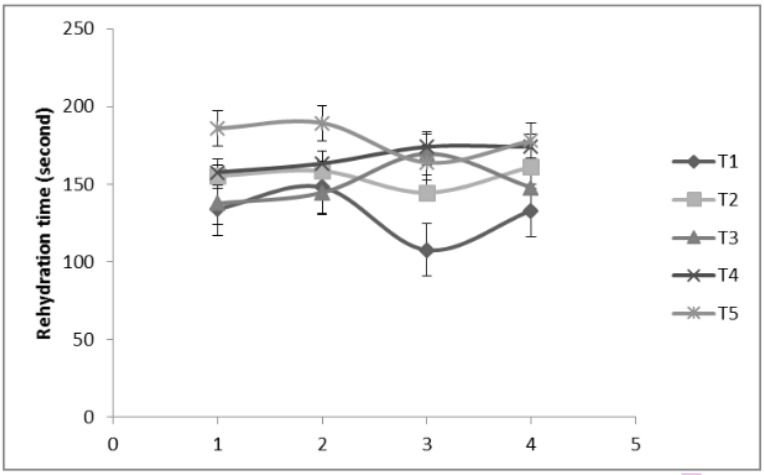

Figure 3. The Rehydration time of Instant complementary food with difference formulation of purple sweet potato flour and green bean flour.

Conclusion

The difference formulation of purple sweet potato flour and green bean flour instant complementary food formulation has a significant effect on solubility, rehydration power, and rehydration time. The best formulation was 70% of purple sweet potato flour and 30% of green bean flour.

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