

PROXIMATE COMPOSITION AND ORGANOLEPTIC PROPERTIES OF PUMPKIN (*Cucurbita moschata*)-BASED COMPLEMENTARY FOODS WITH SEVERAL TYPES OF NUTS

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ABSTRACT

Complementary Foods is food given to infants aged 6-24 months. Complementary foods must fulfill the criteria for nutritional needs that have been regulated by the government such as adequacy of macro and micro nutrients. One of the local food ingredients that can be used as complementary foods is pumpkin. Pumpkin is known to contain nutritional components that are quite complete but have a small protein content. Therefore, it is necessary to add nuts as a source of protein. The purpose of this study was to determine the comparison effect of pumpkin puree with various types of nuts on the proximate composition and organoleptic properties of complementary foods. This study used a completely randomized design with one factor, namely the differences in the type of bean puree with five levels of treatments, A1 (35% pumpkin: 35% Bambara bean), A2 (35% pumpkin: 35% kidney bean), A3 (35% pumpkin: 35% mung bean), A4 (35% pumpkin: 35% soybean), and A5 (35% pumpkin: 35% edamame bean). Data analysis using analysis of variance and Kruskal Wallis test. The result showed that the Complementary Foods formulations made with 35% pumpkin puree and 35% soybean puree had the highest nutritional content. The Complementary Foods had 57.25% water content, 2.83% ash content, 20.62% protein content, and 10.49 fat content which had fulfill the Complementary Foods standard except the carbohydrate content. The addition of nuts puree to pumpkin complementary foods had an effect on color and texture sensors and all parameters in the hedonic test.

1. INTRODUCTION

Complementary Foods is food or drink given to infants aged 6-24 months to meet the nutritional needs of infants other than breast milk. Complementary Foods is also known as transitional food from breast milk to family food (Mufida et al., 2015). The introduction and provision of Complementary Foods are carried out in stages such as the introduction of shapes, giving the number and ability of the baby's digestion (Kemenkes RI, 2007). According to Sudaryanto (2014), the criteria for good Complementary Foods are healthy, high energy and protein values, good supplementation values, contain vitamins and minerals suitable for babies, easy to obtain and fresh ingredients, relatively cheap prices, types of food according to the baby's age, acceptable to the baby's digestion, the content of crude fiber in small amounts and the processing must be hygienic. Nutrient components that play an important role in the baby's growth period include vitamin A and protein (Noer et al., 2014). According to Kemenkes RI (2007), Complementary Foods making must be able to fulfill the criteria for nutritional needs that have been regulated in government regulations such as an energy content of 400-450 kcal, protein content of 15-22 grams, and vitamin A 250-350 µg in 100 grams of ingredients. Therefore, it is necessary to have food material containing high protein and vitamin A to make Complementary Foods which can fulfill the protein and vitamin A needs of infants. One of the local food sources of provitamin A that can be used as Complementary Foods is pumpkin.

Pumpkin (*Cucurbita moschata*) is a type of vegetable plant that can grow in tropical and subtropical regions (Kulkarni & Joshi, 2013). Pumpkin is one of the local food ingredients whose availability is quite a lot in Indonesia. Pumpkin is also a local food ingredient that has a fairly complete nutritional content, because it contains fat, carbohydrates, protein, vitamin A, vitamin B, vitamin C, magnesium, phosphorus, and calories. Pumpkin is a source of carotenoids, pectin, mineral salts, vitamins and other bioactive substances, such as phenolic compounds (Cerniauskiene et al., 2014). The content of beta-carotene in pumpkin reaches 1187.23 µg/g (Suarni, 2009). In the digestive tract, according to the body's needs, beta-carotene is then converted by an enzyme system into retinol which further functions as vitamin A. Beta-carotene which is not used as vitamin A will act as an antioxidant in the body that functions to maintain the integrity of body cells (Anam & Handayani, 2010).

Pumpkin which is used as a raw material in Complementary Foods is made in the form of puree. Pumpkin puree needs to be added with other food ingredients such as nuts to fulfill the protein needs such as bambara beans, mung beans, kidney beans, soybeans, and edamame beans. Based on the data in the Indonesian Material Composition Table, 100 grams of bambara beans contain 7.7 grams of protein, 27.1 grams of carbohydrates, and 2.8 grams of fat, as well as several other micro components (Kemenkes RI, 2017). Bambara beans also contain essential amino acids, namely lysine and methionine (Olaleye et al., 2013). Pumpkin puree has a bitter after taste, so to provide a better taste and aroma in making complementary food, ambon banana puree is added. Ambon banana has a distinctive aroma and soft texture. Based on this background, it is necessary to conduct research to determine and study the effect of the addition of various types of nuts on the parameters of the proximate composition and organoleptic properties of pumpkin complementary foods.

2. METHODS

The raw materials used in this study were pumpkin obtained from the Cigombong-Bogor area, bambara beans (*Vigna subterranean L.*), mung beans (*Phalseolus vulgaris*), kidney beans (*Vigna radiate L.*), soybeans (*Glycine max*), edamame beans (*Glycine max L*) and Ambon bananas (*Musa paradisiaca var.*). Pumpkin and nuts were made in the form of puree first. Making pumpkin puree modifies research conducted by Siregar (2020). Pumpkin puree was made by soaking the pumpkin in Na₂S₂O₃ 0.3% solution for 15 minutes, then washing, steaming at 90°C for 10 minutes and followed by pulverizing using a blender. While the making of nuts puree was done by boiling at a temperature of 90°C for 30 minutes which had previously been soaked in water for 6 hours. Nuts that had been boiled were drained and peeled then crushed with a blender. The making of Complementary Foods was done by mixing pumpkin puree and nuts puree with other ingredients such as 5 grams of Ambon banana puree, 20 grams of skim milk, 5 grams of coconut oil and water. Then filtered to get Complementary Foods in the form of filter slurry.

This study used single-factor completely randomized design with 5 levels of treatment (A1 = Bambara bean puree 35%; A2 = kidney puree 35%; A3 = mung bean puree 35%; A4 = soybean puree 35% and A5 = edamame bean puree 35%). Product analysis includes analysis of proximate composition consisting of moisture content (AOAC, 2005), ash content (AOAC, 2005), protein content using Kjeldahl Micro method (AOAC, 2005), fat content using soxhlet method (AOAC, 2005), carbohydrate content by difference (AOAC, 2005) and organoleptic properties (Wahyuningtias, 2010). Organoleptic test is a test method using the human senses as the main tool for measuring the acceptance of the resulting product. The organoleptic tests used in this study were sensory quality tests and hedonic quality tests including color, aroma, taste, and texture with a scoring (1-7) conducted by 30 semi-trained panelists. Proximate data analysis used the Analysis of Variance (ANOVA) test, while the organoleptic test data were analyzed using the Kruskal Wallis test. If there is a significant difference, then continue with the Mann Whitney U Test at a 95% confidence interval.

3. RESULTS AND DISCUSSION

3.1. Results

The pumpkin used had a round shape and was harvested for ± 6 months with a weight ranging from 1.5 to 3 kg/fruit. The maturity level used was pumpkin with a sugar content of ± 9 brix. The results of the proximate composition of fresh pumpkin used in the making of Complementary Foods filtermung porridge can be seen in Table 1.

Table 1 The results of the proximate analysis of fresh pumpkin

Parameter of Proximate	Value
Water content (%)	92.1
Ash content (%)	0.1
Protein content (%)	0.37
Fat content (%)	0.20
Carbohydrate content (%)	7.23

The results of the proximate analysis showed that the largest component in the pumpkin was water. While protein and fat have small levels. Pumpkin used in the manufacture of Complementary Foods was made in the form of puree. The results of the proximate analysis of pumpkin puree Complementary Foods can be seen in Table 2.

Table 2 The results of the proximate analysis of Complementary Foods

Parameter of Proximate	Value				
	A1	A2	A3	A4	A5
Water content (%)	67.77 ^b	66.02 ^b	64.98 ^b	57.25 ^a	66.78 ^b
Ash content (%)	1.82 ^{ab}	2.29 ^{ab}	1.73 ^a	2.83 ^b	2.51 ^{ab}
Protein content (%)	19.84 ^b	19.53 ^a	19.53 ^a	20.62 ^c	20.97 ^d
Fat content (%)	10.27 ^b	7.33 ^a	6.51 ^a	10.49 ^b	6.43 ^a
Carbohydrate content (%)	0.28 ^a	4.82 ^{ab}	7.23 ^b	8.79 ^b	3.30 ^{ab}

Description: Different letter notation in the same row showed that significantly different at level $\alpha=0.05$

A1: Pumpkin puree + Bambara beans puree

A2: Pumpkin puree + Kidney beans puree

A3: Pumpkin puree + Mung beans puree

A4: Pumpkin puree + Soybean

A5: Pumpkin puree + Edamame beans

Based on Table 2, the addition of nuts in the making of pumpkin complementary food significantly affected all proximate compositions. The lowest water content was found in pumpkin complementary food which was added with soybeans. In the ash content, the addition of mung beans was significantly different from the addition of soybeans. In protein content, the addition of edamame beans was significantly different from other treatments and had the highest protein content. The fat content of the pumpkin complementary food added with Bambara nuts was not significantly different from the addition of soybean but was significantly different from all other treatments. Meanwhile, for carbohydrates, the addition of mung beans was significantly different from the addition of soybeans. In addition to the analysis of the proximate composition, this study also observed organoleptic properties consisting of the results of sensory analysis (Table 3) and the results of hedonic analysis (Table 4).

Table 3 Sensory Quality of Complementary Foods

Parameter	Value				
	A1	A2	A3	A4	A5
Color	2.32 ^a	3.03 ^b	5.73 ^d	4.13 ^c	4.48 ^c
Aroma	3.38 ^a	3.93 ^a	3.95 ^a	3.85 ^a	4.03 ^a
Taste	3.83 ^a	4.30 ^a	4.68 ^a	4.42 ^a	4.53 ^a
Texture	4.93 ^{bc}	5.17 ^c	3.90 ^a	5.67 ^d	4.68 ^b

Description: Different letter notation in the same row showed that significantly different at level $\alpha=0.05$

Color : 1 - 7 (very brown - very yellow)

Aroma : 1 - 7 (little smelly - smell)

Taste : 1 - 7 (not very pumpkin taste - very pumpkin taste)

Texture : 1 - 7 (very runny - very thick)

Table 4 Hedonic Quality of Complementary Foods

Parameter	Value				
	A1	A2	A3	A4	A5
Color	3.38 ^a	4.40 ^{bc}	5.25 ^d	4.87 ^{cd}	4.33 ^b
Aroma	3.62 ^a	4.62 ^b	4.75 ^b	4.53 ^b	4.32 ^b
Taste	3.28 ^a	4.97 ^c	4.88 ^c	4.68 ^{bc}	4.35 ^b
Texture	4.32 ^a	5.03 ^b	4.78 ^{ab}	5.13 ^b	4.77 ^{ab}

Description: Different letter notation in the same row showed that significantly different at level $\alpha=0.05$

The hedonic quality test using a scale of 1 – 7. Scale 1 = very dislike, scale 2 = dislike, scale 3 = somewhat dislike, scale 4 = normal, scale 5 = somewhat like, scale 6 = like and scale 7 = very like

3.2 Discussion

3.2.1. Proximate Value of Complementary Foods

Water content is the percentage of water in a food ingredient. According to Nisviaty (2006), water can affect the texture, taste, appearance and is related to the shelf life of the product. The results of the analysis of variance showed that the different types of nuts puree had a significant effect on the water content of the Complementary Foods produced. Pumpkin puree Complementary Foods with the addition of soybean puree had the lowest water content compared to other treatments (Table 2). The existence of the soaking and cooking process in nuts had a direct effect on the water content, where the nuts will undergo a process of water absorption which can have an effect on their dimensions. According to Agustina et al., (2013), the soaking process in soybeans produces smaller dimensions than kidney beans, so that the water absorption becomes less. This is related to the permeability of the skin and the different chemical content of each nut. Complementary foods if added with liquid have a semi-solid or liquid texture like fine porridge, free from lumps, and can be eaten with a spoon (Badan Standarisasi Nasional, 2005).

Ash content is the number of inorganic substances from the residue resulting from the combustion of organic material. High or low ash content and composition depends on the type of material and how it is ashed. Ash content is related to the presence of minerals from a material (Mardiah et al., 2020). Determination of ash content is carried out by oxidizing organic substances at high temperatures and then weighing the remaining substances. The results of the analysis of variance (Table 2) showed that the different types of nuts puree had an effect on the ash content of the Complementary Foods produced. Pumpkin puree Complementary Foods with various nuts had an average ash content value ranging from 0.28% - 2.83%. The resulting value fulfilled the quality requirements of ready-to-eat Complementary Foods, which was not more than 3.5% (Badan Standarisasi Nasional, 2005). Complementary Foods with the addition of soybean puree had the highest average ash content compared to other formulas. This is thought to be influenced by the high vitamin and mineral content of soybeans. The vitamin and mineral content in soybeans include thiamine, riboflavin, niacin, and carotene, with mineral content namely, Ca, Fe, Cu, Mg, and Na (Ekafitri & Isworo, 2014).

Protein is one of the macronutrients that play an important role in producing energy. Proteins are organic compounds formed from amino acids joined to form peptide chains. There are 20 types of amino acids, 9 of which are classified as essential amino acids, namely amino acids that cannot be synthesized by the body and can only be obtained from food intake. The main function of protein for the body is to help and maintain body tissues, produce neurotransmitters for the brain and nerve function, the formation of various hormones, maintain fluid balance, and as a source of energy (Schlenker et al., 2007). The results of the analysis of variance showed that the different types of nuts gave an influence on the protein content of Complementary Foods (Table 2). The protein content of pumpkin puree Complementary Foods with the addition of edamame nuts had a higher value than other nuts, namely 20.97%. The protein content of Complementary Foods obtained was strongly influenced by the protein content of its constituent raw materials. The average protein content of pumpkin puree Complementary Foods with various nuts ranged from 19.53% - 20.97%. This value had fulfilled the quality requirements for ready-to-eat protein levels, namely 8% - 22% (Badan Standarisasi Nasional, 2005). Research conducted by (Hersoelistyorini, 2014),

MPASI made from a mixture of soybean sprout flour, mung beans and rice has the highest protein content of 23.29%. This result is higher than the protein content of the research results. This could be due to differences in the treatment given to nuts and other materials used. The highest protein content was found in Complementary Foods with the addition of edamame beans. The protein content of Complementary Foods produced is influenced by the protein content of its constituent raw materials. The protein content in edamame beans was 11.4%, this value was higher than the protein content in kidney beans, which was 10%, and mung beans, at 8.7% (Kemenkes RI, 2017).

Fats are organic compounds found in tissue cells, insoluble in water, and soluble in non-polar solvents, such as ether, chloroform, and benzene. Fat is a substance that is rich in energy with its function as the main energy source for the body's metabolic processes. The results of the analysis of variance showed that the different types of nuts gave an influence on the fat content of solid food (Table 2). The fat content of pumpkin puree Complementary Foods with the addition of soybeans had a higher value than other nuts, namely 10.49%. The fat content of the Complementary Foods obtained can be influenced by the fat content of its constituent raw materials. The average fat content of pumpkin puree Complementary Foods with various nuts ranged from 6.43% - 10.49%. This value had fulfilled the quality requirements for ready-to-eat fat content, namely 6% - 18% (Badan Standarisasi Nasional, 2005). According to Farida et al., (2016) that complementary food with a mixture of pumpkin flour, tempeh flour and brown rice flour found the fat content of 7.76-8.89%. This value is smaller than the fat content of the research results but is still in accordance with the established standards.

Carbohydrates are the main source of calories for almost the entire world's population. Carbohydrates consist of simple carbohydrates and complex carbohydrates. Monosaccharides and disaccharides are classified as simple carbohydrates, while polysaccharides (glycogen, starch, and fiber) are classified into complex carbohydrates. The main function of carbohydrates is to provide energy for body cells, brain cells, and the central nervous system that require blood glucose (Winarno, 2004). The Carbohydrate content of pumpkin puree with nuts puree ranged from 0.28% - 8.79% (Table 2). This value had fulfilled the quality standard of ready-to-eat Complementary Foods which was 30% (Badan Standarisasi Nasional, 2005). According to Winarno (2004), carbohydrate content in a product is strongly influenced by other nutritional content such as water, ash, protein, and fat.

3.2.2. Organoleptic Value of Complementary Foods

The organoleptic test on the pumpkin puree Complementary Foods with additional nuts puree included a sensory quality test and a hedonic test. The test parameters include color, aroma, taste, and texture. The sensory quality of Complementary Foods was assessed on a scale of 1-7. The color of the Complementary Foods produced ranges from 2.32 to 5.73 which had a brown to yellow color (Table 3). The brown color can be influenced by the epidermis of each nut. Complementary food with the addition of Bambara beans had a very brown color because Bambara beans have a purple pigment in the epidermis. In addition, the presence of protein and carbohydrates in food can also affect the color of the product. At high temperatures, a browning reaction can occur between mungucing sugars and primary amino groups which produces brown nitrogen polymers (Winarno, 2004).

The aroma of the pumpkin puree Complementary Foods ranges from 3.83 to 4.03, which was a little smelly to the smell of the pumpkin. The smell of pumpkin in the complementary food is due to the presence of aromatic compounds (Cahyaningtyas et al., 2014). In addition,

the nuts added to the pumpkin complementary food had also been cooked beforehand. According to (Ismayasari, 2014), the unpleasant aroma of soybeans can be removed by boiling.

The taste of the pumpkin puree Complementary Foods ranged from 3.83 to 4.68, which was enough to taste like a pumpkin. While the texture of Complementary Foods ranges from 3.90 to 5.67, which was quite thick to thick. Complementary Foods with the addition of nuts had a different texture in terms of thickness. According to Tamrin & Pujilestari (2016), the viscosity of a product is influenced by the content of the raw materials used, such as the gelatinization properties of starch.

Observations of hedonic quality (Table 4) were assessed using a scale of 1-7, namely from very dislike to very like. The color produced by pumpkin complementary foods ranged from 3.38 to 5.25, i.e., slightly disliked to slightly liked. The aroma of the MPASI produced ranges from 3.61 to 4.75 which is somewhat distasteful to neutral. Complementary foods with the addition of mung beans were the most preferred with the color towards yellow and the aroma slightly smells of pumpkin. The taste of the complementary foods produced ranges from 3.28 to 4.97 which was somewhat less favorable to neutral. Complementary foods with the addition of kidney beans had a neutral taste, which was slightly pumpkin-like. Meanwhile, the texture of complementary foods ranged from 4.32 to 5.13, which was neutral to somewhat like.

4. CONCLUSION

The addition of nuts puree effects the water content, ash content, carbohydrate, protein and fat content of the pumpkin puree Complementary Foods. Complementary Foods with the addition of 35% soy bean puree gave the highest result and met the standard for ready-to-eat Complementary Foods with a moisture content of 57.25%, ash content of 2.83%, protein content of 20.62%, and fat content of 10.49% except the carbohydrate content. The addition of puree of various types of nuts only affected the sensory properties of the color and texture parameters of pumpkin complementary food.; meanwhile difference in puree of nuts had an effect on all hedonic parameters.

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