

The Effect of Adding Mocaf Flour (*Modified cassava flour*) and Kepok Banana Peels (*Musa paradisiaca forma typica*) on Vla Pie as Alternative Snack for Hypertension Patients

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Abstract

Hypertension is a condition when blood pressure is above 140/90 mmHg. One of the causes of hypertension is a lack of calcium and potassium intake. Mocaf flour and kepok banana peels contain calcium and potassium. This study aims to analyze differences in organoleptic characteristics, public acceptability, calcium levels, potassium levels and water content in vla pie with adding mocaf flour and kepok banana peels. The research design used was experimental with a completely randomized design method, the use of wheat flour and mocaf flour, namely F1(50%:50%), F2(35%:65%), F3(20%:80%) and the addition of 50 grams of kepok banana peels in each treatment. The results of the Friedman statistical test showed no differences in aroma, texture and colour, but there was a significant difference in the taste of the Vla pie. The highest hedonic test results were found in F1. The highest calcium content is found in F3. The highest potassium content is found in F1. The water content is not following the pie quality standards in SNI. The conclusion is that vla pie with mocaf flour and kepok banana peels is acceptable to the public.

Keywords: Calcium, Kepok Banana Peels, Mocaf Flour, Potassium, Vla Pie

Introduction

Hypertension is when the systolic blood pressure is above 140 mmHg and the diastolic blood pressure is above 90 mmHg after a re-examination (Unger *et al.*, 2020). The prevalence of hypertension in Indonesia in 2018 has increased since 2013, from 25.8% to 34.1% (Riset Kesehatan Dasar, 2013; Riset Kesehatan Dasar, 2018). It is far from the global target of overcoming non-communicable diseases, namely, to reduce the incidence of hypertension by 25% in 2025 (World Health Organization, 2021). Uncontrolled high blood pressure can cause complications such as heart disease, stroke, kidney disease, retinal damage, nerve disorders, cerebral disorders and peripheral vascular disease (Kemenkes, 2018). Factors that can influence the onset of hypertension include factors that cannot be changed, namely age and gender, as well as factors that can be changed, namely by preventing a deficiency in calcium and potassium intake (Krummel, 2008; US Department of Health and Human Service, 2006).

The use of drugs for the treatment of hypertension is a significant concern in drug selection because of the safety factor of long-term drug use (Wirjowidagdo & Sitanggang, 2002). Therefore, one way to reduce high blood pressure apart from using drugs is to innovate food products that can help lower blood pressure safely. When a person's calcium and potassium intake is low, it can cause blood pressure to rise and vice versa (Damayati, 2020; Putri, 2014). Therefore, it is necessary to innovate food products with attractive shapes that are liked by various age groups, such as vla pie with the addition of mocaf flour and kepok banana peels. This research aims to analyze the effect of adding mocaf flour and kepok banana peels to vla pie as an alternative snack for hypertension patients regarding differences in organoleptic characteristics, public acceptability, calcium content, potassium content and water content in vla pie.

Methods

Three formula vla pie were developed with the following ratios wheat flour and mocaf flour namely F1(50%:50%), F2(35%:65%), F3(20%:80%) and the addition of 50 grams of kepok banana peels in each treatment. The analysis used in this study included chemical analyses such as calcium, potassium and water content. The statistical test used to process organoleptic and hedonic data is the Friedman test, while to process data on calcium, potassium and water content used Kruskal Wallis test. The calcium and potassium analyses used atomic absorption spectrophotometry (AAS) and for water content used gravimetric method. In this research, organoleptic and hedonic formula tests were also carried out on 35 panelists with inclusion criteria namely willing to fill out a questionnaire sheet and exclusion criteria being the presence of health problems in respondents that affect the five senses (taste, smell, sight), having allergies to eggs, gluten and lactose. This research was carried out at Mitra Keluarga College of Health Sciences from March - June 2023. The research design used was experimental with a completely randomized design.

Results and Discussions

Figure 1 shows the determination of the appropriateness of intensity (AIT) value based on the panelist's assessment of the intensity of aroma, texture, color and taste. The scale is from 1 to 4. From the results of AIT, formulas 1, 2 and 3 both smelled a bit like mocaf flour and banana peels, with a crunchy texture, and golden yellow color and tasted a bit like mocaf flour and banana peels. Figure 1 also shows that the highest aroma assessment results in vla pie were found in the F1 treatment, namely 2.93; The highest texture assessment results in vla pie were found in the F2 treatment, namely 2.81; The highest color assessment results in vla pie were found in the F2 treatment, namely 3.61; The highest taste assessment results in vla pie were found in the F1 treatment, namely 2.94.

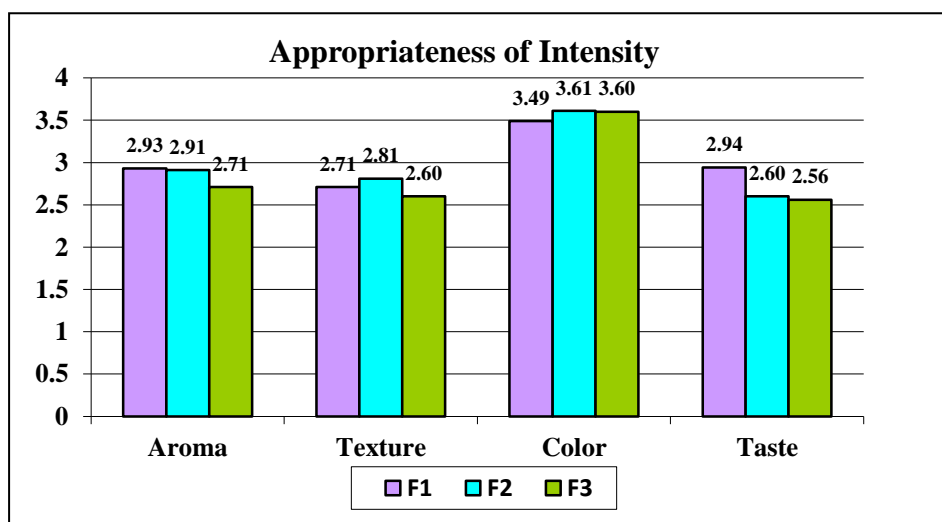


Figure 1. AIT Test

Table 1 shows the results of the vla pie sensory difference test analysis with the Friedman test. The purpose of the Friedman analysis is to determine whether there are significant differences between the three samples. If the results of the data test have a p-value less than 0.05 ($p < 0.05$), then it can be said that there is a difference in the data. From Table 1, it can be seen that there is no difference in aroma, texture and color, but there is a significant difference in the taste of vla pie.

Table 1. Results of the Vla Pie Sensory Difference Test Analysis with the Friedman test

No.	Indicators	Formula	Significant	Information
1	Aroma	F1	0.163 > 0.05	No difference
		F2		
		F3		
2	Texture	F1	0.083 > 0.05	No difference
		F2		
		F3		
3	Color	F1	0.913 > 0.05	No difference
		F2		
		F3		
4	Taste	F1	0.004 < 0.05	There is a difference
		F2		
		F3		

Source: Primary Data, 2023

Table 2 shows the results of the hedonic test where the highest hedonic score is found in F1, namely 80.71% with a like interpretation. Meanwhile, F3 has the lowest hedonic score of 75.07% but is still included in the like interpretation and based on the results of the Friedman test on the pie vla hedonic test with the addition of mocaf flour and kepok banana peels, it shows that the p-value is > 0.05 so it can be concluded that there is no difference in the level of liking of the three pie vla formulas.

Table 2. Hedonic Test

No.	Formula	Hedonic Score	Interpretation	Significant	Information
1	F1	80.71%	Like	0.129 > 0.05	No difference
2	F2	77.50%	Like		
3	F3	75.07%	Like		

Source: Primary Data, 2023

Table 3 shows the chemical tests which include tests of calcium, potassium and water content of the vla pie. Formula 3 has a higher calcium content due to the greater addition of mocaf flour, which is 80% and based on the results of the Kruskal Wallis test on the calcium content of vla pie with the addition of mocaf flour and kepok banana peel, it shows that the p-value is > 0.05 so it can be concluded that there is no significant difference. Formula 1 has a higher potassium content through the addition of less mocaf flour, which is 50% and based on the results of the Kruskal Wallis test on the potassium content of vla pie with the addition of mocaf flour and kepok banana peel, it shows that the p-value is > 0.05 so it can be concluded that there is no significant difference. The vla pie produced in this study has a relatively high water content which increases the risk of damage and based on the results of the Kruskal Wallis test on the water content of vla pie with the addition of mocaf flour and kepok banana peels, it shows that the p-value is > 0.05 so it can be concluded that there is no significant difference.

Table 3. Vla Pie Chemical Analyze

No .	Chemical Characteristic	Formula 1	Formula 2	Formula 3	Sig.	Information
1	Calcium	45.41 mg/100 g	44.48 mg/100 g	46.06 mg/100 g	0.368 > 0.05	No difference
2	Potassium	182.88 mg/100 g	182.56 mg/100 g	182.05 mg/100 g	0.368 > 0.05	No difference
3	Water content	40.36%	40.73%	40.08%	0.368 > 0.05	No difference

Source: Vicma Lab Laboratory Test Results, 2023

From the results of the AIT test, the highest average aroma value was found in Formula 1 at 2.93. However, Formulas 1, 2 and 3 have the same category, namely they smell a bit like mocaf flour and banana peels with sufficient organoleptic quality criteria. This is because the higher the addition of mocaf flour, the aroma produced by the vla pie product will have a distinctive aroma from mocaf flour. This is in line with research by [Ihromil et al. \(2018\)](#) where the more mocaf flour is added, the more the aroma of the cookies produced will be flavorful with mocaf flour. In research conducted by [Alfirochah & Bahar \(2014\)](#), it was also stated that the greater the number of mocaf flour substitutes used, the more the aroma of the pancakes would be mocaf flour. In this research, apart from the aroma of mocaf flour, there was another aroma produced by adding the same amount of kepok banana peel to each formula to produce a banana peel aroma in the vla pie product.

From the results of the AIT test, the highest average texture value was found in Formula 2 of 2.81. However, in reality, Formula 3 has a higher crispness due to the higher addition of mocaf flour in Formula 3. This is because the starch content in mocaf flour is higher than in wheat flour so the higher the addition of mocaf flour can be increasingly crunchy ([Juanda & Cahyono, 2004](#)). This is in line with research by [Ihromil et al. \(2018\)](#) which states that a higher level of mocaf flour addition can make the texture of the dry cake crispier. The results of this research are also in line with research by [Widasari & Handayani \(2014\)](#), where the more mocaf flour added, the crispier the flake product will be.

From the results of the AIT test, the highest average color value was found in Formula 2 of 3.61. However, in reality, Formula 1 has a more golden yellow color than Formula 2 which has a paler white color. This is because the color of mocaf flour is whiter than wheat flour with the whiteness of mocaf flour being 88-91% and wheat flour being 86.5%, so the higher the addition of mocaf flour, the more pale yellow color of the vla pie ([Salim, 2011](#)). This is in line with research by [Mustaqim et al. \(2017\)](#), where the high use of mocaf flour affected the appearance of the color of the Bhoi cake to become pale so the panelists did not like it. The results of this study are also in line with research conducted by [Normasari \(2010\)](#) where the more addition of mocaf flour, the paler the resulting color will be due to the influence of white mocaf flour.

From the results of the AIT test, the highest average taste value was found in Formula 1 of 2.94. However, Formulas 1, 2 and 3 have the same category, namely they taste a bit like mocaf flour and banana peels with the criteria being that they are of sufficient organoleptic quality. This is because the higher the addition of mocaf flour, the more distinctive the taste produced by the vla pie product is from the mocaf flour. This is in line with research by [Badriani et al. \(2020\)](#), where the more mocaf flour is added to the dough, the kasippi taste will also be more pronounced with mocaf flour so that it can reduce the panelist's level of preference. Apart from the taste of mocaf flour, there are other flavors produced by adding the same amount of kepok banana peel to each formula, but the more dominant taste in the pie vla product comes from mocaf flour.

In the results of the sensory difference analysis using the Friedman test, there were no significant differences in the aroma, texture and color of the three pie vla formulas because the p-value > 0.05 . This can be interpreted that the addition of mocaf flour and kepok banana peels does not affect the aroma, texture and color of the vla pie because the ingredients used in each formula are not much different so the aroma, texture and color are quite similar. Regarding aroma, according to [Widiantara et al. \(2018\)](#), the aroma of food products can be influenced by the ingredients used and their processing. Regarding texture, according to [Affandi & Ferdiansyah \(2017\)](#), the crunchy texture of a dry cake product is greatly influenced by the characteristics of the raw materials used.

Regarding color in the research of Mikasari *et al.* (2015), the raw materials used can affect the color of food and drink. However, there was a significant difference in the taste of the three vla pie formulas because the p-value < 0.05, so the Wilcoxon test was continued to determine the difference in taste in the three formulas. The results of the Wilcoxon test on F1 and F2 with F1 and F3 obtained a p-value < 0.05, indicating that there was a real difference in the formula. According to Muchtar & Hastian (2017), the taste of a food product can come from the basic ingredients for making the product itself, the product processing process, and the ingredients added to the product during the processing process.

The results of the hedonic test on vla pie with the addition of mocaf flour and kepok banana peels which got the highest average was in Formula 1 which had a percentage of 80.71 with the liking criteria. F1 uses the lowest addition of mocaf flour, resulting smelled a bit like mocaf flour and banana peels, with a crunchy texture, and golden yellow color and tasted a bit like mocaf flour and banana peels which is well accepted by the panelists. This is because less mocaf flour is used in F1 compared to F2 and F3 with the same ratio of using kepok banana peels in each formula, resulting in an aroma that smelled a bit like mocaf flour and banana peels. This is in line with the research of Ihromil *et al.* (2018), which shows that the level of preference of panelists tends to decrease along with the higher substitution of mocaf flour. However, the texture that the panelists preferred was found in Formula 1 compared to F2 and F3 because the higher the addition of mocaf flour, the texture of the vla pie, apart from being crunchy, would also be more easily crushed or not sturdy. This is not in line with research by Widasari & Handayani (2014), where the higher the addition of mocaf flour, the crunchier the flake texture is, so the panelists like it more. Meanwhile, the color that the panelists liked was found in Formula 1. This was not in line with the research by Ihromil *et al.* (2018), which stated that the higher the addition of mocaf flour, the color the panelists preferred. In reality, the panelists preferred the color Formula 1 compared to F2 and F3 because the higher the addition of mocaf flour, the paler the color of the vla pie. This is in line with research by Normasari (2010), where the higher the mocaf flour substitution, the lower the panelists' preference for the color of the cookies. In terms of taste indicators, Formula 1 was the most preferred by the panelists because less mocaf flour was used in F1 compared to F2 and F3 with the same ratio of kepok banana peel used in each formula, resulting in a taste that tasted a bit like mocaf flour and banana peels. This is in line with the research of Ihromil *et al.* (2018), which shows that the higher the percentage of substitution of mocaf flour instead of wheat flour, the lower the taste score of the dry cake. The results of this study are also in line with the research of Badriani *et al.* (2020), where the higher the concentration of mocaf flour substitution, the panelist's assessment of the cassava taste decreased.

Based on the results of the calcium test on the vla pie, it is known that Formula 3 has a higher calcium content due to the greater addition of mocaf flour, which is 80%. Based on the results of the analysis of calcium levels, it can be seen that the higher the percentage of use of mocaf flour, the higher the calcium level in the vla pie, although it does not increase much. According to Damayanti (2014), this is because the calcium content in mocaf flour is higher than the calcium content in wheat flour. According to Kemenkes (2018), the calcium content in mocaf flour is higher, namely 60 mg/100 g, while the calcium level in wheat flour is 22 mg/100 g. However, this vla pie product cannot be claimed to be a source of calcium because the requirement is that it must be 15% of the nutritional label reference value, namely 165 mg/100 g.

Based on the results of the potassium test on vla pie, it is known that Formula 1 has a higher potassium content although the addition of less mocaf flour is 50%. Based on the results of the potassium content analysis, it can be seen that the higher the percentage of mocaf flour used, the lower the potassium content in the vla pie, although it does not decrease much because the ingredients used in each formula are not much different, resulting in quite similar potassium levels. According to Kemenkes (2018), the potassium content in mocaf flour is higher, namely 403 mg/100 g, while the potassium content in wheat flour is 0 mg/100 g, so it does not follow existing sources because the higher addition of mocaf flour, the more also high levels of potassium in vla pie. This can be caused by insufficient temperature control and processing time, especially during roasting. This is in line with the research by Damanik *et al.* (2021), where the longer the cooking process, the minerals in the food will decrease because they will evaporate when cooked, and this will result in the potassium content in the tuna fish meal getting lower over time. However, this vla pie product cannot be claimed to be a source of potassium because the requirement is that it must be 15% of the nutritional label reference value, namely 705 mg/100 g.

Based on the results of the water content test on vla pie, it is known that the lowest water content is found in Formula 3 at 40.08%. The water content tends to decrease in Formula 3 due to the increased use of mocaf flour. According to Salim (2011), this is because the water content in mocaf flour is lower, namely 6.9%, while the water content in wheat flour is 13%. This research is in line with the research of Ihromil *et al.* (2018), which shows that the higher the percentage of mocaf flour substitution, the lower the moisture content of the pastries. This research is also in line with the research of Badriani *et al.* (2020), where the higher the substitution of mocaf flour, the lower the water content produced in cassava. However, the water content in vla pie which does not meet standards can also be influenced by the addition of kepok banana peels to vla pie, because the water content in kepok banana peels in 100 grams is 68.90% (Anggraeni & Sian, 2004). In general, the moisture content of vla pie ranges from 5-10% Badan Pengawas Obat dan Makanan Republik Indonesia (2016). In this study, the vla pie produced contained relatively high water content, which might increase the risk of damage. Therefore, recommendations for future research related to this topic are adding foods high in calcium and potassium to vla pie and conducting research related to the effect of consuming vla pie snacks in lowering blood pressure in hypertensive patients.

Conclusions

This research concludes that there is no significant difference between organoleptic characteristics except taste, public

acceptability, calcium content, potassium content and water content in vla pie with the addition of mocaf flour and kepok banana peels. Suggestions for future researchers are that it is necessary to carry out tests related to the nutritional content of vla pie (energy, carbohydrates, protein, fat) and carry out shelf life testing to find out how long the vla pie product can last and add color to vla to produce a more attractive color and make additional more varied food ingredients in quite different amounts into the vla pie formulation to increase calcium levels and potassium levels.

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