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Characterization and Antioxidant Activity of Banana Peels, Pineapple Peels, and Combination Extracts of both Peels as Raw Materials in the Development of Hard Candy

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ABSTRACT

Kepok banana and pineapple are horticultural commodities found in West Kalimantan. The two fruits are generally used as processed foods such as fried bananas and pineapple jam. The use of fruit as food often leaves the peel as a by-product, which can produce waste twice the weight of the food consumed. Meanwhile, waste utilization is an innovation in food processing into functional products which are developed into hard candy. Therefore, this research aims to the specific and non-specific characterization of raw materials for making candy, namely the combination of banana and pineapple peel extract (KP-KN). The characterization is organoleptic tests on the content of ethanol-soluble and water-soluble extracts. The Total phenolic content was determined by the Follin ciocalticeu method with UV/Vis spectrophotometry. Furthermore, antioxidant activity tests with DPPH and FRAP methods using UV/Vis spectrophotometry and ELISA to determine antioxidant activity. The mineral content was observed using the molybdate vandalate method with UV/vis spectrophotometry and ICP-MS, Heavy metal contamination using the ICP-MS tool, and microbial contamination using the plate method. Moreover, the infundation process was carried out on banana and pineapple peels, and the results were evaporated using a food dehydrator to obtain a combination extract. The results showed that the organoleptically KP-KN combination extract had a bitter taste, pineapple smells, 15.57% ash content, ethanol soluble extract content of 55.10%, and 47.99% water-soluble extract. Also, the total phenolic of 6.22 g/Kg, as well as the mineral content of Potassium (K), Calcium (Ca), Iron (Fe), Magnesium (Mg), Zinc (Zn), and Phosphorus (P), which were 47.23 g/Kg, 291.43 mg/Kg, $<1x10^{-6}$ g/Kg, $2.59x10^{-3}$ g/Kg, and 2.38 g/Kg, respectively. Meanwhile, the heavy metal and bacterial contamination test showed that Arsenic (As), Sn, Mercury (Hg), and lead (Pb) were $<1x10^{-6}$ g/Kg and Cadmium (Cd) was 0.0293. In the microbial contamination test with bacterial components including the ALT test, a value of 4.83×10^3 cfu/g was found, and there was no contamination from E.coli, mold, and yeast bacteria, DPPH and FRAP methods showed antioxidant activity combination extract banana peels and pineapple peels with values of 1390.96±2.83 mg/L and 4542.81±1.10 mg/L compare antioxidant activity of ascorbic acid as standard is 2.13 mg/L and 4.83 mg/L. The test with the KP-KN combined extract can be used as a raw material for making hard candy because it contains minerals needed by the body, meets the safety and quality requirements of traditional medicines, and has antioxidant activity in vitro.

Keywords: Characterization; Antioxidant; Banana Peel; Pineapple Peel; Combination Extracts of both Peels

INTRODUCTION

Kepok banana is a horticultural commodity found in the West Kalimantan area, which can be used as processed food such as fried bananas (Tumion, 2017). Meanwhile, Indonesia is a banana-producing country that supplies 50% of its production in Asia. In 2020, West Kalimantan produced 60,281 tons of Kapok bananas per year (National Agency for Drug and Food Control, 2020). The use of bananas, especially the flesh, is very diverse, including as food raw materials and in serving traditional cakes (Zuhrina, 2011). However, it generates waste in the form of peel, which is two times the flesh weight (Tumion, 2017). Based on research, pineapple peel can be used as a source of bioethanol and syrup which is rich in vitamin D (Jeharu et al, 2015; Diastutik, 2014), hence the use of the fruit peel can always be developed.

Besides kepok banana, pineapple is also one of the fruits commonly found in the community.

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Based on data on 2020 production, West Kalimantan produced 208,463 tons of pineapple per year (National Agency for Drug and Food Control, 2020). The higher this production, the more waste is generated. Consumption can produce peel waste by 34.61% (Syauqi, 2020), therefore the utilization needs to be optimally carried out to reduce the amount and increase the economic value of the waste (Susanti, 2013; Mahmud, 2018).

As found by Saputri in 2020, the antioxidant activity of a single kepok banana peel produces a small IC_{50} value of 95.85 mg/L. IC_{50} indicates that the antioxidant activity of banana peels has a high ability to ward off free radicals, hence it is beneficial for the body. Another research by Alfiani in 2014 showed the antioxidant activity of ethanol extract from peels was higher than the flesh with a capacity of 73.89%. Also, Hatam et al. in 2013 found that the antioxidant activity of pineapple peel extract had an IC_{50} value of 2.78 mg/L (Pantria, 2020; Hatam, 2013; Saputri, 2020).

Kepok banana (*Musa paradisiaca* L. var kepok) is typical fruit from West Kalimantan with potassium (K) of 479 mg/100 g (Verina, 2011) as the highest macro element content. Meanwhile, pineapple (*Ananas comosus*) is rich in nutrients, vitamins, and minerals. The minerals are calcium at 18 mg, iron at 0.3 mg, magnesium at 12 mg, phosphorus at 12 mg, potassium at 98 mg, and sodium at 1 mg (Khamidah, 2011; Irfandi, 2018). Besides the fruit, potassium is also contained in banana and pineapple peels which have only been considered waste. The potassium levels in fresh and steamed peels were 2.39 ± 0.0046 mg/100g and 2.34 ± 0.0026 mg/100g, respectively (Agustina J, 2018). Although little research has been conducted on the potassium content in pineapple peel, according to Susi et al (2018), the peel in the form of organic fertilizer contains potassium.

To utilize the waste, the combination of banana and pineapple peels which are known to have biological activity and micronutrient content is beneficial to public health when packaged in a more practical form. A literature search by Rachmawati (2021), showed the use of banana and pineapple peels as liquid organic fertilizers is following quality standards (Rachmawati, 2021). Novia et al., 2022 showed that the combined banana and pineapple peel extracts do not have a toxic effect, hence they are safe to use (Novia, 2022). According to Hiqbar et al., (2022), based on the combination of banana and pineapple peels (3:1) by in vivo test on rats, potassium levels in the blood are normal (Hiqbar, 2022). Nugraha et al., (2021) found that the combination of banana and pineapple peels produced a potassium of 47.483 mg/g (Nugraha, 2021).

Therefore, banana and pineapple peels as functional food can be used and developed into practical, effective, easy-to-accept preparations for all ages, such as candy. Hard candy from the combination of banana and pineapple peels contains 229.3463 mg/g of potassium (Anggraeni, 2021).

Following the regulation of the drug and food control agency (BPOM) No. 32, 2019 concerning requirements for the safety and quality of traditional medicine, the active ingredients in raw materials and final goods must adhere to safety and quality standards for organoleptic, air content, microbiological contamination, total aflatoxin, and heavy metal contamination. Therefore, to produce high-quality raw materials, a process is required to ascertain the extract's properties, including both specific and non-specific parameters. This is followed by activity tests, tests for the content of secondary metabolites and micronutrients, and tests for the metal contamination of extract combinations. testing for bacterial contamination, namely E. coli, ALT, mold, and yeast, as well as tests for As, Cd, Cu, Hg, and Pb.

METHODOLOGY

Characterization

Standardization of simplicia and extracts of banana and pineapple peels, as well as the combination of both peels (3:1)

The simplicia standardization was carried out on Drying shrink, water-soluble extract content, and ethanol-soluble extract content by gravimetric method (Department of Health, 2008).

Test of Secondary Metabolit and Micronutrient Element

Total Phenolic Content Test

In the Folin-Ciocalteu method, as much as 1 ml of a sample solution was put into a 10 ml volumetric flask and added with 500 µl of Folin reagent. Furthermore, Ciocalteau and 2 ml of 10% sodium carbonate (Na_2CO_3) and aquadest were added to the mark and shaken until homogeneous. After that, the solution was transferred into a test tube, covered with aluminum foil, and heated in a water bath at 50˚C for 5 minutes. The solution mixture was subsequently incubated for 10 minutes, and the absorbance was measured at a wavelength of 757 nm (Hanani, 2015).

Test on Micronutrients K, Ca, Fe, Mg, Zn, and P

Sample preparation of banana peel (KP), pineapple peel (KN), and a combination of KP: KN (3:1) was used for the analysis of mineral content

(K, Ca, Fe, Mg, and Zn). About 2.5 grams of sample were obtained, put into a Kjedal micro tube, added with 5 ml of aquabidest, and vortexed until homogeneous. The homogeneous solution was added with about 1.25 ml of concentrated H_2SO_4, vortexed, and added with 5 ml of concentrated HNO_3. This was subsequently vortexed until homogeneous and allowed to stand for 2 to 3 minutes. The tube was heated at 85°C until no brown smoke ($NO_{2(g)}$) was formed. The heating was continued by increasing the temperature to 200°C until the sample was black (burned). About 0.8 ml of HNO3 was added carefully every 15 minutes until brown smoke ($NO_{2(g)}$) was no longer formed or until the color of the sample, and liquid has turned pale yellow (National Standardization Agency, 2009). The sample solution was added with 10 ml of aqubidest, heated again at 200°C for 20 minutes, and allowed to stand for 24 hours. The tube was added with 25 ml of aquabidest, then the sample was ready to be analyzed using the ICP-MS tool at a maximum wavelength of K = 766.6 nm, Ca=422.7 nm, Fe = 248.3 nm, Mg = 285.2, and Zn = 215.8 nm (AOAC, 2005).

The analysis of mineral P content used the molybdate vandalate method. The vandalate molybdate reagent was prepared by dissolving 20 g of ammonium molybdate into 200 mL of hot distilled water and then cooled. About 1.0 g of ammonium metavanadate was dissolved into 125 mL of hot aquadest, cooled, added with 160 mL of HCl, and put into a 1-liter volumetric flask. The sample was treated with nitric acid to change all metaphosphate and pyrophosphate to orthophosphate. Then the sample was treated with molybdic and vanadic acids, hence the orthophosphate present in the sample will react with these reagents and form a yellow vanadimolybdiphosphate acid complex. The color intensity of these complex compounds can be measured with a spectrophotometer at a wavelength of 400 nm and compared with standard phosphorus (Ritonga, 2012).

Quality Control of Raw Material

Test on Metal As, Cd, Sn, Hg, and Pb Contaminants

In the analysis of mineral content (As, Cd, Cu, Hg, and Pb), 2.5 grams of the sample were taken, put into a Kjedal micro tube, added with 5 ml of aquabidest, and vortexed until homogeneous. The homogeneous solution was added with 1.25 ml of concentrated H_2SO_4, vortexed, and added with 5 ml of concentrated HNO_3. This was subsequently vortexed until homogeneous and allowed to stand for 2 to 3 minutes. The tube was heated at 85°C until no brown smoke ($NO_{2(g)}$) was formed. The heating was continued by increasing the temperature to 200°C until the sample was black (burned). Also, 0.8 ml of HNO_3 was added carefully every 15 minutes until the brown smoke ($NO_{2(g)}$) was no longer formed or until the color of the sample, and the liquid turned pale yellow (National Standardization Agency, 2009). The sample solution was added with 10 ml of aqubidest, then reheated at 200°C for 20 minutes, and allowed to stand for 24 hours. In addition, the tube was added with 25 ml of aquabidest, and the sample was ready to be analyzed using the ICP-MS tool at a maximum wavelength of As = 193.7 nm, Cd = 316 nm, Sn = 317.5 nm, Hg = 253.7 nm, and Pb = 283.3 nm (AOAC, 2005).

Microbial Test

The microbial tests included ALT, *E. coli*, Mold, and Yeast tests using the plate number counting test in cash or spread. The test was carried out by directly inoculating a certain amount of the initial suspension which has been decimally diluted into a specific medium by pouring or spreading and incubating aerobically at a suitable temperature for a certain time. The number of microbes was expressed in colonies or cfu (colony forming units) (Silvi, 2021).

Antioxidant Activity Test

The antioxidant activity test was carried out using the DPPH and FRAP methods.

DPPH Radical Scavenging Antioxidant Activity Method

In the DPPH method, 1 ml sample of banana peel (KP), pineapple peel (KN), and a combination of KP: KN (3:1) were put into a 5 ml volumetric flask, added with 3 ml of 40 mg/L DPPH and dissolved to 5 ml. Subsequently, the mixture was homogenized, incubated at room temperature, stored in a dark place for 30 minutes, and read at a maximum wavelength of 515.5 nm using a UV/Vis spectrophotometer (Brand-Williams, 1995; Kikuzaki, 2002).

FRAP capacity method.

The antioxidant activity test by FRAP method used ferric chloride (3 mM in 5 mM citric acid) and TPTZ solutions (1 mM in 0.05 M hydrochloric acid). A total of 30 L of sample solution were added with 30 L FeCl3 and 240 L TPTZ solutions in a 96-well microplate. Furthermore, the mixture was vortexed and incubated at 37 °C for 30 minutes in a dark place at room temperature. The absorption was measured at a wavelength of 615 nm using ELISA for 15-30 minutes (Syamsu, 2017).

Table I. Organoleptic Test

Sample	Result
Banana Peel (KP)	Color: Dark Brown Flavour: Bitter Odour: Sour Shape: Fine powder
Pineapple Peel (KN)	Color: Brownish yellow Flavour: Sour Odour: Sour Shape: Fine powder
Combination of KP:KN (3:1)	Color: Blackish Brown Flavour: Bitter Odour]: Sweet Shape: Mushy

Table II. Data of Ash Content, Drying Shrinkage, Water Soluble Extraction, and Ethanol Soluble Extraction by Gravimetric Method

No.	Parameter	Concentration (%)		
		Pineapple Peel (KN)	Banana Peel (KP)	Combination of KP:KN (3:1)
1	Ash Content	3,48	12,42	15,57
2	Drying shrink	9,59	8,73	8,33
3	Ethanol Soluble Extraction	41,87	29,24	55,10
4	Water Soluble Extraction	30,08	24,81	47,99

RESULT AND DISCUSSION

The banana and pineapple peels were obtained at Mawar Market, Pontianak City Sub-district, West Kalimantan Province. The peels were first sorted to separate extraneous substances or impurities. They were subsequently washed using running water and chopped to expand the surface of the plant parts to speed up the drying process. The drying process was carried out in an oven at 50°C. Furthermore, the peels were re-sorted to separate extraneous substances in the drying process, mashed using a blender, and then sieved to obtain a uniform simplicia powder. Standardization of materials was needed to ensure the efficacy, quality, and safety of the ingredients or extracts to fulfill the requirements with good parameter values (Syaifudin, 2011). The organoleptic test is a physical recognition using the five senses to describe color, shape, smell, and taste. The organoleptic test on the banana and pineapple peels and the combination of both can be seen in Table I.

The ash content test provides an overview of the internal and external minerals originating from the initial process, where the results can be seen in Table II. The information refers to the examination of micronutrient content and metal contamination that may be present in the KP, KN, and KP: KN combination (3:1). In conclusion, the higher the ash content, the greater the mineral.

Characterization of raw material used in this study started from the determination of specific and non-specific. Extract dissolved compounds in water and ethanol solvents aims to estimate the active compounds that are polar (soluble in water) and non-polar (soluble in ethanol). The test results can be seen in Table II, which showed the value of the ethanol-soluble extract was greater than the water-soluble extract. Therefore, KP, KN, and the combination of both KP:KN (3:1) contained more non-polar compounds. This is because banana peels contain a lot of amylopectin in KP. The pectin content in banana peels ranges from 0.9% of the dry weight. Furthermore, pectin is a polymer of D-galacturonic acid linked by -1,4 glycosidic bonds. It is obtained from the cell walls of land plants. The form of the extracted pectin is a white to light brown powder (Satria, 2008).

Examination of secondary metabolit, and micronutrients determines the nutritional content of KP, KN, and a combination of KP: KN when consumed as processed food ingredients. Nutrients are components contained in food which is needed by the body in adequate amounts for growth,

Table III. Total phenolic content Test using the Folin-Ciocalteu Method

No.	Parameter	Concentration (g/Kg)		
		Pineapple Peel (KN)	Banana Peel (KP)	Combination of KP:KN (3:1)
1	Total phenolic content	3,74	1,79	6,22

Table IV. Micronutrient K, Ca, Fe, Mg, Zn, and P Test

No.	Parameter	Concentration (g/Kg)		
		Pineapple Peel (KN)	Banana Peel (KP)	Combination of KP:KN (3:1)
1	K	7,01	2,77	47,23
2	Ca	1,92	1,71	0.29
3	Fe	0,67	0,02	<0,0001
4	Mg	0,86	2,00	2,59
5	Zn	0,005	0,02	0.02
6	P	2,09	2,17	2,38

Table V. Metal As, Cd, Sn, Hg, and Pb Contamination Test on

No.	Parameter	Concentration (mg/Kg)		
		Pineapple Peel (KN)	Banana Peel (KP)	Combination of KP:KN (3:1)
1	As	<0,0001	<0,0001	<0,0001
2	Cd	$7,4x10^{-3}$	$1,3x10^{-4}$	$2,9x10^{-5}$
3	Sn	$5,7x10^{-4}$	$1,55x10^{-3}$	<0,0001
4	Hg	<0,0001	<0,0001	<0,0001
5	Pb	$2,7x10^{-3}$	$3,8x10^{-3}$	<0,0001

development, and fitness (Cakrawati, 2012). The total phenolic content in KP, KN, and the combination of KP: KN was 1,79 g/Kg, 3,74 g/Kg, and 6,22 g/Kg. Total phenolic compounds are one the compounds that can be responsible for providing antioxidant activity, by giving electrons to radical compounds (Zahra et al., 2021). The nutritional content can be reflected in the amount of macro and micronutrients contained in KP, KN, and the Combination of KP: KN.

The levels of Ca, P, Mg, K, and Fe in the samples were measured to determine essential and macro minerals, namely calcium (Ca) and phosphorus (P), as well as essential micro minerals, namely iron (Fe) Magnesium (Mg) and Potassium (K). The presence of calcium and phosphorus in the body is associated with the formation of bones and teeth, muscle contraction, as well as the activation of various enzymes in metabolic processes. Meanwhile, iron minerals are associated with heme components which are part of red blood cells related to energy metabolism (Cakrawati, 2012). Magnesium helps to build bones, improves the appearance of nerve function, and is a very important element for producing energy from the food consumed (Nugroho, 2021). This element is naturally found in many foods, or usually added to processed products, and is available as a dietary supplement, as well as in some types of heartburn medications and laxatives (Gumantan, 2021). It is a cofactor in more than 300 enzyme systems that regulate various biochemical reactions in the body, including protein synthesis, muscle, and nerve function. Furthermore, it plays a role in regulating blood pressure and glucose levels. According to Prio, 2022, potassium is known to be beneficial for the body by maintaining nerve function, blood pressure, blood vessel health, and bone density, as well as preventing muscle cramps (Prio, 2022). Therefore, the mineral content of Ca, P, Mg, K, and Fe, in food indicates a good nutritional value for health and body development. The measurement of the mineral content of Ca, P, Mg, K, and Fe is presented in table IV.

To ensure the quality of raw materials used in the development of functional food, it is necessary to comply with the applicable regulations. In this case, the testing of metal and microbial contamination is adjusted to the BPOM No.32 2019 (national agency for drug and food control) regulations concerning microbial contamination, including the content of ALT, *E. coli*, Yeast, and Mold (BPOM, 2019). Referring to the results in Table VI, BPOM No. 32 2019 regulation

Table VI. Total Microbial Extract Test

No	Sample	Unit	ALT	*E. coli*	Mold
1	Combination of KP:KN (3:1)	Cfu/g	$4{,}83 \times 10^3$	0	0
2	Banana Peel (KP)	Cfu/g	$2{,}97 \times 10^2$	0	0
3	Pineapple Peel (KN)	Cfu/g	$1{,}22 \times 10^3$	0	0

Table VII. Antioxidant Activity Test using DPPH Method

Group	IC_{50} Value (mg/L)	Average IC_{50} Value ± RSD
KP (Banana Peel)	1430,00	1421,52 ± 2,69
	1379,74	
	1454,82	
KN (Pineapple Peel)	641,87	655,83 ± 1,87
	664,85	
	660,76	
Combination of KP:KN (3:1)	1394,13	1390,96 ± 2,83
	1350,16	
	1428,59	

Table VIII. Antioxidant Activity Test using FRAP Method

Group	IC_{50} Value (mg/L)	Average IC_{50} Value ± RSD
KP (Banana Peel)	3168,03	3169,19 ± 4,21
	3036,27	
	3303,26	
KN (Pineapple Peel)	1143,33	1130,35 ± 2,09
	1103,12	
	1144,58	
Combination of KP:KN (3:1)	4502,72	4542,81 ± 1,10
	4598,53	
	4527,16	

on metal contamination has a maximum limit of Arsenic (As), Lead (Pb), Mercury (Hg), Cadmium (Cd), and Tin (Sn) (BPOM, 2019). The measurements that have been carried out can be seen in Table V. According to the tests carried out following the regulations in Indonesia, the combination of KP: KN fulfills the requirements of metal contamination and microbial tests.

Antioxidant testing with DPPH and FRAP methods was carried out to determine the presence of antioxidant activity in the test sample. Antioxidant activity test using the DPPH method on KN by Lilyawati et al., (2019) and Hatam et al., (2013) showed that 80% ethanol solvent with several extraction techniques produced an IC_{50} value of maceration = 1513.56 mg/L, soxhletation = 602.56 mg/L, and reflux = 891.25 mg/L. Also, while using 70% ethanol solvent, the highest inhibitory value was = 78.4 mg/L (Lilyawati, 2019; Hatam, 2013). In research conducted using the KN infusion, the value of IC_{50} = 655.83 ± 1.87 mg/L, using the DPPH method and IC_{50} = 1130.35 ± 2.09 mg/L, and using the FRAP method. As found by Reiza et al., (2019), the ethanol extract of pineapple peels contains flavonoids, saponins, and tannins. Hatam et al., (2013) explained that 70% of ethanol extract contains 16.53 g/ml phenol and 3.51 g/ml flavonoids (Reiza, 2019; Hatam, 2013). Rahmi et al., (2021) showed that the antioxidant activity of the ethanolic extract of the kepok banana peels has an IC_{50} value of 9,702 mg/L. Also, Aboul et al., (2016) found that fresh banana peels have an IC_{50} value of 55.45-120.03 g/ml using the DPPH method (Rahmi, 2021; Aboul, 2016). In this research, the IC_{50} values for KP infusion with the DPPH and FRAP methods were 1421.52 ± 2.69 mg/L and 3169.19 ± 4.21 mg/L, respectively compared to the antioxidant activity of ascorbic acid as standard is 2.13 mg/L DPPH method and FRAP method is 4.83 mg/L. The antioxidant activity found in the banana peels was caused by flavonoid secondary metabolites owned by KP (Rahmi, 2021). The mechanism of antioxidant activity using DPPH, namely the interaction of

Table IX. Measurement of IC_{50} Value of DPPH and FRAP Methods

Group	DPPH IC_{50} Value (mg/L)	FRAP IC_{50} Value (mg/L)
KP (Banana Peel)	1421,52*	3169,19*
KN (Pineapple Peel)	655,83*	1130,35*
Combination of KP:KN (3:1)	1390,96*	4542,81*
Ascorbic Acid	2.13*	4.83*

*= ($p \leq 0,05$)

antioxidant compounds with DPPH either by electron transfer or hydrogen radicals, will neutralize the free radical character of DPPH. The pairing of all electrons in the free radical will turn the solution color to bright yellow. The increase in solution concentration will decrease the absorbance and increase the antioxidant activity. This is indicated by the faded color of the DPPH and the greater percentage of inhibition (Rahmi, 2021).

In the FRAP method, the antioxidant action is based on a reduction reaction in an acidic environment from a yellow Fe^{3+} complex compound (Potassium hexacyanoferat) to a bluish-green Fe^{2+} due to electron donors from antioxidants. Testing of antioxidant activity in the FRAP method was carried out by measuring the absorption of the formed Fe^{2+} complex compound (Panda, 2012). The results showed that the KP: KN combination had an antioxidant activity with IC_{50} of 1390.96 ± 2.83 mg/L (DPPH method) and 4542.81 ± 1.10 (FRAP method) compare antioxidant activity of ascorbic acid as standard is 2.13 mg/L and 4.83 mg/L. The results of testing the antioxidant activity using DPPH and FRAP are presented in Tables III and IV. A statistical test with a confidence level of 0.05% on antioxidant activity testing using the DPPH and FRAP methods is presented in Table IX. Also, the differences in antioxidant activity values in this research could be due to the variation in the mechanism of action between DPPH and FRAP on the content of secondary metabolites in KP, KN, and the combination of KP: KN. In line with Maesaroh et al., (2018), the difference in antioxidant activity in FRAP and DPPH is that there is a very strong relationship between free radical inhibition and the potential for reducing polyhydroxy compounds (Total phenolic contents) to iron ions (Maesaroh, 2018).

CONCLUSION

Based on the results, the extract combination of KP-KN showed that the organoleptically KP-KN had a bitter taste, pineapple smells, 15.57% ash content, ethanol soluble extract content of 55.10%, and 47.99% water-soluble extract. DPPH and FRAP methods showed antioxidant activity in combination with extract banana peels and pineapple peels with values of 1390.96±2.83 mg/L and 4542.81±1.10 mg/L, total phenolic of 6.22 g/Kg. The mineral content of Potassium (K), Calcium (Ca), Iron (Fe), Magnesium (Mg), Zinc (Zn), and Phosphorus (P), which were 47.23 g/Kg, 291.43 mg/Kg, $<1x10^{-6}$ g/Kg, $2.59x10^{-3}$ g/Kg, and 2.38 g/Kg, respectively. Quality control of the extract is heavy metal and bacterial contamination test showed that Arsenic (As), Sn, Mercury (Hg), and lead (Pb) were $<1x10^{-6}$ g/Kg and Cadmium (Cd) was $2,9x10^{-5}$ g/Kg. In the microbial contamination test with bacterial components including the ALT test, a value of 4.83 x 10^3 Cfu/gr was found, and there was no contamination from E.coli, mold, and yeast bacteria. Quality control test results on raw materials for processed food candy preparations have met the requirements of BPOM regulation No. 32, 2019 concerning requirements for the safety and quality of traditional medicine including microbial contamination and heavy metal contamination.

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