

Analyze of Nutrition and Bioactive Compound in Unripe and Ripe Berlin Banana (*Musa acuminata*) Flour

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Abstract. Berlin banana (*Musa acuminata*) is one of the biggest fruit in Indonesia, especially in East Java. Banana flour known has longer life. The ripeness of banana influences nutrient and bioactive content. This research aimed to know nutrition and bioactive compounds on unripe and ripe Berlin banana flour. The banana was obtained from Banyuwangi and its was processed at Food Laboratory, State Polytechnic of Jember. Proximate analysis of banana flour used gravimetric and volumetric methods to determine the nutrients content such as carbohydrates, protein, lipid, water and ash content, while flavonoid, magnesium, and potassium were analyzed by spectrophotometry. Data were analyzed by descriptive. The result showed that water content, ash content, lipid, protein, carbohydrates, resistant starch, flavonoid, magnesium and potassium on Unripe Banana Flour (UBF) were 6,53%; 2,14%; 1,07%; 4,23%; 86,02%; 40,01%; 241 mg/100g; 12,08 mg/100g and 715 mg/100g respectively ($p < 0,05$). Ripe banana flour (RBF) were 6,91%; 2,02%; 0,98%; 4,11%; 85,97%; 39,76%; 258 mg/100g; 12,16 mg/100g and 709 mg/100g respectively ($p > 0,05$). UBF analysis of *Musa acuminata* has more ash, fat, protein, carbohydrate, resistant starch, and potassium content than RBF. Meanwhile, RBF has a higher water, flavonoid and magnesium content than UBF.

1. Introduction

Banana is one of functional food for degenerative diseases prevention [1,2]. The health benefits of Bananas are reduce the ratio of LDL / HDL cholesterol to diabetic patients with hypercholesterolemia, antioxidant effect, decreases of blood glucose and triglyceride levels [3,4,5].

Banana production in Indonesia contributes to 88,07%. The East Java is the province that has the highest contribution (21,87%) and the production of bananas up to 1.865.772 ton at 2016 [6,7]. However, the consumption of bananas at 2016 was only 1.519,93 million nationally [8]. This condition causes the number of bananas that are not used because of short banana storage life.

Musa acuminata is the most popular and widely cultivated banana variety. The variety of *Musa acuminata* that is commonly found is banana berlin [9]. Bananas in the form of flour are known that have a longer shelf life without reducing nutritional value, easier in packaging and transportation, more practical for diversification of processed products, able to provide added value of bananas, increase the nutritional value of fruit through the fortification process during processing and create business opportunities for the development of agroindustry [10,11]. Banana flour is an intermediate product that is quite prospective in developing local resources. Therefore, it is necessary to conduct research to analyze the nutrient and bioactive content of ripe banana flour (RBF) and unripe banana flour (UBF) of Berlin banana (*Musa acuminata*).

2. Methods

2.1 Preparing of Berlin Banana

The experimental Banana Berlin was used unripe and ripe. Banana Berlin unripe had ripeness on stage 3 which more green than yellow[12]. Banana berlin ripe and unripe were collected from banana's field at Banyuwangi. Banana determined on BalaiKonservasiTumbuhanKebun Raya Purwoadi-LIPI, Pasuruan, East Java.

2.2 Flour Banana

Banana was processed in flour by several steps. First, banana washed using tap water to remove the dirty that stick on the peel. Next, banana fruit and peel were separated. The banana fruit was sliced with size 3 mm. The pieces soaked into citric acid solution 0.2% for 10 minutes. The solution disposed, and the pieces on heat in oscillating tray dryer temperature of 60°C until the final moisture content 8-10%. The pieces were grinding and it was sieving size 80 mesh. Banana flour was used[13].

2.3 Analyzing Berlin Banana Flour

Nutrient and bioactive compound on ripe banana flour (RBF) and unripe banana flour (UBF) Berlin banana (*Musa acuminata*) were analyzed at laboratory food analysis, State Polytechnic of Jember. Carbohydrate, protein, fat, water, and ash were determined according to gravimetric and volumetric method. Then, magnesium and potassium were determined using spectrophotometry method. Data were analyzed by descriptive.

3. Result and Discussion

The results indicated that ripe banana flour (RBF) and unripe banana flour (UBF) *Musa acuminata* contains carbohydrates, proteins, fats, water, ash, flavonoid, magnesium, and potassium (Table 1).

Table 1. Nutritional Substances and Bioactive Compounds Unripe Banana Flour (UBF) and Ripe Banana Flour (RBF) *Musa acuminata*

Parameter	Banana Flour	
	UBF	RBF
Water (%)	6,53	6,91
Ash (%)	2,14	2,02
Fat (%)	1,07	0,98
Protein (%)	4,23	4,11
Carbohydrate (%)	86,02	85,97
Resistant starch (%)	40,01	39,76
Flavonoid (mg / 100g)	241	258
Magnesium (mg / 100g)	12,08	12,16
Potassium (mg / 100g)	715	709

Table 1 shows result of proximate analysis on ash, fat, protein, carbohydrates, resistant starch, and potassium in UBF higher than RBF. The study also supported the research from Yap et al. (2017) which reported the maturity the banana have ash content decreased[14]. The ash content influenced by quality the flour[15].

Carbohydrates content in RBF was less than in UBF (Table 1). Ripeness stage due to change of physiology in fruit. Starch was modified into simple sugar by enzymatic process[16]. Protein content in UBF was higher than in RBF. This condition was caused by existence of nitrogen content on the maturation process[17].

Fat and potassium content in this study was different from the research results of Yap et al. (2017), reported that more mature the banana, lower fat and potassium content. This research result also

showed that more ripe the banana effect to the decreased resistant starch content[14]. This research similar with Pragati et al. (2014), showed that resistant starch content in UBF also greater than RBF[15].was reported the decrease resistant starch content depends on levels of ripeness[18].According to Sajilata et al. (2006b) resistant starch was starch can be fermented by the microflora in colon. This condition will stimulate growth of probiotic microflora such as *Lactobacillus* sp and *Bifidobacteria* which can reduce pH in intestinaland it can prevent the growth of pathogenic bacteria namely *E.coli*, *Salmonella* sp, *Staphylococcus aureus* and *Clostridium* sp. Banana contain resistant starch type 2. Its characteristics are without gelatinized. Resistant starch type 2 can be useful for improving the health of the digestive system, lowering cholesterol level, antidiabetic and to regulating body weight[19].

Ripe banana flour (RBF)contain water, flavonoid, and magnesium higher than unripe banana flour (UBF). Banana fruit have the high level maturation can effect to increase water content. Starch modified into simple sugar on maturation[16].Whereas, flavonoid levels in Table 1 contrast with Youryon and Supapvanich (2017) which flavonoids in unripe bananas were higher than ripe bananas [20].Flavonoids act as antioxidants by inhibiting free radicals[19].Magnesium content in RBF was more than in UBF. The results of this study are in line with the research of Yap et al. (2017) showed that moreripe bananahas impactincreasing magnesium content[14].Magnesium is micronutrient that has functions as a cofactor of several enzymes that play a role in fat metabolism, protein, carbohydrates and insulin action[20].

4. Conclusion

The unripe banana flour (UBF) has higher amount of ash, fat, protein, resistant starch and potassium. Then, ripe banana flour (RBF) contain water, flavonoid, and magnesiumhigher than UBF.

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