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## Hypoglycemic Effect of Banana Peel Extract (*Musa Paradisiaca* Var *Kepok*) in New Zealand White Rabbits with Diabetes Hyperlipidemia

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### ABSTRACT

Introduction: banana peels just end up in the trash to date. It needs to be thought of waste processing into a more useful product for health. This study aims to determine the effect of peel extract *Musa Paradisiaca* var. *kepok* (MPvK) toward the blood sugar level of New Zealand White (NZW) rabbits which have diabetes hyperlipidemia. Method: 27 male New Zealand White rabbit, age 4 months, average weight 1.5-2 kg. The 104-day study was conducted at LPPT unit 4 UGM that has been standardized internationally. Results: The test results of repeated ANOVA on the blood sugar group 1 (O1) shows that at least 2 measurement times that had significantly different mean values with  $p\text{-value} = 0.003 < 0.05$ . The result of the Friedman test on the blood sugar level for group 2 (O2) showed that at least 2 measurement times having mean value was significantly different with  $p\text{-value} = 0.001 < 0.05$ . The group 3 (O3) indicated that at least 2 measurement times had significantly different value mean with  $p\text{-value} = 0.045 < 0.05$ . There are the differences on blood sugar levels in each group and at each measurement time. Conclusion: an ethanol extract of MPvK peels have a hypoglycemia effect on New Zealand White rabbit with Diabetic Hyperlipidemia.

**Keywords:** Blood sugar, Diabetes hyperlipidemia, Banana peel

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### INTRODUCTION

#### Background

The incidence of Diabetes Mellitus (DM) in the world has been predicted to reach 439 million in 2030, and Indonesia is ranked 4th. The main death cause of DM patients is Atherosclerosis. Factors that play a role in increasing the risk of Atherosclerosis in DM is increased levels of *Triglyceride* (TG) and decreased *High-density lipoprotein* (HDL).<sup>(1)</sup> The management of DM Hyperlipidemia with the drug was not significantly effective, and it also has severe side effects. The preventive effort that has the minimal side effects is necessary to do, such as the utilization of tropical plants as the development of antioxidants using herbs since Indonesia has rich various medicinal plant.<sup>(2),(3)</sup> Utilization of fruit peels that has been considered only useless to date has shifted potentially be a very highly beneficial herbal medicine.<sup>(4),(5)</sup> This research examine the effect of banana peel extract (*Musa Paradisiaca* Var *Kepok*) against fasting blood glucose level.

#### Purpose

The specific purpose of this study is to prove banana peel extract *Musa Paradisiaca* Var *Kepok* can decrease fasting blood sugar and control diabetes mellitus. The significances of the study can improve health status, prevent atherosclerosis disease caused by diabetes hyperlipidemia, and reduce health costs.

## METHODS

The sample of the research was randomly taken from the male NZW rabbit, age 4 months, 1.5 - 2.5 kg weight (according to experimental age) from the Livestock Research Institute Tapos Bogor. Determination of the number of samples was done by using laboratory experimental formula WHO 1993 and Frederer (Chambell, 1967). The rabbits were divided into 3 groups, 2 treatment groups and 1 control group, the minimum sample size for each group was 9, so the total number of NZW rabbits used for this study was 27. Their Food is *Champion Rabbit Feed* that was mixed by a *High Fructose Fat Diet* (HFFD). The raw material of Banana peel was obtained from the traditional market in Demak Central Java. The method was maceration extraction. The treatment in this research was the feeding of HFFD and banana peel extract (*Musa pradiasiaca* Var. *kepok*) in group O1 and O2 while O3 without given banana peel extract. The dose of each treatment group 1 (O<sub>1</sub>) was 200 mg/kg BB, and treatment group 2 (O<sub>2</sub>) was 400 mg/kg BB for 12 weeks that was given per oral. The study lasted 104 days, 12 days of adaptation and 90-day treatment period. Collecting Research data was done repeatedly i.e. on the first day, 45<sup>th</sup> day, and 90<sup>th</sup> day. The procedure for measuring fasting blood sugar levels using GOD PAD. This study has obtained the ethical clearance from ethical commissions of the medical faculty of UNDIP and DR. Kariadi Hospital number 76/EC/H/FK-RSDK/X/2017. Laboratory research and inspection were conducted in UGM laboratories that has KAN standard. The analysis of data test was conducted by using Repeated ANOVA test.

## RESULTS

### Effect of Banana Peel Extract on Blood Sugar Level

The mean of blood sugar level O1 for pretest group 90 gr / dl, O2 91 gr/dl, and the control group was 110 gr/dl. The 45th day of the blood sugar level increased. The averages of blood sugar level of group O1 are 93.33 gr/dl, O2 95.78mg / dl, control 128.56 gr/dl. Blood sugar level of posttest average O1 115.11 gr/dl, O2 125mg / dl and post-test 129.78 gr/dl as in table 1. The results show on the group GDP variable 1 indicates that at least two measurement times having mean values differ significantly with p-value = 0.003 <0.05. Residual data GDP group 1 has a normal data distribution so that the test results repeated ANOVA acceptable. The repeated ANOVA test result of Friedman test on GDP variable of group 2 shows that at least 2 measurement times that have mean value is significantly different with p-value = 0.001 <0.05, group 3 indicates that at least 2 measurement times that have mean value is significantly different with p-value = 0.045 <0.05. There are differences in blood sugar levels in each group and at each measurement time. Dosing of 200mg / kg bb in the group (O1) and the dose of 400mg / kg bb in group 2 (O2) had the same hypoglycemia effect.

Table 1. The mean of New Zealand White rabbit blood sugar levels (gr / dl)

No		K	O1	O2	p
1	Pre test	110.00 ± 19.19	90.78 ± 6.300	91.00 ± 18.94	0.026 <sup>1</sup>
2	45 days	128.56 ± 18.50	93.33 ± 19.391	95.78 ± 16.54	0.001 <sup>2</sup>
3	90 days(post test)	129.78 ± 25.79	115.11 ± 11.805	125.89 ± 27.67	0.013 <sup>1</sup>
		p=0.045 <sup>3</sup>	p=0.003 <sup>3</sup>	p=0.0001 <sup>3</sup>	

<sup>1</sup> p value one way anova test

<sup>2</sup> p Value kruskall wallis test

<sup>3</sup> p value repeated anova test

## DISCUSSION

Based on the research result study, HFFD diet triggers the occurrence of hyperglycemia. Hyperglycemia will cause oxidative stress that supports DM. Diabetes is a disease with oxidative stress components. Oxidative stress is characterized by an imbalance between oxidants and antioxidants in the body. The emergence of oxidative stress in DM occurs through three mechanisms, namely non-enzymatic *glycation* in proteins, polyol sorbitol pathways (aldose reductase), and glucose autooxidation. Changes in oxidative status are characterized by changes in endogenous antioxidant activity and increased the oxidative damage of biomolecules.<sup>(6),(7)</sup> Oxidative stress in DM improves glycosidation and liposidation results in plasma and protein tissues. HFFD dietary factors can cause oxidative stress in β cells, and it also occurs in DM patients.<sup>(7)</sup>

The shifting of balancing redox reactions due to changes in carbohydrate and lipid metabolism will increase ROS formation from glycation reactions and lipid oxidation is thereby decreasing antioxidant defense systems including GSH. Hyperglycemia will aggravate the formation of ROS through several mechanisms. ROS increases the formation of Tumor necrosis factor- $\alpha$  expression (TNF- $\alpha$ ) and exacerbates oxidative stress. TNF- $\alpha$  may lead to insulin resistance through decreased *auto-phosphorylation* of the insulin receptor, substrate insulin receptor transformation into *inhibitor insulin receptor tyrosine kinase activity*, decrease *insulin-sensitive glucose transporter* (GLUT-4), improves fatty acid circulation, changes the function of  $\beta$  cells, increases triglyceride levels and decreases HDL levels.<sup>(8),(9)</sup>

The oxidative stress on DM is characterized by an imbalance between oxidants and antioxidants in the body, so it causes hyperglycemia. Banana peel antioxidants are able to show the effect of hypoglycemia. The banana peel contains water, carbohydrates, fats, proteins, calcium, phosphorus, iron, vitamin B, and vitamin C. it contains significant potassium and fiber. In detail, inside the banana peel, there is a protein content (10.09%), crude fiber (18.01%), fat (5.17%); dry matter (55.59%), calcium (0.36%); phosphorus (0.10%), energy (3727 kcal / kg), glucose (14.6%), and sucrose (56%). In addition, it also contains bioactive compounds such as *pectin, tannin, saponin, and flavonoids* that function as antioxidants.<sup>(10),(11),(12),(13)</sup>

Other studies that support the success of this study are DM rats given banana peel extract significantly decreased the blood glucose, TG, *total cholesterol LDL-c* and *VLDL-c cholesterol* and arteriogenic index compared with the control group. The hyperlipidemic rats were given *Pholifenol* bananas decreased TC, TAG, *free fatty acids*, increased HDL. Healthy humans given *pholifenol* bananas decreased *Lipid peroxides*. There is a positive correlation between the activity of *antioxidant and scavenging pholifenol* banana.<sup>(14),(15)</sup> Banana antioxidant activity significantly decreases lipid peroxidation, but increasing GSH. Mature banana peels (old) have higher antioxidant activity than young ones. Administration of banana peel extract was higher than the banana peels of Ambon in decreasing cholesterol levels of rats of *Spague Dawley* (SD).<sup>(15),(16),(17),(18)</sup>

## CONCLUSION

The peel extract of *Musa Paradisiaca var. kepok* causes a hypoglycemia effect on New Zealand White rabbit with Diabetic hyperlipidemia.

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