The Effect of Giving Rice Bran to Blood Glucose at Mice which Given Alloxan

Hapsari Sulistya Kusuma[1,a)] ,JB Suparyatmo[2)] ,Bambang Suprapto[3)]

[1] *Study Program of Nutrition, University of Muhammadiyah Semarang*
[2]*Nutritional Science Post Graduate Program, Sebelas Maret University*

[a)] Corresponding author: hapsa31@yahoo.co.id

Abstract. World Health Organization predicts that Indonesia will encounter an increasing number of diabetic patients from 8.4 million in 2004 to approximately 21.3 million in 2030. The aims of this work is to investigate the effect of blood glucose following the administration of rice bran on the experimental rats treated with alloxan. This research is an experimental laboratory one with the randomized pre- and post-test research design with control group. The samples were white male Wistar rats aged seven weeks with the inclusion criteria, namely: blood glucose >142mg/dl, healthy, and energetic. They were divided into experiment and control groups. Each group had 6 rats. The total samples were 24. The t- test result shows that the difference of weekly blood glucose level of experiment groups and the one control group is statistically significant. It be concluded that the supplementation of rice bran powder amounting to 50% to the daily food intake of the diabetic rats exposed to the treatment can decrease their weekly blood glucose if compared to those that are not exposed to the same treatment.

INTRODUCTION

World Health Organization (WHO) predicts that Indonesia will encounter an increasing number of diabetic patients from 8.4 million in 2004 to approximately 21.3 million in 2030 (Perkeni, 2006). Diabetes mellitus therapy employing a good diet management is actually cheap and easy to be done, but it truly requires a severe discipline. Chen and Cheng research (2006) conducted a research in which they used diabetic rats to be treated by using a rice bran oil. The research resulted in insulin sensitivity escalation, triglycerides plasma, LDL cholesterol, and hepatic triglycerides reductions.

METHOD

This research is an experimental laboratory one with the randomized pre- and post-test research designs with control group. The Guinea pig custody and intervention were done in the Unit of Guinea pig Development, the University of Muhammadiyah Surakarta. The guinea pigs custody took 30 days started from selecting until treating periods of the guinea pigs. Laboratory tests conducted at the University of Muhammadiyah Surakarta. The samples used in this research were taken randomly from the provided population namely guinea pigs, Wistar strain males, aged 7 weeks which were being isolated in the the Unit of Guinea pig Development, University of Muhammadiyah Surakarta, in accordance with the terms of inclusion criteria. The inclusion criteria are as follows: blood glucose level of the guinea pigs ranged >142 mg/dl, and healthy and energetic guinea pigs. The number of guinea pigs used in this research were six (6) guinea pigs for each group (1 group is experimental group and 1 group is control group) so that the total numbers of the guinea pigs used in this research were 12 guinea pigs. For anticipating the possibility of a sudden death happened to the guinea pigs, each group was given one supernumerary guinea pig so that the total numbers of the guinea pigs were 14. Food supply for a guinea pig is 10% from the total guinea pig's weight. If the average weight of the guinea pig is 200 gr, then the total number of food supply need is 20gr. Rice bran which was given to the guinea pigs was 50% in the form of powder. Then, it needed 10 gr of rice bran powder given from the total 20 gr rice bran. The rice bran powder was given for substituting the standard food for guinea pigs with 50% concentration. Feeding was done by using nasogastric tube in order to make all foods being eaten well by the guinea pigs.

Table 1. Feed Composition

Foodstuff	Standard Feed AIN 93	Treatment 1
Maizena	620,69	310
Casein	140	70
Sucrose	100	50
soybean oil	40	20
fiber	50	25
mineral	35	17,5
vitamin	10	5
Choline bitrate	2,5	1,25
L-Sistine	1,8	0,9
Rice ban powder	-	499,19
Tempeh (soybean curd) powder		-
Total (g)	998,38	998,84
Total (cal)	3346,40	3045,9

Retnaningsih et al, 2001[3]

Alloxan injection was done through intra peritoneal way with the dosage 80 mg/kg from the guinea pigs' weight (Retnaningsih et al, 2001, Suarsana et al, 2008)[3,4]. The guinea pigs were kept in a good ventilated room, kept in group in a one cage (1 cage consisted of 6 guinea pigs). The room temperature was about 28-32 degree celcius, with 50±5% humidity rate. Feeding treatment was given through the nasogastric tube. The cage was being cleaned once a week. Group 1 as the control group was only given a standard meal of AIN 93 for about 21 days. Group 2 as the experimental group was given a standard meal mixed with 50% rice bran concentration for around 21 days. Blood glucose of the guinea pigs were measured on the day 0 before the alloxan injection done, day 21 after the alloxan injection meaning that the blood glucose was measured on day 0 soon as the aloxan injected and day 22 after the alloxan injected. The blood that had been taken from the blood vessel of the guinea pigs' tail ± 1 µl. the blood were then being centrifuged so that the serum is gained. In order to measure the blood glucose level, the sample and testing sheets must be prepared. The data were being analyzed statistically by using the following steps: descriptive and statistical analysis employed t test method to investigate whether there was a difference on the decrease of blood glucose happened in both experimental and control groups. The margin will be achieved is $p< 0,05$ with 80% research power and 95% trust intervention.

RESULTS

The effect of rice bran powder for the guinea pigs fed alloxan is shown in the table 2 below

Table 2. the average of the guinea pigs' blood glucose level (mg/dl)

Treatment	Pre Alloxan	Post alloxan	Week I treatment	Week II treatment	Week III treatment
Rice bran powder 50%	58,1	193,1	117,5	103,8	93
Control of the feed standard 100%	116,6	199,8	195,1	196,3	193.8

From the table 2 above, it is clearly shown that after alloxan were given to the all guinea pigs, the blood glucose level of guinea pigs increased.

It is found that the blood glucose level is gradually decreased every week. It is proven by the t-test that had been conducted on week 1, 2, and 3.

The decrease of the blood glucose level every week can be seen in the table 3 below.

Table 3. The Average Of The Decrease Of The Bllod Glocose On The 1st, 2nd, And 3rd Weeks

Trearment	N	Week 1		Week 2		Week 3	
		Mean	SD	Mean	SD	Mean	SD
Control	6	-4.7	3.3	-3.5	12.9	-6.0	13.2
Rice bran	6	-75.7	36.1	-89.3	28.3	-100.0	33.1

Based on the three aforementioned description of the blood glucose level mean presented on the table above, it can be seen that the blood glucose level is gradually decreased every week happened to the experimental group.

For investigating the blood glucose level among the control groups and each treatment, t-test then conducted as it is presented on the table 4, 5, 6.

Table 4. T Test Results On The Mean Differentiation Of Blood Glucose Level Among The Experimental Groups In Week 1

group	n	Mean	SD	F	P
Control	6	-4.6	3.2	14.69	0.000
Rice bran	6	-75.6	14.7		

After the treatment done, on the first week, the result shows that there is a significant differentiation in the mean of the decrease of the blood glucose level happened to the each experimental group statistically because the value of p is <0.001.

Table 5. T Test Results On The Mean Difefrentiation Of The Blood Glucose Level Among Experimental Group Given Treatments On The Week II

group	n	Mean	SD	F	P
Control	6	-3.5	12.8	26.51	0.000
Rice bran	6	-89.3	11.5		

After the treatment being given, on the week 2, the results show that the mean differentiation of the blood glucose level happened to the each experimental group is statistically significant because the value of p is <0.001.

Table 6. T Test Results On The Mean Difefrentiation Of The Blood Glucose Level Among Experimental Group Given Treatments On The Week III

Kelompok	N	Mean	SD	F	P
Kontrol	6	-6.0	13.1	34.65	0.000
Bekatul	6	-100.1	33.0		

On the week 3, after the treatment being given, the results show that the mean differentiation of the blood glucose level happened to the each experimental group is statistically significant because the value of p is <0.001.

Based on this study, it can be seen that 2 weeks after the alloxan treatment being given to the all guinea pig groups, the blood glucose level of those guinea pig groups increase. This result is in line with the research that had been conducted by Retnaningsih (2001) which is stated that one day after the alloxan being injected to the guinea pigs, the blood glucose level on the serum is increased and it is happened to the all guinea pig groups. This result indicates that all guinea pigs are suffering diabetes mellitus. In line with Ganung's proposition in Retananingsih (2001), "alloxan is one of substances which can obstruct the insulin secretion which then trigger the hyperglycemia" [3].

Rice bran treatment that were given for around 3 weeks generally decreases the blood glucose level around 51,8% respectively.

The result of this study is supported by Chen and Cheng research in 2006. Chen and Cheng(2006) stated that the components of *γ oryzanol and γ tocotrienol* found in rice bran can increase the insulin sensitivity in guinea pigs suffered diabetes mellitus. In other side, Madar (1983) stated that rice bran fiber only gives a slight significant effect on the glucose tolerance[5].

The data collected every week soon as the blood glucose examination done, then were being examined. Saphiro Wilk method was employed to examine the data normality test. The test result is $p > 0,05$. In other word, it can be stated that the data which were normally distributed, was then being examined by using t test method in order to investigate whether there was a decrease of blood glucose level among the guinea pigs in the control group that had already given a rice bran treatment in advance. Based on the t test on the week 1, week 2, and week 3, the result is as follows: p value $p < 0,001$, namely $p=0,000$.

The result of this study is in line with the result of Nygren and Hollmans's research in 1982. They stated that there is a differentiation in the blood glucose level namely in the guinea pigs suffering diabetes mellitus which given raw rice bran compared to those which are not being given the rice bran[6].

SUMMARY

Rice bran powder that is given to the guinea pigs is about 50% from the daily food intake can actually decrease the blood glucose level every week compared to the guinea pigs which are not being treated the same thing.

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