



## EFFECT OF JAMBLANG (*SYZYGIUM CUMINI* (L) SKEELS.) ACEH ETHANOL EXTRACT TO BLOOD SUGAR LEVELS IN RATS (*RATTUS NORVEGICUS*)

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### ABSTRACT

This study aimed to analyze the effect of ethanol extract jamblang (*Syzygium cumini* (L) Skeels) Aceh to (i) a level of sugar in blood, and (ii) the level of body weight (BW) in rats with diabetes mellitus (DM). Type of this research was experimentally using non factorial completely randomized design. This research was using 20 male rats (*Rattus norvegicus*) Wistar which divided into five groups: (i) negative control / non diabetes mellitus (NC), (ii) positive control (PC), (iii) control drug / group of non DM with treatment 200 mg / kg (TC), (iv) diabetic group with treatment 200 mg / kg (T2), and (v) diabetic group with treatment 300 mg / kg (T3). DM conditions obtained by alloxan induction with dose of 150 mg / kg were injected intraperitoneally. Sugar blood measurement was done using a glucometer, two days after alloxan induced. Rats with level of sugar blood  $\geq 200$  mg / ml otherwise have diabetes. Then, DM rats were given by ethanol extract of jamblang every other day for 28 days orally using a needle probe. Jamblang ethanol extract was made by maceration method with solvent in the form of 96% ethanol. Measurement of blood sugar levels and body weight is done every four days, and measurements are taken in the morning. The results of measurements of blood sugar levels and body weight were analyzed by one-way ANOVA through Tukey's test using SPSS 21.0 software. The results showed that the treatment of ethanol extract of jamblang with a dose of 200 mg / kg body weight had an effect on weight loss and increased blood sugar levels in rats with DM rats. But in non-DM rats treatment with a dose of 200 mg / kg body weight did not give effect on weight gain and blood sugar levels. In the treatment with a dose of 300 mg / kg body weight did not give effect to weight loss and increased blood sugar levels in rats with DM or non-DM. In general it can be concluded that the treatment of ethanol extract of jamblang can increase body weight and reduce blood sugar levels of DM patients.

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### INTRODUCTION

DM is a disease with the highest incidence rate in humans. In Indonesia, DM affects almost 9.1 million people, this number has placed Indonesia in the 5th place in the world, the most countries with DM (Restuati *et al*, 2014). Jumlah penderita DM di Indonesia akan terus meningkat selain karena tingkat hidup sehat masyarakat yang rendah, tetapi juga disebabkan pada umumnya penderita DM tidak memiliki kemampuan dalam membayar biaya pengobatan (Bosenberg and Zyl, 2008). DM patients must be regularly injected with insulin (for patients with type I diabetes) and consume hypoglycemic

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agents (for type II DM patients). The cost of both treatments is not easily reached by DM patients especially for long-term use. The presence of alternative phytochemical compounds from plants for treatment of DM patients is expected. Some plants have been reported to have such abilities as savory herbs, bay leaves and other plants (Diningrat *et al.*, 2016; Restuati and Diningrat, 2018; Diningrat and Marwani, 2018). In previous studies it was reported that most acehnese jamblang would have antidiabetic potential because it contained flavonoids (Sari *et al*, 2018). In this study the potential of Acehnese jamblang plants was explored to act as antidiabetic and hypoglycemic compounds. The test was carried out in the form of ethanol extract tested in model animals, rats (*Rattus norvegicus*).

## METHODS

**Time and Location:** This research was conducted at animal physiology laboratory Universitas Negeri Medan, the Pathology and Anatomy Laboratory Syiah Kuala University in Banda Aceh and the biology laboratory of the Ar-Raniry State Islamic University in Banda Aceh. This research was conducted in April to July 2018.

**Population and sample:** The population of this study were rats white wistar strain obtained from the rat farm of the pharmaceutical laboratory of North Sumatra University. The sample of this study consisted of twenty rats with an average age of two months and had an average weight of 150 to 250 grams.

**Ethanol extract of jamblang Aceh fruit preparation:** The procedure for making ethanol extract of Aceh jamblang fruit was carried out following the procedure developed by Diningrat *et al* (2014). The extraction method was carried out by maceration method using 96% ethanol. Samples of fresh jamblang fruit are mashed with a blender to form simplicia. Simpliciajamblang fruit was added with 96% ethanol solvent with a comparison of the amount of simplicia and ethanol, namely 100 gr: 1 L. The simplicia immersion was carried out for five days with occasional stirring. Then the simplicia immersion was filtered using filter paper and simplicia pulp was added with 96% ethanol solvent again, then soaked again for five more days and refined. The resulting extract is then concentrated using a dryer to get the ethanol extract in the form of pasta.

**Rats acclimatization:** Acclimatization of rats was carried out 7 days before treatment began. Mice were given food in the form of pellets of type C551 and drink every day at 8 am. The amount of food given is 10% of body weight. The amount of food left is measured every day.

**Alloxan preparation:**Preparation of alloxan refers the procedures performed by Prasetiawan (2015). Alloxan was weighed and dissolved with 0.9% NaCl, the alloxan given was 3%.

**Preparation and determination of dose giving jamblang Aceh fruit ethanol extract:** Determination of extract concentration was carried out by following the protocol developed by Diningrat *et al* (2016).Jamblang aceh fruit ethanol extract was administered orally to the rats with concentration 4%

**Treatment:** The treatment design in this study was carried out in five treatment groups, consisting of three control groups and two treatment groups. The treatment was given after the rats had hyperglycemic and diabetes which was about 28 days after being given alloxan (Prasetiawan, 2015)

**Table 1. The treatment design**

Notation	Treatment
NC	given food and drink
PC	given food and drink + Jamblang fruit ethanol extract (200 mg / kg bodyweight)
DC	drinking + alloxan Feed
T2	given food and drink + alloxan+ Jamblang fruit ethanol extract (200 mg / kg bodyweight)
T3	given food and drink + alloxan+ Jamblang fruit ethanol extract(300 mg / kg bodyweight)

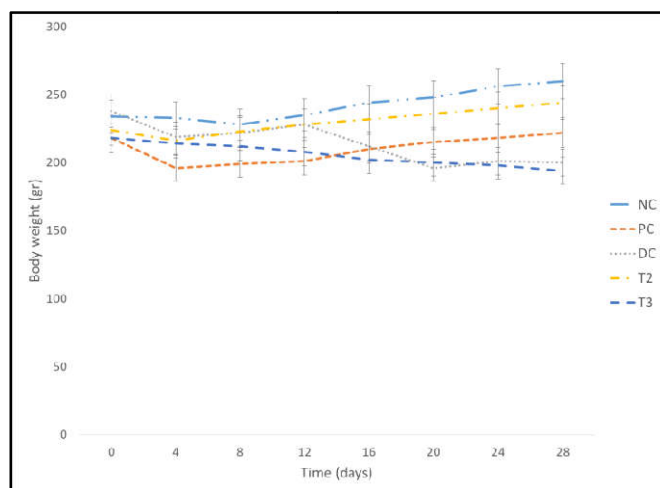
**Weight measurement:** Measurement of rat body weight was done with a digital balance, measurements were taken every 4 days.

**Measurement of blood sugar levels:**Measurement of blood sugar levels is done with a digital glucometer with the principle of glucose oxidase biosensor (Suarsana *et al*, 2010). Mice with blood sugar levels of 200 mg / L were diagnosed with diabetes. Measurements are carried out every 4 days in the morning for 28 days so total observations are 8 times(Prasetiawan, 2015).

**Techniques Data Analysis:** The design of this study used was a non factorial completely randomized. Quantitative data were analyzed using analysis of variance (ANOVA) in one direction with a significance level  $\alpha = 0.05$ . If the test results showed no significant differences / highly significant ( $P < 0.05$ ) then continued by *Least Significant Difference* (LSD) or least significant difference (LSD) to see the significance of the results obtained and comparison of each treatment. Data analysis was performed using *the Statistical Software Product and Service Solutions* (SPSS) version 21.0.

## RESULTS AND DISCUSSION

**The effect of ethanol extract of jamblang aceh fruit on rat body weight:** Based on the Analysis of Variance to the effects of a dose of ethanol extract of jamblang aceh fruit at different doses in rats with diabetes mellitus, acquired that dose ethanol extract of jamblang aceh fruit significant effect on body weight of rats. Effect of ethanol extract of jamblang aceh fruit can be seen from the graph below:

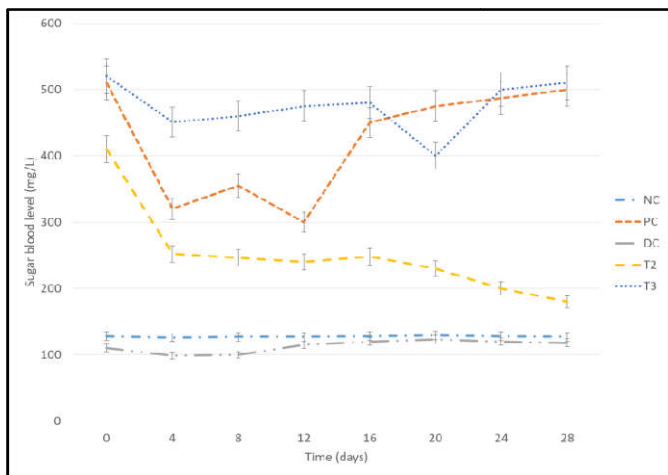


**Figure 2. Changes in rat body weight during treatment**

The trend of increasing rat body weight occurred in the NC, PC and T2 groups. In the DC and T3 treatment groups, there was a trend of weight loss. The highest weight gain trend occurred in rats with the treatment of feeding alone without alloxan treatment and the treatment of ethanol extract of jamblang. Giving alloxan causes a weight loss trend. The treatment of giving ethanol extract of jamblang fruit 200 mg / kg body weight was able to increase body weight gain after experiencing a decrease due to the influence of alloxan. The treatment of giving ethanol extract of jamblang fruit with a concentration of 300 mg / kg body weight was not able to increase body weight even more weight loss. It seems that the antidiabetic compounds contained in the jamblang fruit work

also in maintaining body weight at the right concentration (Velayutham *et al*, 2013; Diningrat *et al*, 2016). In this study the concentration of ethanol extract of jamblang fruit which can maintain the body weight of rats was at a concentration of 200 mg / kg body weight. Concentration above 200 mg / kg body weight actually decreases the trend of weight gain.

**The effect of jamblang Acehfruit ethanol extract on rat blood sugar levels:** Based on the Analysis of Variance to the effects of a dose of ethanol extract of jamblang aceh fruit at different doses in rats with diabetes mellitus, acquired that dose ethanol extract of jamblang aceh fruit on rat blood sugar level significant effect on rats. Effect of ethanol extract of jamblang aceh fruit can be seen from the graph below:



**Figure 3. Changes in rat blood sugar levels during treatment**

Alloxan feeding treatment has increased blood sugar levels in rats, all alloxan treatments caused an increase in blood sugar levels in rats. Alloxan is a compound commonly used for induction treatment increasing blood sugar levels (Lazaro. 2009; Thiruvengatasubramaniam & Jayakar, 2010; Diningrat *et al*, 2016). Ethanol extract of jamblang fruit at the right concentration can reduce blood sugar levels. In addition to the right concentration of ethanol extract, jamblang fruit must be given at the right time. At T2 treatment, the treatment of feeding 200 mg / kg body weight of ethanol extract of jamblang fruit continuously decreases the blood sugar levels of rats close to normal blood sugar levels. In T3 treatment, the treatment of 300 mg / kg body weight of ethanol extract of jamblang fruit can reduce blood sugar levels at 4 initial treatments but after that there is an increase in blood sugar levels. Even an increase in blood sugar levels overtook the beginning of Alloxan's treatment. Antioxidant compounds contained in jamblang fruit are thought to have worked to reduce rat blood sugar levels. Phytochemical compounds such as flavonoids work to increase insulin secretion, perform hyperglycemic control through regulation of glucose metabolism in hepatocytes (Velayutham *et al*, 2013; Pereira *et al*, 2011). Meanwhile saponins can prevent the increased absorption of glucose in the small intestine by deactivating enzymes that play a role in the movement of glucose (Bosenberg & Zyl, 2008; Smith & Andanlawo, 2012). The results of this study indicate that the ethanol extract of jamblang Aceh fruit is very potential as a raw material for making antidiabetic or anti-hyperglycemic.

## Conclusion

The treatment of feeding ethanol extract of jamblang aceh fruit at a concentration of 200 mg / kg body weight was able to lose

weight and reduce blood sugar levels of rats. Ethanol extract of jamblang fruit has the potential as antidiabetic and antiglycemic.

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