

## The Effect of Pepino (*Solanum Muricatum Aiton*) Extract on Blood Glucose Level in Type 2 Diabetic Rats

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### ABSTRACT

Pepino contains of flavonoid and phenol as antioxidant which can reduce blood glucose level. This research was aimed to study the effect of pepino extract on blood glucose level in type 2 diabetic rats. The study was used randomized pre-posttest control group design. The subjects of this study were 20 male *wistar* rats divided into 4 groups, they are control group, the group of pepino extract dosage 250 mg/kg, Pepino extract dosage 500 mg/kg body weight (BW), and preventive group. Rats were induced diabetes with alloxan. Pepino extract was supplied for 2 weeks. Blood glucose level was evaluated every week. Results showed that pepino extract affect blood glucose level in diabetic rats ( $p < 0.05$ ). Results of analysis showed the significant difference between control group with the groups of pepino extract dosage 250 mg/kg BW and dosage 500 mg/kg BW ( $p < 0.05$ ). Meanwhile, there was no significant difference between pepino extract dosage 250 mg/kg BW at a dose of 500 mg/kg BW ( $p > 0.05$ ). Pepino extract dosage 250 mg/kg BW was found to have the same effectiveness as 500 mg/kg BW dose to decrease blood glucose level.

**Keywords:** Diabetes mellitus, blood glucose level, pepino extract

### INTRODUCTION

According to WHO, there are four major non-communicable diseases, namely diabetes mellitus, cardiovascular disease, cancer, and chronic respiratory disease. Since 1980, approximately 108 million adults over the world have lived with diabetes mellitus, and this number has increased almost twice to 422 million cases

in 2014. The prevalence of diabetes has increased more rapidly in low and middle-income countries compared to high-income countries in the last decades including Indonesia. According to National Basic Health Research Surveys, the prevalence of diabetes has increased from 1.1% (2007) to 2.1% (2013). The highest prevalence of diabetes mellitus was found in Central Sulawesi (3.7%), and followed by Sulawesi Utara (3.6%) as well as Sulawesi Selatan (3.4%). All of these figures have increased from previous surveys (2007).<sup>[1,2]</sup>

The determinant factors for type 2 diabetes mellitus (DM) have been identified, such as food intake and social-economy. The imbalance of intake has been associated with increased risk of type 2 DM.<sup>[3]</sup> The utilization of local food as functional food may positively contribute to address DM, especially food containing high antioxidants. It has found that Pepino fruit (*Solanum muricatum Aiton*) has high antioxidant, but the utilization of this fruit is highly rare.

Studies have shown that Pepino is well known for its antitumor effects against prostate, liver, and even breast cancer via its cytotoxic activity.<sup>[4]</sup> This fruit contained several phenolic acids and flavonoids and had been shown to controlled glycemic increase, oxidative stress, and inflammation. The same study showed that Pepino extract could attenuate the development of diabetes through antioxidants, anti-inflammatory and antiglycative effects.<sup>[5]</sup> This research was aimed to study the effect of Pepino extract on blood glucose level in type 2 diabetic

rats. Pepino extract combined with alloxan was used to induce type 2 DM in rats.

## MATERIALS AND METHODS

### Intervention material

Fresh purple Pepino (*Solanum muricatum Aiton*) was obtained from Malino, Sulawesi Selatan. Pepino was cleaned and thinly sliced before being dried in a vacuum oven at 55°C. After drying, they were blended and kept at the room temperature before extraction. Sample mixed with ethanol 96% for two days in a comparison Pepino and ethanol 1:5. After filtration through Whatman no. 1 filter paper, the extract was then rotary evaporated at 65°C to dryness. The extract was stored in a desiccator for further use.

### Animals and Diets

Population in this research are white rats in species of male *Rattus Novergicus strain Wister* with 180-250 g body weight. Rats were adapted and fed with a normal diet. To induce type 2 diabetes, rats were injected once intraperitoneally with alloxan (140 mg/kg BW). The blood glucose level was monitored on day three after alloxan injection using a blood glucose meter. Rats with blood glucose meter  $\geq 200$  mg/dL were used for this study. After diabetes was induced, rats were divided into four groups (5 rats per group). Group I was a negative control: diabetic rats with the normal diet. Group II was the intervention group: diabetic rats with 250 mg/kg BW Pepino extract. Group III was the intervention group: diabetic rats with 500 mg/kg BW Pepino extract. Group IV was a preventive

group: rats were fed 250 mg/kg BW Pepino extract for two weeks, then induced by alloxan, and their blood glucose level was monitored.

### Experimental Design

The study was a quasi-experimental design and used Pepino extract for two weeks at two different doses (250 mg/kg BW and 500 mg/kg BW). Body weight measured by digital scales every five days. Blood samples obtained from the tail vein to monitored blood glucose level with a Blood Glucose Test Meter. Blood glucose measurements carried out on the 1st, 8th, and 15th day after diabetes-induced. Results expressed as mean $\pm$ SEM. Statistical analysis used one-way analysis of variance and post-hoc LSD.

## RESULTS

Pepino extract was obtained according to the method described above and administrated to rats at two different doses to determine the effects on blood glucose level. In order to evaluate the antidiabetic effect of Pepino, diabetes was induced by i.p. Injection of alloxan. Changes in the blood glucose levels after oral administration of Pepino extract were monitored for two weeks period, and the results were given in Table 1. The effect of Pepino extract was found significant to reduce the blood glucose level of diabetic rats at two different doses ( $p < 0.05$ ). Meanwhile, the blood glucose level of the preventive group increased on day 14, which was at that time, rats induced diabetes by alloxan.

Table 1. Effect of pepino extract on blood glucose level of alloxan-induced diabetic rats

Groups	Dose mg/kg	Blood Glucose Level (mg/dL) $\pm$ S.D		
		D-0	D-7	D-14
Control	-	334,20 $\pm$ 122,33	258,60 $\pm$ 23,48	284,40 $\pm$ 37,80
Pepino Extract	250	295,40 $\pm$ 123,95	147,80 $\pm$ 26,21	106,80 $\pm$ 22,01*
	500	317,40 $\pm$ 117,28	116,80 $\pm$ 12,21	89,60 $\pm$ 16,86*
Preventive	250	77,80 $\pm$ 13,81	82,40 $\pm$ 15,96	211,20 $\pm$ 85,44

Number of animals in each group=5, \*  $p < 0.05$ , results compared to group control, S.D: Standard of Deviation

## DISCUSSION

In our experiments, the decrease was observed on the blood glucose levels of alloxan-induced diabetic rats. Pepino is rich in vitamin C, phenolic, flavonoid, and tannin. [6] Flavonoids are known for its

antidiabetic activities that are capable of regenerating cells on Langerhans. [7] This might be the reason for the effectiveness of Pepino extract in the alloxan-induced experiments.

In the literature survey, Hsu et al. [5] examined the protective effects of Pepino aqueous extract (PAE) in diabetic mice for five weeks. They found that PAE treatments at 2 and 4% significantly lowered plasma glucose level, additionally at 4% elevated plasma insulin level at week five significantly. They also revealed that PAE treatments decreased reactive oxygen species and reduced oxidised glutathione level. Data obtained from this study confirm our results.

Flavonoids, a group of hydroxylated phenolic substances known to be potent free radical scavengers, have attracted tremendous interest as possible therapeutics against free radical-mediated diseases, particularly diabetes mellitus. The protective effects of flavonoids in biological systems are ascribed to their capacity to transfer electrons free radical, activate antioxidant enzymes, and inhibit oxidases [8]

In another study, Sudha et al. [9] showed the content of total phenols and flavonoids in ethyl acetate extract of raw and ripe Pepino fruit. In all methods, extracts of both raw and ripe fruits showed good scavenging activity. A substantial amount of phenol and flavonoids was noticed.

Another study by Mahato et al. [6] evaluated the effects of fruit juice of Pepino on blood glucose levels during a four h period. In oral glucose tolerance test (OGTT), the effect of Pepino fruit juice was not promising (4.3-9.3%) after loading glucose, but the effect of tolbutamide was found to be highly effective (22.7-41.3%). On the other hand, antidiabetic effect of Pepino on blood glucose levels of streptozotocin-induced diabetic rats showed that Pepino fruit at 500 mg/kg was found more potent than the reference drug tolbutamide. The antidiabetic effect of Pepino fruit was promising (2.2-27.1%).

## CONCLUSION

In conclusion, Pepino extract, in both doses (250 and 500 mg/kg BW), has a significant effect on the reduction of blood glucose level in alloxan-induced diabetic rats. This fruit can be an alternative food for diabetic patients in order to prevent the elevation of blood glucose. A further study regarding the specific antioxidant that may affect directly to the pancreatic cells can be done.

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How to cite this article: Chaerunnisa NN, Suarsi I, Dachlan DM et.al. The effect of pepino (*solanum muricatum aiton*) extract on blood glucose level in type 2 diabetic rats. *International Journal of Science & Healthcare Research*. 2018; 3(4): 283-285.

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