Effect of Leaf and Fruit Extract of Fig Tree (Ficus Carica) on Glucose Level of Blood

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Abstract: Ficus carica (fig tree) leaf and fruit has long been observed to significantly affect blood glucose level. Fruit and leaves are known to contain polyphenol compound that plays a role in the glucose level of blood. However, the comparative study of these two extracts is not so much been explored. We investigate the effect of the fruit and leaf of a fig tree on the glucose level of blood. The method used in this experiment is using a completely randomized design (CRD) which consisted of 3 treatments, namely control (aquadest), fig leaf extract, and fig fruit extract. The extract is given orally for 14 days straight to a mouse (Mus musculus) with a dosage equal to 300 mg/kgW/day. These studies show that the blood glucose level of a mouse is lowered to 1,31% for a fig leaf and 1,96% for a fig fruit from a normal level. It can be concluded that a fig tree's leaf and fruit extract can increase the blood glucose level.

1 INTRODUCTION

Blood glucose in the body works as fuel for metabolic processes and it also functions mainly as a source of energy for the brain. It is a sugar in the blood that is formed from carbohydrates in food and stored as glycogen in the liver and skeletal muscles (Joyce, 2006). Blood glucose level can also act as a health indicator of certain diseases which was previously used for whole blood. Hemoglobin holds the most glucose in the body (Subiyono, 2016). Any disorder that affects blood glucose levels is considered a metabolic disease. One of the natural compounds that have an effect on the glucose level of blood is figs fruit and leaf. It is considered this extract can affect the glucose level in the blood (El-Shobaki et al, 2010).

The fig plant (Ficus carica Linn.) has long been known as a health remedy for all kinds of diseases (Imran et al., 2011). Leaf and fig fruit extracts are classified as alternative medicine-containing compounds such as flavonoids, tannins, and terpenoids known to have antibacterial and antiviral properties potential (Nirwana et al., 2018). While figs are often used as a source of food and medicine (Zhang et al., 2018) and have the highest polyphenol concentration, which is 1.090-1.110 mg/100 g of fresh fruit, among others. foods and beverages that are commonly consumed (Vinson, 1999).

Fig Fruit extract contains all sorts of compounds like sugar, organic acid, carotenoid, phenolic compound, and antioxidant activity (Vebelic & Mikulic-Petkovsek, 2016). According to Trad et al (2014), the most abundant chemical in fig fruit respectively is glucose, citric acid, and anthocyanin group. The other nutritious compounds in fig fruit are fiber, vitamin A, vitamin C, calcium, magnesium, and potassium (Nugraha & Mulyani, 2020).

The leaf of a fig tree that is considered a medicinal product often contains polyphenols in huge deposits and a little to no amount of furanocoumarin (Takahashi et al, 2017). The leaf also has antioxidant activity and polyphenol compounds (Horozić et al, 2021). The leaf has the least amount of polyphenols compared to the fruit while flavonoid is detected more in the leaf than in

the fruit (El-Shobaki et al, 2010). All of these compounds above it shown to have benefits in health, especially in maintaining the glucose level of blood Our study aims to determine the effect of fig leaves and fruit on blood glucose levels.

2 METHODS

The materials used were white mice (Mus musculus), fig leaf extract, fig fruit extract, and aquadest. The tools used are syringes, sonde, test tubes, test tube racks, aluminum foil, cotton, Easy Touch glucose measuring instruments, digital scales.

This research is an experimental study using Completely Randomized Design (CRD). The treatment group was divided into 3 test groups, each consisting of 4 mice. Measurement of blood glucose levels was carried out after giving treatment according to the test group. This research was conducted at the Integrated Laboratory of the State Islamic University of Sunan Ampel Surabaya. It was conducted in June-July 2022.

Mice were acclimatized for 7 days in order to adapt to the new environment. Feeding is done every day and cleaning of cages and changing of husks is done every 3-4 days. Mice were given treatment according to the test group after the acclimatization stage. The treatment was given orally at a dose of 300mg/kgBW/day using a probe and was carried out for 14 consecutive days.

First, the weight of the mice was weighed using a digital scale, then the blood from the heart was taken with a syringe. The blood that has been taken is dripped on the Easy Touch glucose meter. The test strip is inserted into the Easy Touch and will automatically turn on when the test strip is inserted and will turn off when the test strip is unplugged. When Easy Touch is on, the numbers will appear on the monitor. This figure is the blood glucose level of mice in mg/dl units. One by one the mice were checked in this way so that all mice were known for their glucose levels. The data obtained were analyzed descriptively by comparing the difference between the decrease and increase in blood glucose levels of mice.

3 RESULTS

The results of observations on the glucose levels of mice with control treatment (aquades), fig leaf extract and fig fruit extract, are presented in the following table.

Table 1. Glucose level of mice after treatment for 14 days

	Glucose level of mice		
	Control (Aquades)	Fig Leaf Extract	Fig Fruit Extract
	61 g/dl	28 g/dl	39 g/dl
	22 g/dl	98 g/dl	141 g/dl
		69 g/dl	30 g/dl
			73 g/dl
Mean	41,5 g/dl	65 g/dl	70,75 g/dl

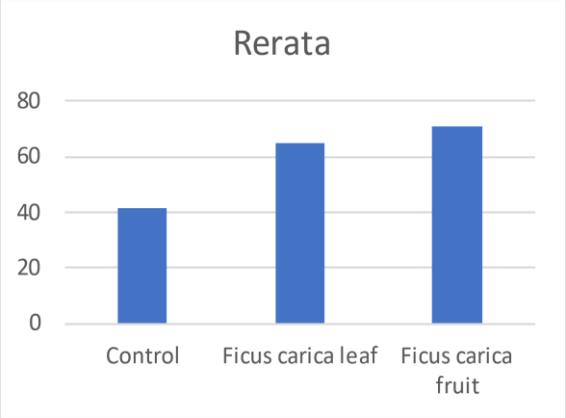

Figure 1. Histogram comparison between control groups, fig leaves, and fig fruit

4 DISCUSSIONS

The results of measuring glucose levels based on table 1. indicate that there is an increase in glucose levels after the administration of fig leaf extract and fig fruit when compared to the administration of distilled water as a control. The measurement results in table 1. show that the highest glucose levels in mice after 14 days of treatment were found in the administration of fig fruit extract, which was 141 g/dl. The smallest mice blood glucose levels were found in control treatment by giving aquades, is about 22 g/dl. The increase in glucose levels in mice showed that the administration of fig leaf and fruit extract at a dose

of 300 mg/kg BW for 14 days of treatment was able to affect glucose levels in mice compared to the control treatment.

The mice that were given the extract of a fig fruit are reported to have an increase in glucose level of blood from a hypoglycemic to a normal level. According to research by Nugrahani (2012), normal glucose levels in mice ranged from 62.8-176 mg/dl. Thus the increase to 70,75mg/dl is still within the normal range. Atkinson et al (2019) say that the increase was due to the presence of abscisic acid (ABA) in figs. ABA is one of the hormones involved in plant growth and also in the process of abscission, seed dormancy, and response to stress (Fedoroff, 2002., Finkelstein, 2008., Yin et al, 2009). In the treatment of fig leaf extract, it was seen that the average treatment increased. This is because ABA can increase glucose homeostasis and reduce inflammation by activating the lanthionine synthase C-like 2 (LANCL2) enzyme (Atkinson et al, 2019). ABA hormone is known to be present in leaf mesophilic tissue and is also present in almost all plant tissues and is released when the tissue is stressed (Zhang et al, 2021). The increase in blood sugar in mice to be within the normal threshold is one of the effects of the extract's active compounds that affect homeostasis.

In a 2007 study, it was reported that dietary ABA improves glucose tolerance and inflammation in mice that is associated with obesity and it is strongly suspected that this hormone affects the LANCL2 receptor which affects insulin, opening up the possibility of its wider effect on human physiology (Zocchi, 2017). A previous study conducted to determine the effect of fig leaf extract on blood glucose levels said that fig leaf extract contains ethyl acetate which is known to stimulate insulin release in the pancreas which can ultimately lower blood sugar levels and stabilize the body (Stephen et al, 2017). From the research we did, the measured blood glucose was still within normal limits. It can be seen in Figure 2. that fig leaf extract shows an increase in glucose levels to normal limits along with fig fruit extract although it can be seen that fig leaf extract has a weaker effect than fig extract. In the research of El-Shobaki et al (2010), it was seen that the most active compounds contained in figs. In leaves, it is known that the active compounds that have an influence on blood sugar are polyphenols and flavonoids (El-Shobaki et al, 2010). It can be said that the extract of fig leaf and fruit can stabilize the glucose level of the blood.

The mice that were given the extract of fig tree leaf also showed higher blood glucose levels compared to the control group. A similar study conducted by El-Shobaki et al (2010) shows a stabilize glucose level of blood in mice that were given the extract of a fig leaf. El-Shobaki et al (2010) suggest polyphenol and flavonoid is one of a reason that leaves extract to have the property to affect glucose level. Flavonoid is reported to modulate glucose and vitamin C transport making it one of a compound that can affect the glucose level of blood (Song et al, 2002). One of the compounds found in fig leaf is ferulic acid (El-Shobaki et al, 2010). It is known that ferulic acid has a property to affect the glucose level, especially in diabetes induces mice (Ohnishi et al, 2004).

One of the data that were noticeable is that fig fruit extract has a higher glucose level than fig leaves. One of the reasons is the high fiber content that the leaf has. Fiber is digested more slowly thus making nutrition absorption slower (Milton & Demment, 1988). It might be one of the reasons why but we suggest a further study of this effect whether or not it is significant enough to consider as a difference.

5 CONCLUSIONS

Glucose levels of blood increased in each treatment except the control group. The average glucose level of mice with fig leaf treatment decreased by 1.31%. Meanwhile, the average glucose level of mice in the fig treatment decreased by 1.96%.

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