

Original Research Article

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Anti-diabetic Effects of Basil Extract (*Ocimum basilicum*) towards Hyperglycemia in Gestational Diabetes Mellitus

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ABSTRACT

Gestational Diabetes Mellitus is a disorder of carbohydrate tolerance that occurs or firstly known during pregnancy. Basil (*Ocimum Basilicum*) was reported as an herbal plant that contains active substances as antidiabetic drugs. This study aims at the antidiabetic effect of basil extract (*ocimum basilicum*) towards hyperglycemia in gestational diabetes mellitus. The research sample was carried out on 24 pregnant rats that induced streptozotisin 40 mg / kg BW. Samples were divided into 4 groups: negative control, positive control induced by streptozotisin, and 2 treatment groups induced by streptozotisin and given basil extract with doses of 100 mg / kg BW and 200 mg / kg BW. Examination of blood glucose using a blood glucometer. From the results of this study, p value < 0,05 which means it was concluded that there was an effect of basil extract on the decrease in blood glucose.

Keywords

Basil, Gestational Diabetes Mellitus, Hyperglycemia

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Introduction

Gestational Diabetes Mellitus is a disorder of carbohydrate tolerance that occurs or firstly known during pregnancy. In 2017 the IDF estimates, gestational diabetes mellitus can affect around 14% of pregnancies worldwide which represent around 18 million births

annually. During pregnancy, females undergoes changes in metabolism to meet the energy needs of the fetus.

Hyperglycemia occurs because pancreatic β cells can not compensate for an increase in blood glucose during pregnancy (Salzer *et al.*, 2014).

Pancreatic β cell dysfunction and insulin resistance are the main contributions of the pathophysiology of gestational diabetes mellitus (Barbour LA, 2007; Colomiere M, 2010).

Gestational diabetes mellitus can increase the risk of females and baby, including preeclampsia, preterm, cesarean section, macrosomia, shoulder dystocia and others (Wojcik Marzena, 2016).

Gestational diabetes mellitus can also increase the risk of T2DM after giving birth to the mother (Hunt Katharine F, 2014).

The role of oral hypoglycaemic agents (OHAs) in gestational diabetes is still controversial. According to the USA Food and Drug Administration (FDA) stated that, it does not recommend the used of OHAs during pregnancy (Hunt Katharine F, 2014).

O.basilicum extract was stated as an herbal plant that contains antidiabetic active substances, can reduce blood glucose, and is hepatoprotective so that it is useful for diabetics as an alternative treatment (El-Beshbishy, 2012; Yacout, 2012; Umar *et al.*, 2012).

Basil has a complex chemical content consisting of glycosides, amino acids, tannins, phenolic compounds, steroids, triterpenoids, terpenoids, sterols, saponins, flavones and flavonoids (Bilal A *et al.*, 2012).

Basil also has the effect of Anti-Oxidative stress, Anti-inflammatory effect, Antibacterial activity, Antioxidant capacity (Miraj Sepideh, *et al.*, 2016).

The aim of this study was to look at the antidiabetic effect on gestational diabetes mellitus hyperglycemia.

Materials and Methods

Animal

Sample 24 Female white rats (*Rattus norvegicus* L) with a weight of 180-250 grams from the animal laboratory at the Faculty of Pharmacy, Andalas University.

The treatment of experimental animals has received ethical approval from the Research Ethics Committee of the Andalas University Medical School. After 1 week, it was estimated that female rats were mated with male rats (2: 1).

Females declared pregnant through vaginal smears. The sample was divided into 4 groups: the negative control group was pregnant without treatment, the positive control group was gestational diabetes mellitus, the other 2 groups were gestational diabetes mellitus treated with basil extract 100 mg / kg and 200 mg / kg BW for 14 days.

Gestational diabetes mellitus induction

Experimental animals were induced by 2% streptozotocin (STZ) (Bioworld, USA) 40 mg / kg single dose subcutaneously on the first day after being declared pregnant.

Blood glucose was measured 72 hours after administration of STZ with blood glucose levels of ≥ 200 mg / dl - ≤ 300 mg / dl (Aziz Abdul, *et al.*, 2016; Wang Yuwei, *et al.*, 2014).

Preparation of crude extract

Fresh basil samples collected as much as 3.5 kg. Dried by aerating without direct sunlight for 15 days. Dried basil grinder into powder.

The powder was soaked with 96% ethanol (1:10) for 3 days in a closed vessel. The

maserate was separated then the filtering results were thickened with a rotary evaporator at a temperature of around 630C to obtain a thick extract of 120 gr

Phytochemical test of basil extract (Harborne, 1996)

Determination of flavonoids content

As much as 40 mg of extract was added to 100 mL of hot water, boil for 5 minutes, then filtered. 5 mL filtrate was added with 0.05 mg Mg powder and 1 mL concentrated HCl, then shaken vigorously. A positive test is indicated by the formation of red, yellow or orange.

Determination of phenolics content

As much as 40 mg of extract was added 10 drops of FeCl₃ 1%. The extract signifies positively containing phenolic compounds if it produces purple, blue or jet black color.

Determination of alkaloids content

As much as 40 mg of extract was added 2 mL of chloroform and 2 mL of ammonia then filtered. The filtrate is added 3 to 5 drops of concentrated H₂SO₄ then shaken to form two layers.

The acid fraction is separated, then Mayer reagents are added 4-5 drops. If a precipitate forms, it indicates that the sample contains an alkaloid, with the Mayer reagent giving a white precipitate.

Determination of saponins content

As much as 40 mg of extract was added 10 mL of water while being shaken for 1 minute, then added 2 drops of HCl 1 N. If the foam formed remained stable \pm 7 minutes, then the positive extract contained saponins.

Determination of steroids and triterpenoids Content

As much as 40 mg extract added 10 drops of glacial CH₃COOH and 2 drops of H₂SO₄. The solution is shaken slowly and left for several minutes. Steroids give blue or green, while triterpenoids give red or purple.

Statistical Analysis

Data were analyzed using the One Way ANOVA test with a p value <0.05.

Results and Discussion

Phytochemical test results from basil ethanol extract (table 1). In this research, basil extract contents were tested which contained bioactive compounds such as flavonoids, phenolics (tannins), saponins, terpenoids, and steroids.

This was in line with research by Mboji (2014) and Dev et al (2011) which states that basil extract contains carbohydrates, glycosides, resins, saponins, tannins, terpenoids, steroids and various other phytochemicals.

Table.1 Phytochemicals of Basil Extract

Test Parameters	Etanol Extract
Alkaloid	-
Flavonoid	+
Fenolik	+
Saponin	+
Steroid	+
Triterpenoid	+

From the results of statistical tests, the average blood glucose level decreased in the basil extract group 100 mg / kg and 200 mg / kg body weight compared with the positive control group (table 2) with a p value = 0,000.

It was because basil extract contains typical bioactive compounds that could improve dglucose homeostasis through inhibition of digestion and absorption of gastrointestinal carbohydrates, imitation of insulin and insulin sensitivity properties, without the risk of toxicity. Basil extract contains flavonoids which could provided inhibitory effects on the α -glucosidase enzyme through hydroxylation bonds and strong inhibitor compounds towards the α -amylase enzyme that functions for the breakdown of carbohydrates.

The inhibitory power of this enzyme causes the process of breaking down and absorption of carbohydrates will be disrupted, so that blood sugar levels could be reduced (Ridwan *et al.*, 2012; Taufiqrohman, 2015).

A study by El-Beshbishy et al stated that the extract of *Ocimum basilicum* could inhibit the enzymes of α -glucosidase and α -amylase with minimum side effects. It was reported that dietary inhibitors α -glucosidase and α -amylase can modulate decreased glucose absorption in hyperglycemia (El-Beshbishy *et al.*, 2012).

A similar research study was also carried out by Ezeani Chinelo et al (2017). in alloxan-induced diabetic rats showed that 100-400 mg / kg of *Ocimum basilicum* (OB) extract can significantly reduce fasting blood glucose levels, increase oral glucose tolerance, and increase liver glycogen reserves through inhibition of α -glucosidase and α -amylase resulting in antihyperglycemic effect.

Table.2 Blood Glucose Levels

Subject Group	Day 14 of Glucose Levels	P Value
Negative control	97,17 mg/dl \pm 4,45	0,000
Positive Control	266 mg/dl \pm 16,09	
Extract100 mg/kg	144,33 mg/dl \pm 36,21	
Extract 200 mg/kg	112,83 mg/dl \pm 10,53	

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