

Antidiabetic Activity of *Ipomoea batatas* L. Leaves Extract In Streptozotocin-Induced Diabetic Mice

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Abstract: Diabetes mellitus (DM) is caused by the deficiency of insulin production that functions in the utilization of glucose as the source of energy and fat synthesis so that the lack of insulin hormone will increase the blood glucose level. Traditionally, *Ipomoea batatas* L. leaves have been used for the treatment of diabetes, cancer, as antioxidant, hyperlipidemic, by natives in different regions and also to cure dengue fever. The objectives of this study were to analyze antidiabetic activity of ethylacetate extract in streptozotocin-induced mice. This study consisted of plant material procurement and extract preparation, phytochemical screening, mice blood glucose level examination, and data analysis. Analysis of their antidiabetic activity was started by measuring glucose tolerance to identify the extract of the highest activity at varied dosages (100, 200, and 300 mg/kg bw) of this extract was examined on the streptozotocin-induced mice. At the fifteenth day of treatment, all extracts at dosages of 100, 200, and 300 mg/kg bw exerted similar effects to those of metformin, except 0.5% CMC. Antidiabetic effect exerted by EEA of *Ipomoea batatas* L. 300 mg/kg bw was significantly different from that produced by EAE 100 mg/kg bw ($\alpha = 0.05$).

Keywords : *Ipomoea batatas* L. leaf, streptozotocin, diabetes mellitus.

1. Introduction

The diversity of medicinal plants in Indonesia is one of the chances in development potential of Indonesia in the globalization era^[1,2]. The use of medicinal plants in the community is increasing in several decades^[3,4,5]. Indonesia has thousands of islands with various plants in it and the manners of community using plants as treatment for every disease traditionally^[1,2].

Diabetes mellitus (DM) is a heterogeneous syndrome that all of the symptoms are characterized by increased blood sugar level that caused relative or absolute insulin activity. DM is divided by the need for insulin, i.e.: insulin dependent diabetes mellitus (IDDM), called Type 1, and non insulin dependent diabetes mellitus (NIDDM), called Type 2. DM is a dangerous degenerative disease, even considered as a high risk disease because it can cause death^[6].

Ipomoea batatas L. Traditionally used to decrease level of blood glucose, anticancer, antioxidant, and can treat dengue fever. Approximately 100 gm of *Ipomoea batatas* L. boiled with 1 L of water until 500 mL and drink the boiled water. *Ipomoea batatas* L. also contains proteins, carbohydrates, caroten, fiber, flavonoids, vitamin (B1, B2, B6 and C) and minerals^[7].

2. Material and methods

2.1 Plant and chemicals material

The materials used in this study were *Ipomoea batatas* L. Leaves were taken from Pancurbatu region, North Sumatera, Indonesia. The chemicals used unless otherwise stated are pro-analysis grade, i.e., α -naphthol, STZ (streptozotocin), ammonium hydroxide, acetic acid anhydride, concentrated acetic acid, concentrated hydrochloric acid, concentrated nitric acid, concentrated sulfuric acid, benzene, iron (III) chloride, bismuth (III) nitrate, CMC Na, chloroform, ethanol, ether, ethylacetate, n-hexane, iodine, isopropanol, potassium iodide, methanol, sodium hydroxide, sodium sulfate anhydrous, petroleum ether, mercury (II) chloride, magnesium powder, powder zinkum, lead (II) acetate and toluene, technical ethanol and distilled water^[2,8].

2.2 Preparation of extract

The air-dried and powdered leaves of *Ipomoea batatas* L. (1 kg) were repeatedly extracted by cold maceration with n-hexane (3x3 d, 7.5 L). The powder were dried in the air and extracted with ethylacetate (3x3 d, 7.5 L at room temperature on a shake. The filtrate was collected, and then evaporated under reduced pressure to give a viscous extract and then freeze dried to give a dried extract^[5,9].

2.3 Phytochemical screening

Determining the phytochemical screening carried out on ethylacetate extracts^[8].

2.4 Antidiabetic Assay

2.4.1 Animal Preparation

The animals used in this study are male mice weighing 20-35 grams. Before the experiment, mice were maintained for 2 weeks in a good cage to match the environment, i.e., the reception of light, 12 hours dark and 12 hours light.

2.4.2 Preparation of Extract Suspension and STZ Solution

Suspension of extract was prepared by using 0.5 % CMC-Na with certain concentration. Solution of STZ was prepared by dissolving STZ in aquabidest.

2.4.3 Preparation of STZ Induced Diabetic Mice

The mice were induced with STZ solution 55 mg/kg intra-peritoneal (ip). The blood glucose level (BGL) of mice was measured on the third day. On the third day, mice that have BGL higher than 200 mg/dl were separated and used as test animals. Animals with BGL lower than 200 mg/dl, were induced back with STZ. If on the third day the BGL of the mice has been higher than 200 mg/dl, the animal is ready to be tested.

Study of the antidiabetic effect of ethylacetate extract of *Ipomoea batatas* L. leaves was conducted by using STZ induced diabetic mice by single dose of ethylacetate extract. Mice were divided into 5 groups and each group consisting of 5 mice, they were:

Group I : Diabetes mice were given suspension of 0.5 % CMC, dose 1 % of body weight (BW)

Group II : Diabetic mice were given suspension of Metformin® with dose 65 mg/kg BW

Group III, IV and V : Diabetic mice were given suspension of ethylacetate extract of *Ipomoea batatas* L. Leaves with dose 100, 200 and 300 mg/kg BW.

Suspension of test material (ethylacetate extract) was administered for 5 consecutive days orally and the BGL of mice were measured on the 1st, 3rd, 5rd, 7 rd, 9 rd, 11st, 13rd and 15rd days after administration of the test material.

2.5 Statistical analysis

All data were analyzed using regression using SPSS 20.

3. Results and Discussion

The results of phytochemical screening in ethylacetate is presented in Table 1. As can be seen in Table 1, it is shown that the classification of phytochemical compounds contained in *Ipomoea batatas* L. Ethylacetate extract consisted of flavonoids, saponins, glycosides and tannins.

Table 1: The result of phytochemical screening

No	Screening	EEP
1	Alkaloids	-
2	Flavonoids	+
3	Glycosides	+
4	Saponins	+
5	Antrakuinon glycoside	-
6	Tannins	+
7	Triterpenoids/ steroids	-

Antidiabetic effect of ethylacetate extract of *Ipomoea batatas* L. Leaves with dose 100, 200 and 300 mg/kg BW was shown in Figure 1

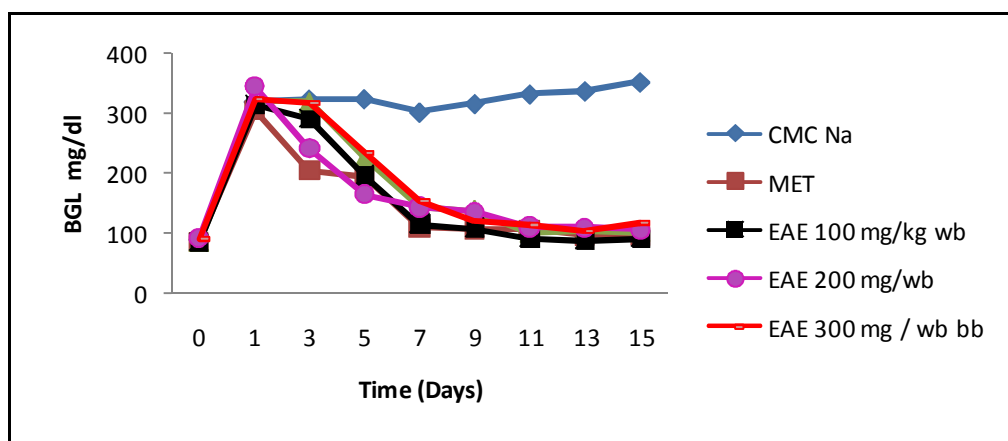


Figure 1. Effect of various treatment to the blood glucose level in STZ induced diabetic mice

Streptozotocin has been shown to cause direct irreversible damage to β -cells of pancreatic islet of Langerhans, resulting in degranulation and loss of insulin secretion. Clarification of the regenerating potential in experimentally-induced diabetic animals would be of interest as an alternative therapy for diabetes^[10].

A preliminary phytochemical analysis of the ethylacetate extract of *Ipomoea batatas* L. Leaves were shown flavonoids, glycosides and saponins. Flavonoids, their glycosides and saponins have been found to be responsible for blood glucose lowering activity through increased insulin secretion, as evidenced in our experiment by STZ-induced diabetic rats, which is capable of modulating pancreatic secretion^[11, 12].

Conflict of interest statement

We declare that we have no conflict of interest.

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