

Effects of Ethanolic Leaf Extract of *Eucalyptus Camaldulensis* on Oral Glucose Tolerance Test in Type-2 Model Diabetic Rats

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Abstract – This study was done to study the anti-hyperglycemic activity of the ethanolic extract of *Eucalyptus camaldulensis* leaves on oral glucose tolerance test (OGTT) on albino rats. The administration of the ethanolic extract at a dose of 500 mg/kg of body weight showed a highly significant reduction on blood glucose when compared with control ($P < 0.001$).

Index Terms – *Eucalyptus camaldulensis* Anti-hyperglycemic activity, Oral Glucose Tolerance Test, Ethanolic Extracts.

1. INTRODUCTION

Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi and herbivorous mammals. At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total [8].

Chemical compounds in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs, thus herbal medicines do not differ greatly from conventional drugs in terms of how they work.

This enables herbal medicines to be as effective as conventional medicines, but also gives them the same potential to cause harmful side effects [8].

More than 400 plant species having hypoglycemic activity have been available in literature, however, searching for new antidiabetic drugs from natural plants is still attractive because they contain substances which demonstrate alternative and safe effects on diabetes mellitus.

Most of plants contain glycosides, alkaloids, terpenoids, flavonoids, carotenoids, etc., that are frequently implicated as having antidiabetic effect. [4]. The main task of this study is to spot light on the antihyperglycemic effects of the very important

medicinal tropical plant which is known as (*Eucalyptus camaldulensis* Dehnh).

The River Red Gum (*Eucalyptus camaldulensis*) is a tree of the genus Eucalyptus, it is one of around 800 in the genus and it is a plantation species in many parts of the world, but it is native to Australia, where it is widespread, especially beside inland water courses [11].

Eucalyptus leaf is used for infections, fever and upset stomach. The leaf is also used for treating respiratory tract infections, whooping cough, asthma, pulmonary tuberculosis, osteoarthritis, joint pain (rheumatism), acne, wounds, poorly healing ulcers, burns, bacterial dysentery, ringworms, liver and gallbladder problems, loss of appetite and cancer [3].

2. RELATED WORKS

There are many herbs with strong anti-diabetic properties. Herbal treatments for diabetes have been used in patients with insulin dependent and non-insulin dependent diabetes, diabetic retinopathy, diabetic neuropathy etc.

The families of plants with the most potent hypoglycaemic effects include Leguminosae, Lamiaceae, Liliaceae, Cucurbitaceae, Asteraceae, Moraceae, Rosaceae, Euphorbiaceae and Araliaceae. The most commonly studied species are: *Opuntia streptacantha*, *Trigonella foenum graecum*, *Momordica charantia*, *Ficus bengalensis*, *Polygala senega* and *Gymnema sylvestre*. In the experiments, oral glucose tolerance test, streptozotocin and alloxan-induced diabetic mouse or rats were most commonly used model for the screening of antidiabetic drugs [7]. Numerous mechanisms of actions have been proposed for plant extracts. Some hypothesis relates to their effects on the activity of pancreatic beta cells, increase in the inhibitory effect against insulinase enzyme, increase of the insulin sensitivity or the insulin-like activity of the plant extracts.

Other mechanisms may also be involved such as increase of peripheral utilization of glucose, increase of synthesis of hepatic glycogen or decrease of glycogenolysis, inhibition of intestinal glucose absorption, reduction of glycaemic index of carbohydrates and reduction of the effect of glutathione [7].

3. PROPOSED SYSTEM

3.1. Plant material collection and Authentication

The leaves of *Eucalyptus camaldulensis* plant were collected during August 2013, from Forest Research Center, they were authenticated by Prof. Mohammed El-mokhtar and prof. Dawoud H. Dawoud, Agricultural Research Corporation (ARC), Federal Ministry of Agricultural and Irrigation, Khartoum, Sudan.

The freshly collected leaves were cleared from any foreign materials and dried in a shade then powdered in a suitable powder form.

3.2. Animals used in screening of hypoglycemic activity

Albino rats (200- 230g) of both sexes were used. Animals were supplied by Medicinal and Aromatic Research Institute (MAPRI), National Center of Research (NCR), Ministry Of Science and Technology (MOST), Sudan.

They were housed under standard environmental conditions at temperature $25 \pm 2^\circ \text{C}$ and light and dark cycles (12/12 h). Rats were fed standard balance diet and water *ad libitum*.

3.3. Preparation of Ethanolic Extracts

60gm of *Eucalyptus camaldulensis* powdered leaves were taken and extracted with soxhlet apparatus ethanol 70%. The solvent was removed under reduced pressure in a rotary evaporator until they become completely dry. The residue was stored at 4°C for further use. Each residue was weighed and the yield percentage was 9.34% [1].

3.4. Study the Effect Of Ethanolic Extract Of *Eucalyptus Camaldulensis* On Oral Glucose Tolerance Test (OGTT) In Rats

Group	Dose	Treatment	Rats no.
I	1ml	Distilled water	6
II	600µg/kg	Glibenclamide	6
III	500mg/kg	Ethanolic extract of <i>Eucalyptus camaldulensis</i>	6

Table 1. Experimental design to study the effect of aqueous extract of *Eucalyptus camaldulensis* on Oral Glucose Tolerance Test (OGTT) in Albino Rats

Initially, hypoglycemic activity of plant extracts was carried out in overnight fasted normal rats, which were equally divided into three groups of six rats each. Group I served as glucose control (received distilled water orally) and Group II as standard group received 600µg/kg of body weight of reference drug Glibenclamide, while group III was received 500mg/kg of ethanolic extract of *Eucalyptus camaldulensis* orally. (This presented in table no.1) After 30 min of extract and standard drug administration, the rats of all the groups were treated with 2g/kg of glucose. Blood glucose levels were determined by collecting the blood at 30 and 90 min after glucose administration [2].

3.5. Statistical analysis

4. RESULTS AND DISCUSSIONS

In the study the effect of aqueous extract of *Eucalyptus camaldulensis* on blood glucose level of hyperglycaemic rats, we found that both of the aqueous extract and Glibenclamide treated groups, showed a highly significant reduction in the blood glucose level ($p < 0.001$) since the first 30 minutes post dosing, when compared with control group.

Name of group	Treated	Blood Glucose (mg/dl)		
		Zero time	30 min	90 min
I	Non-treated control (Distilled water+ 2 g/kg of glucose)	83.7±9.2	167.5±4.5	138.1±8.7
II	Glibenclamide 600µg/kg + 2 g/kg of glucose.	78.7±2.9	126.7±13.28** *	99.5±10.21***
III	500 mg/kg of Ethanolic extract of <i>E.camaldulensis</i> + 2 g/kg of glucose.	79.5±6.3	129.1±16.6***	103.2±4.44***

All values are represented as means ±S.D. of the mean (n=6);

***= $P < 0.001$

Table 2. Effect of Ethanolic extract of eucalyptus on oral glucose tolerance test in Rats

Since, the ethanolic extract of *Eucalyptus camaldulensis* leaves can significantly reduce postprandial hyperglycaemia in type-2 diabetic rat models, this property makes it potentially useful in

human type-2 diabetes subjects with insulin resistance prone to high postprandial glucose surge. The antihyperglycemic effect of *Eucalyptus camaldulensis* may result from the potentiation of insulin from existing β -cells of the islets of langerhans. The blood glucose lowering effect was compared with Glibenclamide has been used for many years to treat diabetes and stimulates insulin secretion from pancreatic β -cells.

This result is consistent with findings of some researchers that some plants have the ability to correct or improve OGT. For example, cocoa powder extract was found to lower blood glucose level in hyperglycemic rats [9]. *Moringa oleifera* Lam was found to have an ameliorating effect for glucose intolerance in [5]. *Dryopteris* spp (Aspidiaceae) have also been known to improve glucose utilization in rats [10,6] also reported that *Vernonia amygdalina* significantly reduced glucose tolerance.

5. CONCLUSION

The experimental results of the present investigation conclude that the ethanolic extract of *Eucalyptus camaldulensis* has ant-hyperglycaemic effect in type-2 diabetic model rats.

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