Nat. Volatiles & Essent. Oils, 2022; 9(1): 1294-1300

Hypoglycemic And Hypolipidemic Effect Of Celtis Philippensis Blanco On Albino Wistar Rats

Sujith Thomas*[1] , Yogender kumar[2]

1-Research Scholar, Sunrise University, Alwar, Rajasthan, India.

2-Research Guide, Sunrise University, Alwar, Rajasthan, India.

ABSTRACT

Diabetes is a chronic disease caused when the pancreas fails to produce sufficient insulin or when the body fails to effectively use insulin in it. Insulin is a hormone that controls blood sugar. Approximately 463 million adults (20-79 years) were living with diabetes; by 2045 this will rise to 700 million. Celtis Philippines belongs to the Ulmaceae family is a large fugacious tree distributed in most parts of India at an altitude of 1400 m. It is distributed in indestructible forests. Qualitative phytochemical analysis of the aqueous, methanol, ethanol, ethyl acetate, chloroform, and hexane plant extracts was carried out. Acute oral toxicity study of extracts of Celtis philippensis leaves in mice have been determined. Glucose Tolerance Test and dexamethasone-induced evaluations were also done to evaluate the anti-diabetic activity of the plant. The phytochemical screening results showed the presence of phytochemical constituents, namely alkaloids, sterols, carbohydrates, glucosides, terpenoids and saponins, tannins, gums and mucilage, and flavonoids. In the acute toxicity tests, administration of 2000 mg/kg doses of Celtis philippensis leaf extract to albino mice did not show any visual symptoms of toxicity or mortality in animals during the entire 14-days observation period. HDL level increased with extract and GLB group respectively when compared to diabetic control.

Keywords: Diabetes mellitus, streptozotocin, blood glucose, lipid profile, celtis philippensis

INTRODUCTION

Diabetes is a chronic disease caused when the pancreas fails to produce sufficient insulin or whenthe body fails to effectively use the insulin in it. Insulin is a hormone that controls blood sugar. Hyperglycaemia or increased blood sugar is a common cause for uncontrollable diabetes, whichmay affect the systems of the body especially thenerves and blood vessels [1]

In 2014, it was reported that about 8.5% of the adults aged 18 years and more having diabetes. Approximately 463 million adults (20-79 years)were living with diabetes; by 2045 this will rise to 700 million. The proportion of people with type2 diabetes is increasing in most countries. 79% ofadults with diabetes were living in low- and middle-income countries. It is also to be noted that 1 in 5 of the people who are above 65 years old have diabetes and 1 in 2 (232 million) people withdiabetes were undiagnosed [2].

Type 1diabetes called as insulin- dependent diabetes mellitus (IDDM) or juvenile diabetes mellitus. It is been reported that about 5to 10 % of diabetes falls in this category. The riskfactors for type 1 diabetes are better than for type 2diabetes. Such development involves autoimmune, genetic, and environmental factors of diabetes [3].

Type 2 diabetes, non-insulin-dependent diabetes mellitus (NIDDM) is having 90 % to 95 % of diabetes cases [4]. Risk factors for type 2diabetesinclude obesity, family history of diabetes, previous history of gestational diabetes, impaired glucose tolerance. Gestational diabetes ranges from 2 to 5% in all pregnancies but usually ends when the pregnancy ends. Gestational diabetes is most common in Africa American, Hispanic / Latino American, Indian American, and people with a family history [5]. Obesity is also associated with a higher risk. The ones who have the risk of gestational diabetes laterincreased for the development of type 2diabetes. In the study, 40% of women with a history of gestational diabetes developed diabetes in the future. Celtis Philippines belongs to the Ulmaceae family, commonly known as Vellai Tovarai, Kalluvari, Pinari, and Kodalimurukki. It is a large fugacious tree distributed in most parts of India at an altitudeof 1400 m. It is distributed in indestructible forests.Roots Celtis philippensis has been used as astringent. These are used as a treatment for diarrhoea. The sap leaves are used for parasites.

MATERIAL AND METHODS

Plant Materials Collection and authentication

The Celtis philippensis Blanco plant is collected entirely from semi-evergreen forests up to 1200 meters high. It is common in tropical Africa from Madagascar, India, Sri Lanka, Myanmar, Thailand, India, China, and Malaysia to Northern Australia. The collected material was authenticated by Dr. K. Madhava Chetty M.Sc ., M.Ed., M.Phil.,Ph.D., PG DGO Plant taxonomist, (IAAT: 357) Assistant Professor, Department of Botany, Sri Venkateswara University, Tripathi.

Extraction of the plant

Extractions using solvents and distilled water are the common method of choice for isolating and extracting many phytochemicals from plants. Thepolarity and nature of the solvent affect the yieldand activity of the extract. Five hundred grams ofdry powdered plant material was extracted with 1000 ml of distilled water for two hours at a low temperature (40° - 45° C). The extract was then filtered with a muslin cloth and centrifuged at 5,000 rpm for 15 minutes. The top layer formed was, evaporated, and the crude extract was obtained. The product of the crude extraction fraction was calculated and stored at 4° C for further use for analysis [6]. The sufficiently dry leafpowder of Celtis philippensis was subjected to sequential solvent extraction using a soxhlet. Eachextract was filtered and concentrated with a rotaryflash vacuum evaporator (Rotel, Equitron) and thedried extract was stored at 4°C for future uses.

Experimental Animals

Wistar albino rats of either sex and of approximately the same age weighing about 175-200g were used for the study. They were housed inpolypropylene cages and fed with standard chowdiet and water ad libitum. The animals wereexposed to alternative cycle of 12 h of darkness and light each. Before each test, the

animals werefasted for atleast 12h. The experimental protocolswere subjected to the scrutinization of the institutional animal ethics committee and were cleared by the same.

Oral glucose tolerance test

At the end of the gavage feeding of the extract, halfof the rats in each of the two collections were fastedfor 14 h and underwent an oral glucose tolerancetest (GTT), while the other half were directly sacrificed by decapitation. Glucose tolerance test in abstained animals was achieved on 16 h fastedrats using one gram of glucose/kg body weight. Identical blood samples from the animal tails werecollected. In all groups, blood was composed of tail snipping at 0, 30, 90, and 120 minutes after the glucose load. The glucose concentration datawere used to compare glucose tolerance in several collections [7].

Dexamethasone induced Diabetes model

Dexamethasone induced Diabetes mellitus Animals are divided into seven groups, in which,the first group is the normal control, second thediabetic control, the third will be the standard (Glibenclamide 5mg/kg) and the other four being theextracts – chloroform extract, ethyl acetate,ethanol, aqueous extracts. Diabetes was inducedby intraperitoneal (i.p.) injection of dexamethasone (1mg/kg) and all the groups had been observedfor a period of 11 days. The blood glucose levelwas estimated and was the biochemical parameters estimated [8].

STATISTICAL ANALYSIS

One-way analysis of variance (ANOVA) followed by Dunnett's method of multiple comparisons was employed using Graph pad Instat 5.0 software. $p<0.05$, $p<0.01$ & $p<0.001$ was considered to be statistically significant.

RESULTS AND DISCUSSION

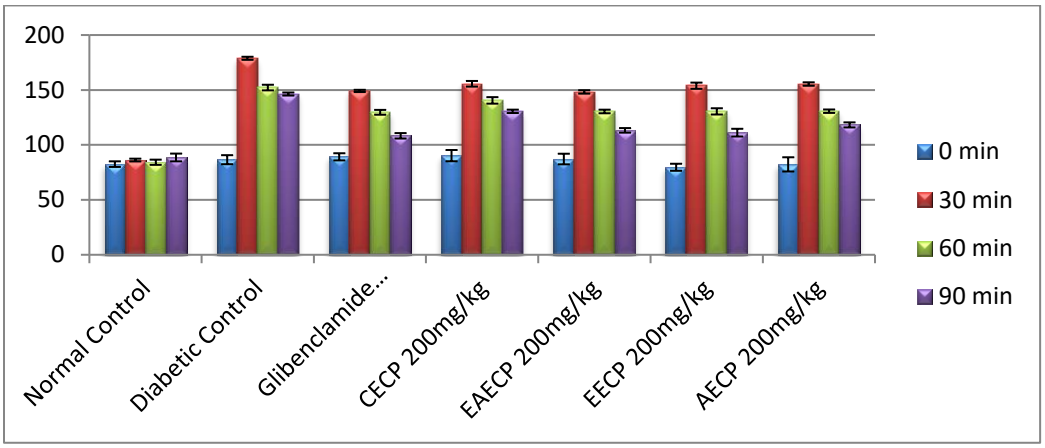
Preliminary Phytochemical screening

The result of preliminary phytochemical analysis of Celtis philippensis leaf extracts was revealed the presence of bioactive components namely alkaloids, sterols, carbohydrates, phenolic compounds, proteins, and amino acids, tannins, and flavonoids, in different concentrations exceptfor glycosides, fixed oils, and fats, terpenoids, saponins, and Gums & mucilage.

Effects of Celtis philippensis extracts on Glucosetolerance test

The effects of extracts of Celtis philippensis (200mg/kg) on the glucose tolerance test are shown inFigure. 1 The administration of Celtis philippensisimproved glucose tolerance in the fasted normal rats. At 30 min after glucose administration the peak value of blood glucose level increased rapidlyand then subsequently decreased at 90 and 120 minutes (after 90 min the glucose level shown in normal control-88, diabetic control-146.3, Glibenclamide-108.2, CECP 200 mg/kg-130.5, EAECP 200 mg/kg-113.2, EECP 200 mg/kg-111.1, AECP 200 mg/kg-118.2 mg/dL. Extracts showed significant hypoglycaemic ($P<0.01$) effect after 90 minutes of treatment.

Figure 1: Effects of Celtis philippensis extract on oral glucose tolerance in rats

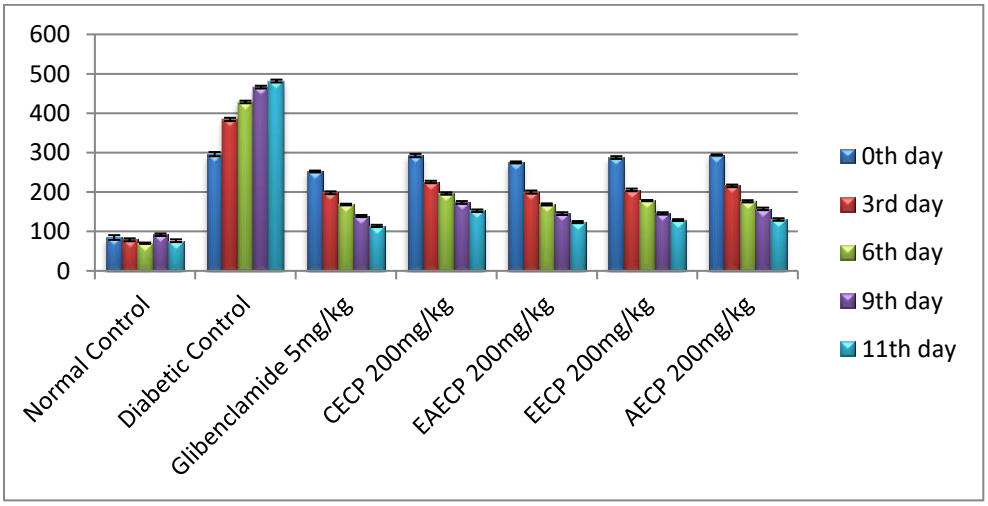


The values are mean±SEM, n=6, **p<0.01 when treated groups compared with diabetic control.

Effects of Celtis philippensis extract of Bloodglucose level by dexamethasone-induced hyperglycaemic rats.

The standard Glibenclamide (5mg/kg) and all extracts of Celtis philippensis at dose of 200 mg/kgtreated groups revealed significant decrease in blood glucose level from 3rd day to 11th day normalcontrol-76, diabetic control-481, Glibenclamide- 113, CECP 200mg/kg-152, EAECP 200mg/kg-123, EECP 200mg/kg-128 and AECP 200 mg/kg- 130 mg/dL. Thus, the extracts were found to be more significant (p<0.01) as a standard drug in lowering blood glucose level compared to diabeticcontrol.

Figure 2: Effect of various extracts of Celtis philippensis on blood glucose level in dexamethasone-induced hyperglycaemic rats

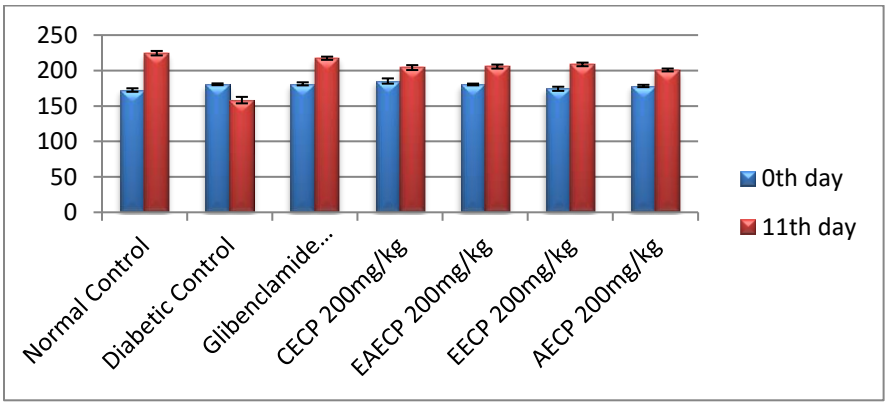


The values are mean±SEM, n=6, **p<0.01 when treated groups compared with diabetic control.

Effects of Celtis philippensis extract of body weightby dexamethasone-induced hyperglycaemic rats.

The table shows the bodyweight of the normal andtreated by dexamethasone-induced hyperglycaemic rat groups significantly differ fromdiabetic control on 11th day normal control-224,diabetic control-158, Glibenclamide-217, CECP200mg/kg-204, EAECP 200mg/kg-205, EECP 200mg/kg-208 and AECP 200 mg/kg- 200g. In the same way urine glucose level of normal and treated groups also significantly differ from diabetic control on the 11th day.

Figure 3: Effect of Celtis philippensis on Body Weight

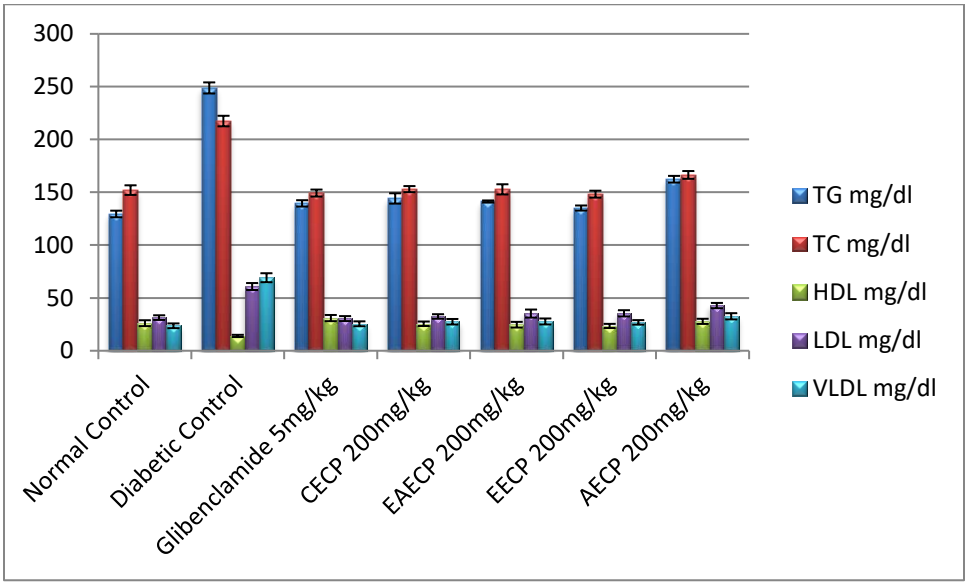


The values are mean±SEM, n=6 when compared with diabetic control **p<0.01

Effects of Celtis philippensis extract on the Biochemical parameters by dexamethasone- induced hyperglycaemic rats

Figure 4 shows extracts has significantly reversed the diabetes-induced hyperlipidemia compared to diabetic control. A significant reduction of triglyceride, total cholesterol, LDL, VLDL level in ethyl acetate and ethanol extracts were alike to standard drug glibenclamide compare to control. The chloroform, aqueous extracts also reveal significant reduction in lipid profile but compared to ethyl acetate and ethanol less significant. However, HDL level increased with extract and GLB group respectivelywhen compared to diabetic control. The results show there is no significant variation between treated groups and the normal control group.

Figure 4: Effect of various extracts of Celtis philippensis on biochemical parameters indexamethasone-induced hypoglycaemic rats



The values are mean±SEM, n=6 when compared with diabetic control **p<0.01

CONCLUSION

After administrated with glucose the blood glucose level value has increased swiftly and then consequently decreased. Extracts exhibited a substantial hypoglycemic effect. The standard glibenclamide and different solvent extract-treated groups, the peak values of blood sugar significantly decreased to Glibenclamide, CECP, EAECP, EECP, and AECP simultaneously on the 14th day. However, HDL level increased withextract and GLB group respectively when compared to diabetic control. The results show there is no significant variation between treated groups and the normal control group.

CONFLICT OF INTEREST

No Conflict of all authors.

REFERENCES

1. Ramalingam K, Ganesan V, Sasi S, Shanmugam S, Balasubramanian A. Comparative assessment of the efficacy of voglibose and metformin combined with insulin in patients with type 2 diabetes mellitus. Int J Res Pharm Sci. 2019;10(3):2255–8.
2. Kothai R, Arul B, Kumar KS, Christina AJM. Hypoglycemic and antiperglycemic effects of Semecarpus anacardium linn in normal and alloxan-induced diabetic rats. J Herb Pharmacother. 2005;5(2):49–56.
3. Balasubramanian A, Sivasamy V, Ekambaram M, Ramalingam K. Antihyperglycemic effect of Portulaca pilosa Linn. in streptozotocin-induced diabetic rats. Int J Res Pharm Sci. 2019;10(1):673–6.
4. Arul B, Kothai R, Christina A. Hypoglycemic and Antihyperglycemic effect of Semecarpusanacarium Linn in normal and streptozotocin induced diabetic rats. Methods Find Exp Clin Pharmacol. 2004; 26(10):759–62.

5. Thomas S, Arul B, Saraswat R. Anti-diabetic in- vivo evaluation of Celtis philippensis Blanco by streptozotocin induced on albino wistar rats. J Nat Remedies. 2020;21(4 S1):26–31.
6. Harborne A. Phytochemical Methods A Guide to Modern Techniques of Plant Analysis. 3rd ed. Springer Netherlands; 1998. 282 p.
7. Singh K, Rao C V, Hussain Z, Pahuja R. Evaluation of in-vivo antioxidant and oral glucose tolerance test of ethanolic extract of Calotropis gigantea Linn against streptozotocin-induced diabetic rats. J Pharmacogn Phytochem. 2014; 2(5):59–65.
8. Fofie CK, Nguelefack-Mbuyo EP, Tsabang N, Kamanyi A, Nguelefack TB. Hypoglycemic Properties of the Aqueous Extract from the Stem Bark of Ceiba pentandra in Dexamethasone- Induced Insulin Resistant Rats. Machado MM, editor. Evidence-Based Complement Altern Med [Internet]. 2018; 2018:4234981.