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Body weight and body glucose of *Umbelliferone, Hymecromone, Qucertine* and *diethyl phthalate* – A comparison study

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Abstract

Diabetes mellitus is a potentially morbid condition with high prevalence worldwide thus the disease constitutesa major health concern. Diabetes is a disorder of metabolism and its pathogenesis involves both genetic and environmental factors. The search for compounds with novel properties to deal with the disease condition is still in progress. The study investigated the Umbelliferone, Hymecromone from ethanolic extract of Cinnamomum, *Quercetin* from Ethanolic extract of *Pouteria sapota and Diethylphthalate* (DEP) from Methanolic extract of *Decalepishamiltonii* on blood glucose and body weight induced Alloxan rats. Cinnamon (*Laureaceae*) is a spice that is made from the inner bark of trees called *Cinnamomum, Sapota* and *Decalepishamiltonii* (Wight &Arn).But there are no more scientific reports available about the antidiabetic activity of this plant. Hence the study was carried out to ascertain the activity. The isolated phytochemicals were characterized by UV, IR, ^{1}H-NMR and^{13}C- NMR. Results from a clinical study suggest that *Umbelliferone, Hymecromone, Quercetin* and *Diethylphthalate* were reduced the blood glucose levels and reduced in the body gain appeared gradually after administration by the 30th day. Further biochemical investigations will be helpful this *Cinnamomum Sapota* and *Decalepishamiltonii* (Wight &Arn)as a therapeutic target in Diabetes research.

Keywords: *Cinnamon, Sapota, Decalepishamiltonii* (Wight &Arn) *Umbelliferone, Hymecromone,Qucertine and Diethyl phthalate*

Introduction

Type 2 diabetes is a complex polygenic disorder currentlymaffecting the lives of over 170 million people worldwide, with that number estimated to double by 2030 [1]. It is characterizedby insulin resistance, impaired glucose-stimulated insulin release (pancreatic β-cell dysfunction), and inappropriate secretion of glucagon, which manifested in concert results in chronic hyperglycemia. Type 2 diabetes is strongly associated with the presence of obesity, and when observed in the presence of other disorders such as cardiovascular disease,hypertension and/or dyslipidemia, is known as Metabolic Syndrome [2].

The disease is characterized by hyperglycemia resulting from either defect in insulin secretion or insulin action or both [3]. Insulin is a hormone manufactured by the β-cells of the pancreas, which is required to uptake and utilize glucose as an energy source [4]. Lack of insulin or insulin resistance prevents efficient glucose uptake by most body cells except brain cells. This results in increased blood glucose levels, reduced cell utilization of glucose and increased utilization of fats and proteins as energy sources [5]. Acute, lifethreatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the non-ketotic hyperosmolar syndrome.

The long-term microvascular and macrovascular complications of the disease include; neuropathy (nerve damage), nephropathy (renal disease), vision disorders, cardiovascular vascular disorders, stroke and peripheral vascular diseases which can lead to ulcers, gangrene and amputation [3]. Treatment of type I diabetes requires administration of exogenous insulin so as the patient will have normal carbohydrate, protein and fat metabolism [5]. However weight gain and hypoglycemia are common side effects of insulin therapy [6]. For type II patients treatment options begin with diet and life style modifications but as disease progresses often oral hypoglycemic agents or insulin or both are required [7].

Plants have served mankind since ages as they are reservoirs of important medicinal components and help to alleviate chronic diseases. The past was considered the synthetic era due to the commercial production of large varieties of synthetic drugs by pharmaceutical industries (8). Over time the continuous use of synthetic drugs caused severe side effects, and led to resistance of microbes. Also synthetic drugs are expensive and large populations cannot afford to get benefit from these drugs. During the last decades a global trend with focus on green medicines due to minimum side effects and cost effectiveness. Medicinal plants play an appreciable role in the development of modern herbal medicines as many diseases like cancer, liver diseases and arthritis find no complete cure in allopathy. The bioactive compounds of medicinal plants are used as anti diabetic, chemotherapeutic, anti inflammatory, anti arthritic agents where no satisfactory cure is present in modern medicines (9). Many plants have shown their immense potential to fight against dreadful diseases including cancer.

Cinnamon is a sweet but pungent spices derived from the inner bark of the branches of wild cinnamon trees is called *Cinnamomum*. Which grow in tropical areas across Southeast Asia, South America and the Caribbean. Cinnamon from thousands of years and was highly prized among many ancient civilisations. Cinnamon, often used in cooking and baking, is increasingly being linked to improvements in the treatment of conditions such as diabetes mellitus.

Different components of the Sapota plant such as saponins, flavanoids and triterpenoids havebeen used in folk medicine and are known to exhibit anti-inflammatory, antioxidant,antimicrobial, analgesic and spermicidal activities. Importantly, chemical constituents such asflavonoids, polyphenols, dihydromyrecetin, myricitrin, catechin, epicatechin, gallocatechinand gallic acid have been isolated from fruits[10].

Decalepishamiltonii (Wight &Arn) is the sole species of plant in the genus Decalepisbelonging to the family Asclepiadaceae. It is endemic and endangered species of Peninsular India is commonly known as MagaliKizhangu in Tamil. It is one of the important plants in Ayurvedic system of medicine in India and is used in curing various diseases like stomach disorders, gastric ulcers,stimulate appetite and as a general tonic, demulcent, diaphoretic, diuretic and tonic. It is useful in the loss of appetite, fever, skin disease, diarrhoea, nutrition disorders, blood purifier and flavouring principle. It is used as a food and health drinks.Phytochemistry, pharmacology and conservation is required. The tubers have reported antimicrobial, antipyretic, antiulcer, antidiabetic, antioxidant, antiinflammatory, chemoprotective, cytoprotective, insecticidal, neuroprotective and hepatoprotective activities.

Materials and Methods

Experimental Design:

Male albino rats weighing150-200 (g) were divided randomly into 6 groups of 6 rats per group, while 6 normal rats in Group- 1 served as the normal control and received 0.2 ml normal saline. Group-2 served as the diabetic control (untreated). Group-3 received 10mg/kg Glibenclamide (a standard drug), while Groups-4(Umbelliferone)-5, (Hymecromone) and -6 (Ethanolic extract of the Cinnamon bark) received 10 mg/kg respectively.

Group- 1 served as the normal control and received 0.2 ml normal saline. Group-2 served as the diabetic control (untreated). Group-3 received 10mg/kg Glibenclamide (a standard drug), while Groups- 4(*Quercetin*) and -5 (Ethanolic extract of the sapota) received 10 mg/kg All treatments were done daily via the oral route and lasted for 21 and 30 days.

Group- 1 served as the normal control and received 0.2 ml normal saline. Group-2 served as the diabetic control (untreated). Group-3 received 10mg/kg Glibenclamide (a standard drug), while Groups- 4(*Diethyl phthalate*) and -5 (Methanolic extract of the Decalepishamiltonii) received 10 mg/kg All treatments were done daily via the oral route and lasted for 21 and 30 days [11].

Biochemical parameters analysis:

The bodyweight of each group was estimated after the 21st and 30th day intervals and the findings were mentioned in ***Table -1,3 and 5.*** Serum was separated by centrifuging the blood samples at 6000 rpm for 20 minutes and stored in the refrigerator until analysed. Serum glucose level test was done on the normal, diabetic, and treated diabetic rats on days 21st and 30th of the experimental period to determine blood glucose levels [11] in the animals were determined in ***Table-2,4 and 6***.

Results and Discussion

Effects of *Umbelliferone, Hymecromone,* Ethanolic extract of *Cinnamon bark*, *Quercetin*, Ethanolic extract of *Pouteriasapota,Diethylphthalate* (DEP) and Methanolic extract of *Decalepishamiltonii*on Fasting Blood Glucose Level in *Alloxan*Induced Diabetic Rats (mean ±S.E)

The results of the effect of *Hymecromone* on fasting blood glucose level are presented in (Table 2). There was a significantly ($P < 0.05$) elevated levels of fasting blood glucose after 21st and 30th days of ***Alloxan*** injection to animals when compared with the normal control animals. Following treatment with *Hymecromone* (10 mg/kg) and glibenclamide (10 mg/kg), there was a significant ($P < 0.05$) and progressive decrease on the levels of fasting blood glucose especially after the 21st and 30th day respectively, with *Hymecromone* (10 mg/kg) producing better effect than glibenclamide when compared with the control group.

Effects of *Umbelliferone, Hymecromone,* Ethanolic extract of *Cinnamon bark*, *Quercetin*, Ethanolic extract of *Pouteriasapota,Diethylphthalate* (DEP) and Methanolic extract of *Decalepishamiltonii*on Fasting Blood Glucose Level in *Alloxan*Induced Diabetic Rats (mean ±S.E)

The results of the effect of *Hymecromone* on fasting body weight level are presented in (Table 2). There was a significantly ($P < 0.05$) elevated levels of body weight after 21st and 30th days of ***Alloxan***injection to animals when compared with the normal control animals. Following treatment with *Hymecromone* (10 mg/kg) and glibenclamide (10 mg/kg), there was a significant ($P < 0.05$) and progressive decrease on the levels of fasting blood weight especially after the 21st and 30th day respectively, with *Hymecromone* (10 mg/kg) producing better effect than glibenclamide when compared with the control group.

Table- 1 Effect of *Umbelliferone, Hymecromone and* Ethanolic extract of *Cinnamon bark* on Body weight in *Alloxan*Induced Diabetic Rats (mean ±S.E)

S. No.	Groups	Body weight (g)		
		1st day	21st day	30th day
1	Normal Control	201.01 ± 1.7	226.52 ± 1.34	227.30 ± 1.40
2	Diabetic Control (Alloxan)	219 ± 1.2	127 ± 1.19	128 ± 1.13
3	Standard Alloxan + glibenclamide (10 mg/kg)	203 ± 1.8	221 ± 1.46	226 ± 1.47
4	Alloxan + *Umbelliferone* (10 mg/kg)	233.6 ± 1.15	212.2 ± 1.12	213.1 ± 1.07
5	Alloxan + *Hymecromone*(10 mg/kg)	222.4 ± 1.60	186.1 ± 1.11	185.73 ± 1.02
6	Alloxan + EthanolicExtract (10mg/kg)	243.2 ± 1.9	163.01 ± 1.21	162.73 ± 1.01

Table- 2 Effect of *Umbelliferone, Hymecromone and* Ethanolic extract of *Cinnamon bark* on Blood glucose in *Alloxan*Induced Diabetic Rats (Mean ±S.E)

S.No.	Groups	Blood Glucose		
		1stday	21st day	30th day
1	Normal Control	91.13 ± 2.15	90.34 ± 2.45	90.34 ± 5.15
2	Diabetic Control (Alloxan)	265.14 ± 15.6	269.01 ± 14.5	268.93 ± 14.4
3	Standard Alloxan+glibenclamide (10 mg/kg)	283.02 ± 15.2	89.78 ± 7.67	88.16 ± 7.18
4	Alloxan + *Umbelliferone*10mg/kg)	284.03 ± 12.3	99.56 ± 15.9	98.45 ± 7.27
5	Alloxan+ *Hymecromone* (10 mg/kg)	278.54 ± 11.2	89..56 ± 11.4	85.16 ± 5.67
6	Alloxan + EthanolicExtract (10mg/kg)	275.03 ± 11.0	92.71 ± 15.1	91.02 ± 13.3

Table- 3 Effect of *Quercetin* and Ethanolic extract of *Pouteriasapota*on Body weight in Alloxan Induced Diabetic Rats (Mean ±S.E)

S. No	Groups	Body weight (g)		
		1st day	21st day	30th day
1	Normal Control	201.75 ± 3.21	205.52 ± 2.34	205.00 ± 2.40
2	Diabetic Control (Alloxan)	205.36 ± 1.28	149.22 ± 5.16	148.78 ± 2.14
3	Standard Alloxan + glibenclamide (10 mg/kg)	205.50 ± 2.82	191.25 ± 1.46	190.28 ± 1.42
4	Alloxan + *Quercetin* (10 mg/kg)	205.66 ± 2.15	178.82 ± 1.12	178.31 ± 1.88
5	Alloxan + Ethanolic extract. (10mg/kg)	205.62 ± 1.88	189.01 ± 2.28	188.72 ± 3.42

Table- 4 Effect of *Quercetin* and Ethanolic extract of *Pouteriasapota* on Blood glucose in Alloxan Induced Diabetic Rats (Mean ±S.E)

S.No	Groups	Blood Glucose		
		1stday	21st day	30th day
1	Normal Control	95.12±2.12	94.16±0.12	93.36±0.12
2	Diabetic Control (Alloxan)	275.54±0.65	405.63±1.5	406.90±1.42
3	Standard Alloxan+glibenclamide (10 mg/kg)	265.02±1.22	89.8±0.62	88.16±0.18
4	Alloxan + Quercetin (10 mg/kg)	260.06±0.38	159.26±0.96	158.45±4.22
5	Alloxan + EthanolicExt. (10mg/kg)	260.02±0.06	94.08±0.42	94.02±0.36

Table-5 Effect of *Diethylphthalate* (DEP) and Methanolic extract of *Decalepishamiltonii*on Body weight in Alloxan Induced Diabetic Rats (Mean ±S.E)

S. No.	Groups	Body weight (g)		
		1st day	21st day	30th day
1	Normal Control	162.67 ± 1.53	155.33 ± 5.43	155.67 ± 2.08
2	Diabetic Control (Alloxan)	162.10 ± 1.00	129.67 ± 2.52	128.67 ± 2.52
3	Standard Alloxan + glibenclamide (10mg/kg)	162.23 ± 2.89	143.67 ± 4.16	143.33 ± 3.21
4	Alloxan + *Diethyl phthalate* (10g/kg)	162.40 ± 1.00	151.66 ± 7.09	151.87 ± 1.53
5	Alloxan + MeOHExt. (10mg/kg)	162.20 ± 1.53	134.67 ± 3.06	134.07 ± 2.08

Table- 6 Effect of *Diethylphthalate* (DEP) and Methanolic extract of *Decalepishamiltonii*on Blood glucose in Alloxan Induced Diabetic Rats(Mean ±S.E)

S.No.	Groups	Blood Glucose		
		1stday	21st day	30th day
1	Normal Control	97.66 ± 10.69	94.66 ± 3.79	95.06 ± 3.79
2	DiabeticControl (Alloxan)	388.66 ± 5.11	410.07 ± 3.51	409.67 ± 2.08
3	Standard Alloxan + glibenclamide (10mg/kg)	375.33 ± 4.04	152.53 ± 2.52	152.93 ± 4.04
4	Alloxan + *Diethyl phthalate* (10mg/kg)	380.33 ± 4.16	155.70 ± 3.00	156.41 ± 5.86
5	Alloxan + MeOHExt. (10mg/kg)	382.42 ± 7.32	161.80 ± 3.40	161.20 ± 2.57

Conclusion

Following available findings from the present study, it can be concluded that the administration of *Hymecromone* and glibenclamide lowered blood glucose level as well as restored the body weights of diabetic animals.

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