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Research Article

COMPARATIVE EVALUATION OF ANTI-DIABETIC ACTIVITY OF SOME EGYPTIAN PLANTS AND PHYTOCHEMICAL PROFILE

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ABSTRACT

The present study explored anti-diabetic activity and phytochemical analysis of four Egyptian plants viz., Sapindus saponaria, Pistacia lenticus, Pistacia chinensis and Terminalia muelleri. The results showed that methanolic extracts of the plants revealed the presence of various phytoconstituents such as flavonoids, triterpenes, carbohydrates and tannins. Further, plants extract (250-500 mg/kg) were investigated for anti-diabetic effect in alloxan induced Swiss Albino mice. It was observed that dose dependent activity as well as retrieved from the abnormal condition to normal, and 500 mg/dL dose showed significant values of 263.67±0.22; 267.35±0.28; 271.56±0.38 and 274.87±0.63 on treatment of Sapindus saponaria, Pistacia lenticus, Pistacia chinensis and Terminalia muelleri respectively. The results suggest that plants extracts have anti-diabetic properties and have potential for the development of pharmacological agents for the treatment of diabetes.

KEY WORDS: Sapindus saponaria, Pistacia lenticus, Pistacia chinensis and Terminalia muelleri, leaves, phytoconstituents, anti-diabetic activity.

INTRODUCTION

Diabetes mellitus is a metabolic disorder of carbohydrate, fat and protein metabolism characterized by elevation of both fasting and postprandial blood glucose levels. Managing the diabetes is a principal challenge in the medical system. Although different types of synthetic oral hypoglycemic agents and insulin are available for the treatment of diabetes mellitus, insulin cannot be taken orally and the synthetic agents in use can produce serious side effects and toxic effects[(1)]. It is one type of chronic disease characterized by high blood glucose levels owing to absolute or relative deficiency of circulating insulin levels[(2)]. Hyperglycemia is the main cause of complications related to coronary artery disease, cerebrovascular disease, renal failure, blindness, limb amputation, neurological complications and premature death[(2)]. The demand for safer and more effective oral hypoglycemic agents is on the rise. In many parts of the world, traditional medicinal plants have been used for the treatment of diabetes and therein exists a hidden wealth of potentially useful natural products for diabetes control [(3)].

For the past few decades, the dietary management has been evolved the use of traditional medicine which are mainly derived from medicinal plants. Even though, the treatment of diabetic mellitus, non-pharmacologic measures (diet, exercise and weight loss) remains a critical component of therapy. There was a numerous traditional medicinal plants reported to have hypoglycemic properties. The purpose of the present

study was to evaluate the antidiabetic activity of methanol extracts of four Egyptian plants, *Sapindus saponaria*, *Pistacia lenticus, Pistacia chinensis* and *Terminalia muelleri*, as well phytochemical composition of the plants

MATERIALS AND METHODS

Plant material

Leaves of *Sapindus saponaria*, *Pistacia lenticus* and *Pistacia chinensis* were collected from Al-Zohiriya garden, Giza, Egypt, while *Terminalia muelleri*leaves were collected from Zoo garden, Giza, Egypt during March, 2012.The plants were identified at Department of Botany, National Research Centre (NRC) and Orman botanical garden, Giza, Egypt.

Plant extraction

The shade dried leaves of *Sapindus saponaria* (600 g), *Pistacia lenticus* (340 g)*, Pistacia chinensis*(260 g) and *Terminalia muelleri* (380 g) were extracted with 70% methanol several times at room temperature by maceration method. Each extract was concentrated under reduced pressure to give 30 g, 24 g, 19.5 and 26.5 g, respectively. Each extract was phytochemically screened according to the methods described by Yadav and Agarwala [(4)].

Animal

The Swiss Albino mice of both sexes, weighing between 20-30 g, were used. The standard drug, extracts and vehicle were administered per-orally; using oral gavage needle for treating the alloxan induced diabetic Swiss Albino mices.

Induction of experimental diabetes

Mice were fasted for 18 hrs and experimental diabetes was then induced by administration of three doses of alloxan monohydrate (150 mg/ kg) each i.p. at intervals of 48 hrs. Then 7 days after the last administration, the animals were fasted for 18 hrs and blood glucose levels were determined. Animals with fasting blood glucose levels ranged from 200-300 mg/dL.

Determination of Blood Glucose Level

The blood was obtained by snipping tail with the help of sharp dissection knife and collected in blood glucose strip. The blood glucose level was monitored by using Blood Glucose Meter.

Determination of Efficacy of Extracts in Alloxan Induced Diabetic Mice

The group one received vehicle (0.5% CMC) only and served as control group. The group two received standard drug Metformin (75 mg/kg) and served as standard group. The remaining two groups received methanolic plant extracts *Sapindus saponaria*, *Pistacia lenticus, Pistacia chinensis* and *Terminalia muelleri*at a dose of 250mg/kg and 500mg/kg body wt. The study for the acute hypoglycemic activity involved in the determination of blood glucose levels at 0, 1, 2, 3, 5 and 24hrs after administration of single dose.

RESULTS AND DISCUSSION

The present study evaluated the antidiabetic activity of Sapindus saponaria, Pistacia lenticus, Pistacia chinensis and Terminalia muelleri, and also phytochemical analysis. Anti-diabetic activity of different plant was presented in table 1. Our findings were confirmed by the earlier findings of Raman and Lau(5) and Dubey (6). Their findings revealed fruit juice or seed powder of Momordica charantia causes a reduction in fasting blood glucose and improves glucose tolerance in normal and diabetic animals as Swiss Albino mice and in humans. The common adverse effects and drug interactions by using conventional anti-diabetic drugs on prolonged use can be minimized by using the fruit extracts of selected medicinal plants. As it reduces the blood glucose level significantly in oral route, it may be used as an alternative emedicine to insulin in diabetic treatment. Generally herbal drug produces anti-diabetic effect by protecting the cells in pancreas from destruction, by restricting glucose load as well as by promoting unrestricted endogenous insulin action(3). However further studies are required to establish its exact mode of action and the active principles involved in this effect(7). Anti-hyperglycemic activity of most effective plant species were in part explained by the ability of the phytoconstituents to increase glucose transport and metabolism in muscle and/or to stimulate insulin

secretion (8, 9, 10, 11). These results suggested that the different types of hypoglycemic compounds are present in the ethyl acetate and ethanol extracts of selected medicinal plants:non-polar and polar compounds (7, 8). Further studies are needed to isolate the bioactive phytoconstituents responsible for the anti-diabetic activity (12). The effective parameters such as; blood glucose was taken as an important evidence for the diabetic control. Those parameters were monitoring the blood circulate the glucose and cholesterol in to the cells; and producing the effects to pancreas whether by altering the β-cells or damage and insulin secretion and further it can be used for further detailed insulin gene level research. The phytochemical analysis revealed that Sapindus saponaria leaves contained triterpenes, flavonoids, tannins, carbohydrates, saponins and coumarins; Pistacia lenticus leaves methanol extract had triterpenes, flavonoids, tannins and carbohydrates; Pistacia chinensis leaves had triterpenes, flavonoids, tannins, carbohydrates and alkaloids, while Terminaliamuelleri leaves had triterpenes, tannins, flavonoids, coumarins and carbohydrates (Table 2).

Table 1. Antidiabetic effect of methanolic extract *Sapindus saponaria*, *Pistacia lenticus, Pistacia chinensis* and *Terminalia muelleri*

Groups/Time	Blood glucose level (mg/dL)					
	0 hr	1 hr	2 hr	3 hr	5 hr	24 hr
Control	260.23±0.26	251.26±0.19	240.53±0.21	224.28±0.13	213.42±0.16	245.15±0.12
Glybenclamide (75mg/kg)	267.51±0.31	240.56±0.32	190.56*±0.59	168.67*±0.52	154.76*±0.31	255.32±0.26
Sapindus saponaria (250mg/kg)	255.67±0.37	240.25±0.33	225.33*±0.21	192.71*±0.29	165.99*±0.65	268.14±0.31
Sapindus saponaria (500mg/kg)	265.56±0.22	255.11±0.42	190.21*±0.52	182.83*±0.37	157.11*±0.41	263.67±0.22
Pistacia lenticus (250mg/kg)	261.67±0.52	250.23±0.85	198.76*±0.37	170.12*±0.29	156.56*±0.26	270.91±0.71
Pistacia lenticus (500mg/kg)	273.11±0.36	221.34±0.86	189.91*±0.81	165.24*±0.57	152.32*±0.37	267.35±0.28
Pistacia chinensis(250mg/kg)	250.98±0.71	235.32±0.43	180.53*±0.29	165.94*±0.69	155.29*±0.71	264.72±0.47
Pistacia chinensis(500mg/kg)	272.67±0.85	234.69±0.48	198.12*±0.38	170.34*±0.61	150.21*±0.39	271.56±0.38
Terminalia muelleri (250mg/kg)	265.12±0.31	237.87±0.63	187.23*±0.49	160.96*±0.32	153.78*±0.34	260.87±0.54
Terminalia muelleri (500mg/kg)	269.76±0.61	245.32±0.44	184.84*±0.82	150.45*±0.38	148.99*±0.62	274.87±0.63

*Notes: Values are mean ± SD, n=5 in each group, *p<0.01 when compared with vehicle treated group.*

Table 2. Phytochemical analysis of *Sapindus saponaria*, *Pistacia lenticus, Pistacia chinensis* and *Terminalia muelleri*

Phytoconstituents	*Sapindus saponaria*	*Pistacia lenticus*	*Pistacia chinensis*	*Terminalia muelleri*
Triterpenes and /or Sterols	+	+	+	+
Carbohydrates and/or glycosides	+	+	+	+
Flavonoids	+	+	+	+
Coumarins	+	-	-	+
Alkaloids and/or nitrogenous compounds	-	-	+	-
Tannins	+	+	+	+
Saponins	+	-	-	-

Notes: (+) the presence of the constituents, (-) the absence of the constituents

CONCLUSION

There were no adverse effects have been found such that fur loss, vomiting sensation, abnormal activity and eye contraction in present study.

The study indicated that the investigated Egyptian plants have antidiabetic effect and some of the extracts have potential for the development of chemotherapeutic agents for the treatment of diabetes.

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