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RESEARCH ARTICLE

Antidiabetic and Hypolipidemic Activity of *Monochoria Vaginalis Presl.* On Alloxan Induced Diabetic Rats

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ABSTRACT

The Antidiabetic activity of *Monochoria vaginalis presl.* (Family: pontederiaceae) was investigated in Alloxan induced diabetic albino rats. The *Monochoria vaginalis prel* plant has been reported for its analgesic activity, nephrotoxic, antioxidant activities and nutritive values, paniya tribe of India used the leaves for diabetes[15] but there are no scientific data is available regarding the effect on the blood glucose levels. So we have made an attempt to use hydroalcoholic extract of *Monochoria vaginalis presl* leaf (HAEMV) for studying anti-diabetic activity. The dried leaves of *Monochoria vaginalis presl.* were subjected to extraction by continuous hot percolation using water and ethanol (50 : 50) as solvent and were subjected to standardization using pharmacognostical and phytochemical screening. Dose selection was made on the basis of acute oral toxicity study (200 mg/kg body weight) as per OECD and CPCSEA guidelines. Oral administration of extracts of *Monochoria vaginalis presl* (200mg/kg, 400mg/kg) for 14 days resulted in a significant reduction in blood glucose levels. The extract also prevented body weight loss in diabetic rats.

KEYWORDS

Alloxan, *Monochoria vaginalis,* Anti diabetic.

INTRODUCTION

Materials and Methods

Animals

Wistar albino rats (150- 200 grams) of both sexes were used for the present study. Prior to the experiment the rats were housed in a clean polypropylene cages (6 rats/ cages) for a period of 7 days under standard temperature (25 - 30^{o} c) , relative humidity (45 – 55 %),dark / light cycle (12 /12 hrs). The studies were performed with the approval of Institutional Animal Ethics Committee (Pcol/01/2013/IAEC/ECP)

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The animals were put in overnight fasting were deprived of food for 16 hrs but allowed free access of water.

Chemicals

Alloxan (Loba Chemie), Standard Glibenclamide (Aventis Pharma) Ethanol (Analytical grade) 5% Dextrose solution Glucose Estimation Kit (GlucoDr Super sensor) Auto analyser all other chemicals used were of analytical grade

Plant Material

The leaves of *Monochoria vaginalis presl* used for the present study was obtained from Therur pond, Kanyakumari district, Tamil Nadu, India. The whole plant was authenticated by V.Chelladurai, Research officer-Botany

(Scientist-c), Central council for Research in Ayurveda & Siddha, Govt. Of .India.

Preparation of Plant Extract

The leaves were collected, shade dried and coarsely powdered by using mechanical grinder. About 200 grams of coarsely powdered leaf material was extracted with 50% ethanol by continuous hot percolation process at 70°C in a Soxhlet apparatus (1000 ml) for 72 hrs then it was concentrated by distillation process.

Phytochemical Screening

The hydroalcoholic extract of the *Monochoria vaginalis presl* was subjected to preliminary phytochemical screening to identify the active chemical constituents.

Acute Toxicity Studies[2]

Acute oral toxicity studies 4 of the extracts were carried out as per the OECD guidelines, draft guidelines 423 adopted and received from Committee for the Purpose of Supervision and Control of Experiments on Animals (CPCSEA), Administration of the stepwise doses of extracts of *Monochoria vaginalis presl.* from 40 mg/kg body weight up to the dose 2000 mg/kg body weight caused no considerable signs of toxicity in the tested animals. One tenth of upper limit dose were selected as the level for examination of anti-diabetic activity. 200 mg/kg and 400 mg/kg were taken as the doses for further studies.

Experimental Model[7,8,9]

A single dose (100 mg/kg b.w., i.p.)[4] of alloxan monohydrate dissolved in normal saline were used for the induction of diabetes in rats after overnight fasting. After 1 hr of alloxan monohydrate administration, the animals were given feed and libitum and 5% dextrose solution was also given in feeding bottle for a day to overcome early hypoglycaemic phase.

The animals were stabilized for a week and animals showing blood glucose level more than 200 mg/dl were selected for the study.

Experimental Design[3,4,5,6]

Five groups of rats six in each groups received the following treatment schedule for 14 days.

GROUP I - Normal control (normal saline 10 ml /kg, p.o.)

GROUP II - Diabetic control (Alloxan 100 mg/kg, i.p.)[4]

GROUP III - Alloxan (100 mg/kg, i.p.) + Standard drug Glibenclamide (5 mg/kg, p.o.)[5].

GROUP IV - Alloxan (100 mg/kg, i.p.) + HAEMV. (200 mg/kg, p.o.)

GROUP V - Alloxan (100 mg/kg, i.p.)+ HAEMV. (400 mg/kg, p.o.)

Plant leaf extract, standard drug and normal saline were administered with the help of oral feeding needle. Group I serve as normal control which received normal saline for 14 days. Group II to Group V were diabetic control rats. Group IV and Group V (which previously received alloxan100mg/kg)[10] were given fixed doses of hydro alcoholic leaf extract (200 mg/kg, p.o., 400 mg/kg, p.o.) of *Monochoria vaginalis presl.*and group III received standard drug glibenclamide (5 mg/kg, p.o.)[5] for 14 consecutive days.

Body Weight Measurement

Body weight of all the animals in each group was measured during the course of study period i.e. 1, 7 and 14 days.

Statistical Analysis

Statistical analysis was done by using GRAPHPAD PRISM 5.0. All the values of Biochemical parameters, cardiac risk ratio and body weight were expressed as Mean ± Standard Error Mean (SEM). The values were analyzed for statistically significance using one-way analysis of variance (ANOVA)

RESULTS

Phytochemical Screening

The phytochemicals present in the hydroalcoholic extract of *Monochoria vaginalis presl.* were alkaloids, glycosides, flavnoids, tannins and carbohydrates.

Table 1: Effect of oral administration of the hydroalcoholic extract of *Monochoria vaginalis presl.* on serum profile in experiment rats after 14 days.

Gp	TG	TP	Chol	Creat	ALP	AST	LDL	HDL	BUN	Urea
N.C	57.33±0.78	6.55±0.217	65.88±1.203	0.70±0.022	520.5±0.280	60.83±1.203	24.71±0.96	23.50±0.28	20.06±0.88	34.80±0.366
D.C	75.46±0.76***	4.15±0.095***	140.38±1.244***	1.15±0.0038***	589.2±0.395***	88.33±2.519***	51.61±0.81***	13.10±0.64***	56.66±1.73***	58.27±0.274***
Glib	56.91±1.15***	5.88±0.212***	69.48±2.333***	0.7±0.025***	547.1±0.230***	70.74±2.653***	28.17±1.39***	22.75±0.44***	23.07±0.94***	44.27±0.239***
HAEMV 200	62.15±1.06***	5.41±0.204***	77±2.399****	0.79±0.036***	560.4±0.168***	78.89±1.243*	39.45±1.04***	18.96±0.56***	26.02±0.74***	51.51±0.487***
HAEMV 400	59.82±1.15***	5.71±0.177***	72.06±2.033***	0.72±0.027***	558.4±0.158***	75.79±1.362***	31.67±1.44***	20.96±0.91***	24.29±1.42***	48.15±0.330***

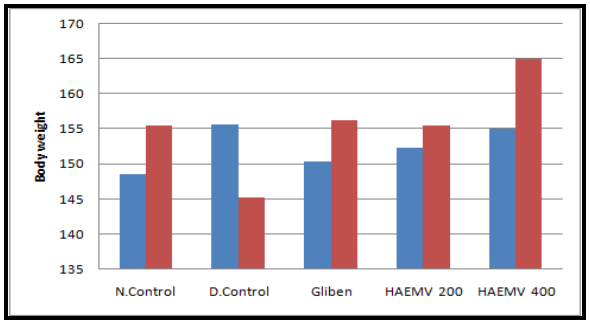
Values are expressed as mean + SEM, n=6. Statistical significance test for comparison was done by ANOVA, followed by Dunnett's *t*-test.***p<0.001, **p<0.01, *p<0.05.

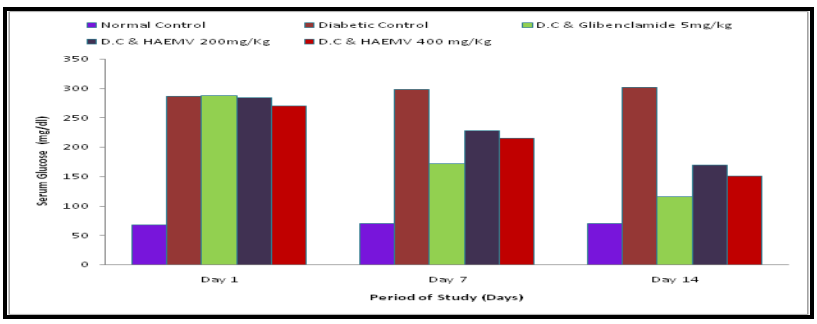
Table 2: Effect of the hydroalcoholic extract of Monochoria vaginalis presl. on body weight after treatment in diabetic rats

Group	Average Body weight (g)±SEM	
N.C	148.6±0.241	155.5±0.529
D.C	155.7±0.750***	145.3±0.567***
Glib	150.4±0.516***	156.3±0.449***
HAEMV 200	152.3±0.364**	155.5±0.468***
HAEMV 400	155.1±0.601^{ns}	165.0±0.376***

Table 3: Effect of the hydroalcoholic extract of *Monochoria vaginalis presl.* on Blood glucose level after treatment in diabetic rats.

Group	Serum glucose (mg/dl)		
	Day 1	Day 7	Day 14
N. control	68.47±0.562	69.71±0.287	70.61±0.399
D.Control	286.5±0.500***	298.88±0.405***	302±0.481***
GLIBEN	288.48±0.506*	172.61±0.297***	115.61±0.457***
HAEMV 200	284.3±0.328*	227.86±0.438***	170.18±1.564***
HAEMV 400	270.15±0.248***	215.63±0.445***	151.11±1.677***





during the first 4 hours and followed by daily observations for 14 days and mortality was also not observed. The drug was found to be safe at the tested dose level of 2000 mg/kg b.w. One-tenth of this dose level was taken as effective dose. The extract were experimented at the same dose of 200 mg/kg b. w. and 400 mg/kg as high dose. In order to ascertain a scientific base for the usefulness of this plant in the treatment of diabetes. It was decided to evaluate experimental design of antidiabetic activity by Alloxan-induced model.

Alloxan induced Diabetic Model[10]

The blood glucose levels were measured on 1st, 7th and 14th days. The diabetic control group on 1st, 7th and 14th days showed significant ($P < 0.001$) increase in blood glucose levels (hyperglycemia) when compared to normal control. HAEMV 200 mg/kg p.o. treated diabetic group showed significant decrease in blood glucose levels on 14th day ($P<0.001$), when compared to diabetic control group. HAEMV 400 mg/kg p.o. treated diabetic group showed significant decrease in blood glucose levels on 7th day ($P< 0.001$), 14th day ($P < 0.001$) GLIBEN 5mg/kg p.o. treated diabetic group showed significant decrease in blood glucose levels on 7th day and 14th day ($P < 0.001$) when compared to diabetic control group.

Body Weight Measurement

In the present study, diabetic rats had lower body weights and high blood glucose level as compared to normal rats. In spite of increased food consumption, loss of body weight due to defect in glucose metabolism and excessive breakdown of tissue protein is a characteristic condition in diabetics. Treatment with HAEMV improved the average body weights of rats, which indicates that control over polyphagia and muscle wasting resulted due to hyperglycemic condition

DISCUSSION

Alloxan-induced experimental diabetes is a valuable model for inducing the diabetes mellitus in a variety of animals by affecting degeneration and necrosis of pancreatic β-cell with lower doses (100 mg/kg b.w.)[4,11]. The chronic hyperglycemia of diabetes is associated with specific chronic complications resulting in damage to or failure of various organs, notably the eyes, kidneys, nerves, heart and blood vessels.[12]

The *Monochoria vaginalis prel* plant has been reported for its *analgesic* activity, nephrotoxic, antioxidant activities and nutritive values[24,25,26] Paniya tribe of India used the leaves for diabetes[15] but there are no scientific data is available regarding the effect on the blood glucose levels. So we have made an attempt to use hydro alcoholic extract of *Monochoria vaginalis presl* (Leaf) for studying anti-diabetic activity.

The management of diabetes without any side effect is still a challenge to the medical system. Herbal drugs are prescribed widely because of their effectiveness, fewer side effects and relatively low cost. Wide array of plant derived active principles have demonstrated antidiabetic activity.[13,14]

At the end of the study (14th day) the hydroalcoholic extracts of *Monochoria vaginalis presl.*(200 mg/kg p.o, 400 mg/kg p.o.) and glibenclamide (5 mg/kg p.o.) treated diabetic groups showed statistically significant decrease in total cholesterol, triglycerides, LDL, VLDL levels, and increase in HDL level, It also increase total protein level which maintains the body weight.

BUN (blood urea nitrogen) is a marker of kidney function that doctors use to determine the progression of kidney failure. Kidney failure is a complication of diabetes. Hydro alcoholic Extract of *Monochoria vaginalis presl* (HAEMV) significantly reduces the BUN thus improves kidney function

The above observations indicate that the hydroalcoholic extract of *Monochoria vaginalis presl.* Treatment can be used in the management of the diabetes mellitus and further studies are needed to elucidate the proper mechanism of action.

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