ISSN : 0974 - 7508 Volume 9 Issue 8

Natural Products

An Indian Journal

Short Communication

NPAIJ, 9(8), 2013 [319-321]

Antidiabetic effect of the leaves of *Kandelia candel* Linn

Vijai Lakshmi[1]*, Rajesh Kumar[1], Arvind Kumar Srivastava[2]

[1]Medicinal and Process Chemistry division Central Drug Research Institute, Lucknow-226001, (INDIA)

[2]Biochemistry Division Central Drug Research Institute, Lucknow-226001, (INDIA)

E-mail: vijlakshmius@yahoo.com

ABSTRACT

The crude ethanolic extract of the leaves of the *Kandelia candel (L.)* showed promising antihypergycemic activity at a dose of 500 mg/kg dose in rats using SLM (35% lowering of blood sugar)and STZ model (20.5 % lowering of blood sugar). On further fractionation of ethanol extract the activity was found to be concentrated only in aqueous fraction (38% lowering of blood sugar in SLM model and 22% lowering of blood sugar in STZ models at 250 mg/kg. dose).

KEYWORDS

Antidiabetic activity;
Kandelia candel;
Leaves.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder affecting carbohydrate, fat and protein metabolism. Besides hyperglycemia the levels of plasma lipids are usually raised causing a risk factor for coronary heart desease[1] The current prevalence of type 2 diabetes is 2.4% in the rural population and 11.6% in the urban population of India. It has been estimated that by the year 2025, India will have the largest number of diabetic subjects in the world[2] Many researchers have conducted various *in vivo* and *in vitro* studies to search for new treatment or new antihyperglycemic agent to control this disease. Although several medicinal plants have been reported in the scientific literature to posses significant hypolipidemic activity in animal model of diabetes[3,4] however no satisfactory effective therapy is still available to cure diabetes mellitus. *Kandelia candel* (Linn.) [Family: Rhizophoraceae, syn *K. rheedii*] is an evergreen shrub or a small tree with spongy, reddish brown, flaky bark, found in the coastal forests of India, usually in muddy swamps and tidal creeks. Leaves opposite, oblong, 2-4 in. x 1-2 in., entire obtuse, dark green above and reddish brown beneath, flowers large, white, in axially dichotomous cymes; fruit ovoid 0.5 – 1.0 in. long. The bark of the tree is rich in tannins and is suitable for heavy leather tanning. The bark is reported to be used, along with dried ginger or long piper and rose water, for diabetes[5]. It has been shown, however, that aqueous or alcoholic extracts of the bark do not have any effect on the blood sugar of normal or alloxan diabetic rabbits[6].

A literature survey revealed that the chemical constituents isolated from this species were mainly tannins. Propelargonidin dimmers, proanthocyanidin trimers and two novel proanthocyanidin dimmers kandelins and four trimers kandelins which all contain a phenyl propanoid substituent in the upper flavan unit, were isolated from the bark of *Kandelia candel*[7]. Cinchonoins I_a (Cinchonoins I_b a new class of flavan-3-ols substituted at A ring with a C_6-C_3 unit, have been isolated.

MATERIAL AND METHODS

Collection of the plant material

The leaves of *Kandelia candel* were collected from

Short Communication

Orissa coast of India. The collection and authantification were made by Botany Division of the Central Drug Research Institute, Lucknow, India, and the voucher specimen no. 357 has been persevered. During on going biological screening programme of the marine flora and fauna in the Institute, the crude ethanol extract of leaves showed promising antidiabetic activity in SLM and STZ models. On further fractionation the activity was localized in aqueous fraction only (TABLE 1). Therefore we have selected this plant for detailed antidiabetic activity screening.

Extraction and fractionation procedure

The leaves were air dried at room temperature and powdered. The powdered plant material (1.5Kg.) was extracted with ethanol five times at room temperature and the total extract obtained was filtered, concentrated under reduced pressure on rotatory evaporator below 50^0. The extract was finally dried under high vacuum for 3 hours to remove the last traces of solvent (50 g). The crude extract (35.0g) was macerated with n-hexane to give n-hexane soluble fraction (4.1.0 g) and insoluble residue. The insoluble residue was partitioned with chloroform and water to give the chloroform soluble fraction, (2.6 g) and water soluble fraction. The water soluble fraction was extracted with n-butanol to afford n-butanol soluble fraction (6.2 g) and butanol insoluble (22.1 g). All these fractions were concentrated under reduced pressure on rotatory evaporator at 50^0 to get respective residues.

Animals

Male albino rats of Sprague Dawley strain (8 to 10 weeks of age: body weight 120 ± 20 g) were procured from the animal colony of Central Drug Research Institute, Lucknow, India. Research on animals was conducted in accordance with the guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) formed by the Government of India in 1964. Rats were always placed in groups of three to five in polypropylene cages. The following norms were always followed for animal room environment: temperature 23 ± 2°C; humidity 50-60%; light 300 Lux at floor level with regular 12 h light cycle; noise level 50 decibel; ventilation 10-15 air changes per hour. The animals were fed *ad libitum* standard pellet diet and had free access to water.

Chemicals

Streptozotocin, metformin, and fenofibrate were obtained from Sigma Chemical Company, St. Louis, USA. Glucose, fructose, sucrose and cholesterol were obtained from Sisco Research Laboratory (India). Biochemical kits used in the study were obtained from the Roche diagnostics. All other chemicals used were of highest purity grade.

Methodology of antidiabetic testing

(i) Sucrose loaded rat model (SLM)

Male albino rats of Charles Foster strain of average body weight 160 ± 20 g were selected for this study. The blood glucose of each animal was checked by glucometer using glucostrips (Boehringer Mannheim) after 16 hours of starvation. Animals showing blood glucose between 60 to 80 mg/dl were divided into groups of five animals. Rats of experimental group were administered suspension of the desired test compound orally (made in 1.0% gum acacia). Animals of control group were given an equal amount of 1.0% gum acacia. A sucrose load (10.0 g/kg) was given to each animal orally exactly after 30 min post administration of the test sample/vehicle. Blood glucose profile of each rat was again determined at 30, 60, 90 and 120 min post administration of sucrose by glucometer. Food but not water was withheld from the cages during the course of experimentation. Quantitative glucose tolerance of each animal was calculated by Area Under Curve (AUC) method (Prism Software). Comparing the AUC of experimental and control groups determined the percentage antihypergycemic activity.

(ii) Sucrose challenged streptozotocin-induced diabetic rats (STZ-s)

Male albino rats of Sprague Dawley strain of body weight 140±20g were selected for this study. Streptozotocin (Sigma, USA) was dissolved in 100 mM citrate buffer pH 4.5 and calculated amount of the fresh solution was injected to overnight fasted rats (45 mg/kg) intraperitoneally. Blood was checked 48 h later by glucostrips and animals showing blood glucose values between 8 to 15 m M were included in the experiments and termed diabetic. The diabetic animals were divided

Short Communication

into groups consisting of six animals in each group. Rats of experimental groups were administered suspension of the desired test samples orally (made in 1.0% gum acacia) at desired doses (shown in TABLE 1). Animals of control group were given an equal amount of 1.0% gum acacia. A sucrose load of 2.5 g/kg body weight was given after 30 minutes of drug administration. After 30 minutes of post sucrose load, blood glucose level was again checked by gluco strips at 30, 60, 90, 120, 180, 240, 300 minutes and at 24 hour, respectively. Food but not water was withheld from the cages during the experimentation. Comparing the AUC of experimental and control groups determined the percent antihyperglycemic activity.

TABLE 1 : Antihyperglycemic activity of extract/ fractions of *Kandelia candel (L.)* in SLM and STZ models

Serial no.	Code no.	Dose (mg/kg)	SLM model (% activity)	STZ model (% activity)	Remark
1.	Ethanol extract	500	35.0**	20.5**	Active
2.	Hexane fraction	250	8.0	2.0	Inactive
3.	Chloroform fraction	250	6.0	5.0	Inactive
4.	n-butanol soluble fraction	250	10.0	6.8	Inactive
5	n-butanol insoluble fraction	250	38.0**	22.0**	Active
6	Metformin (Standard drug)	100	-	35.8** -	Active
7.	Acarbose(Standard drug)	100	47.6*** -		Active

RESULTS AND DISCUSSION

Ethanol extract of the leaves of the *K.candel* showed promising antidiabetic activity in SLM and STZ-s models in rats. On further fractionation the activity was only shown by aqueous fraction. Since aqueous fraction contains 90% tannins and procynidins, Therefore the activity is because of these poly phenolic compounds.

ACKNOWLEDGEMENTS

Author (VL) is grateful to the HRDG- Council of Scientific and Industrial Research, New Delhi, India for providing an emeritus scientist ship, which helped in compiling this work. The authors are also thankful to Dr. MN Srivastava for collection of the plant material.

REFERENCES

[1] W.B.Kannel, D.L .Mc.Gee; Circulation, **59**, 8 **(1979)**.
[2] H.King, R.E.Aubert, W.H.Herman; Diabetes Care **21(9)**, 1414 **(1998)**.
[3] I.Ahmed, M.S.Lakhani, M.Gillet, A.John, H.Raza; Diab.Res and Clin.Pract., **51**,155 **(2001)**.
[4] S.B.Sharma, A.Nasir, K.M.Prabhu, P.S.Murthy, G.Dev; J.Ethnopharmacol., **85**, 201 **(2003)**.
[5] K.R.Kartikar, B.D.Basu; Indian medicinal plants, 2nd. Edition, **4**, 1013 **(1930)**.
[6] B.Mukerji; J.Sci.Ind.Res., **16A**, Suppl, 1 **(1957)**.
[7] F.L.Hsu, G.Nonaka, I.Nishioka; Chem.Pharm.Bull., **33**, 3142 **(1985)**.