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Hypoglycemic effect of *Bauhinia cheilandra* in rats

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Abstract

The extract of the methanolic leaves of *Bauhinia cheilandra* (BC) was tested on glucose loaded and alloxan-induced diabetic rats. In both tests, the methanolic extract at doses of 300, 600, and 900 mg/kg, has shown a statistically significant and considerable hypoglycemic activity.

Keywords: *Bauhinia cheilandra*; Hypoglycemic effect; Alloxan-induced diabetic

1. Introduction

For quite some time, diabetes has been treated orally with various medicinal plants or their extracts based upon "folkloric" medicine. The term diabetes is a word designating a group of metabolic disorders characterized by an alteration in the metabolism of carbohydrates, proteins and fatty substances [1]. This disorder causes a complete or relative insufficiency in insulin secretion and/or its action. An investigation of hypoglycemic agents originating from plants used in traditional medicine would be of major public health importance. *Bauhinia forticata* [2], which is used in popular Brazilian medicine, has demonstrated a hypoglycemic effect. *B. megalandra* has been reported able to inhibit the intestinal glucose absorption [3]. Other species, such as *B. purpurea*, *B. malabarica*, *B. fassoglensis*, *B. candica* and *B. racemosa*, are utilized in various other pharmacological functions [3,4]. *Bauhinia cheilandra* known as pata-de-vaca, unha-de-velho, mororó and "unha-de-anta, is largely recommended for antidiabetic use by folkloric medicine [5–7]. However, till now, no study has been performed in order to confirm its hypoglycemic effect.

2. Experimental

2.1. Plant material

B. cheilandra (Fabaceae) leaves were collected in October 2003, at Patos (Paraíba–Brazil). A voucher specimen (GNOSY 12244) was deposited in the Herbarium of the Pharmaceutical Sciences Federal University of Pernambuco, Brazil.

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Table 1
Effect of the methanolic extract of the *B. cheilandra* leaves (BC) on the oral glucose tolerance in rats

Treatment (p.o)	Blood glucose (mg/100 ml)		
	Fasting	30 min	90 min
Glucose (1.5 g/kg)	89.6±1.19	158.1±3.8	121.9±3.9
BC 300 mg/kg	85.4±1.6	125.5±3.2**	111.5±3.0*
BC 600 mg/kg	78.5±2.2	115.1±3.8**	108.7±2.2**
BC 900 mg/kg	75.8±1.8	110.9±3.4**	91.9±6.9**

Values are means±S.D.; $N=8$. *$P<0.01$; **$P<0.001$ vs. glucose (1.5 g/kg).

2.2. Preparation of extract

B. cheilandra air-dried and powdered leaves were Soxhlet extracted with MeOH for 15 h. The solution evaporated in vacuo and gave a yellowish-brown residue (yield: 6.40%). The phytochemistry analysis showed: cumarins, flavonoids, proantocianidins, terpenoids, monoglycosides of quercetin and kaempferol, β-sistosterol [8].

2.3. Animals

Wistar rats, of either sex, weighing 150–250 g were used. They were housed under standard conditions of temperature (23±2 °C), humidity and dark–light cycle (lights on from 6:00 am to 6:00 pm). Tap water was available ad libitum. All the animals were carefully monitored and maintained in accordance with the ethical recommendation of the Brazilian College of Animal Experimentation (COBEA) and the National Institute of health Guide for Care and use of Laboratory Animals.

2.4. Study of the B. cheilandra extract on glucose tolerance in rats

Fasted rats were divided into four groups of eight animals. Group I, served as a control and received distilled water. Groups II–IV received the extract of *B. cheilandra* at doses of 300, 600, and 900 mg/kg as a fine aqueous suspension. After 1 h of extract administration, the rats of all groups were orally treated with 1.5 g/kg of glucose. Blood samples were collected from the retro-orbital plexus just prior to glucose administration and 30 and 90 min after glucose loading. Serum was separated and blood glucose levels were measured immediately by the glucose oxidase method [9].

2.5. Study of the B. cheilandra extract on the alloxan-induced hyperglycemia

2.5.1. Acute treatment

Diabetes was induced by a single intraperitoneal injection of 150 mg/kg of alloxan monohydrate in sterile saline [10]. After 3 days of alloxan injection, the diabetic rats (glucose level >350 mg/dl) were separated and divided into four groups of eight rats each. Group I served as a diabetic control and was given distilled water. Groups II–IV were treated orally with the tested extract at doses of 300, 600, and 900 mg/kg, respectively. Blood samples were collected from the retro-orbital plexus just prior to and 1 and 4 h after extract administration.

Table 2
Effect of the methanolic extract of the *B. cheilandra* leaves (BC) on the alloxan-induced diabetic rats

Treatment (p.o)	Blood glucose (mg/100 ml)		
	Basal value	1 h	4 h
Control (distilled water)	390.1±1.1	368.1±3.8	3679.9±3.9
BC 300 mg/kg	358.3±1.9	325.5±3.2*	311.5±3.0*
BC 600 mg/kg	349.6±2.2	320.1±3.8*	291.7±2.2**
BC 900 mg/kg	365.8±2.8	316.2±2.9*	268.9±3.4**

Values are means±S.D.; $N=8$. *$P<0.01$; **$P<0.001$ vs. control (distilled water).

Table 3
Effect of the sub-acute treatment with the methanolic extract of the *B. cheilandra* leaves (BC) on the alloxan-induced diabetic rats

Treatment (p.o)	Blood glucose (mg/100 ml)				
	Basal value	Day 1	Day 3	Day 7	Day 10
Diabetic control	390.1±1.1	358.1±3.8	367.9±3.9	355.1±22.1	341.3±19.2
BC 300 mg/kg	358.3±1.9	325.5±3.2*	311.5±3.0*	315.4±15.5*	305.4±13.9*
BC 600 mg/kg	349.6±2.2	320.1±3.8*	291.7±2.2*	303.6±16.1*	279.7±13.7*
BC 900 mg/kg	365.8±2.8	316.2±2.9*	268.9±3.4*	259.9±10.5*	215.9±10.2*

Values are means±S.D.; $N=8$. *$P<0.01$ vs. diabetic control.

2.5.2. Sub-acute treatment

The diabetic rats (glucose level >350 mg/100 ml) were divided into four groups of eight rats each. Group I served as the diabetic control and received distilled water. Groups II–IV received the *B. cheilandra* extract at doses of 300, 600 and 900 mg/kg, as a fine aqueous suspension, orally. The administration of the extract was continued for 10 days, once daily. Blood samples were collected from the retro-orbital plexus once daily for ten days. Blood samples were collected through the retro-orbital plexus just prior to and on days 1, 3, 7 and 10 of extract administration. The blood glucose levels were determined for all the samples by the glucose oxidase method.

2.6. Statistical analysis

Data were expressed as the mean±S.D. The significance of the results was calculated using Student's *t*-test and the results were considered statistically significant when $P<0.05$.

3. Results and discussion

The effect of the *B. cheilandra* extract on glucose tolerance was reported in Table 1. The extract inhibited the increase in blood glucose levels significantly ($P<0.001$) after glucose administration. The maximum glucose tolerance was observed at the 30th min. Also, in alloxan-induced diabetic rats the extract has shown a significant ($P<0.001$) and considerable fall in the glucose level of blood (Table 2).

The sub-acute treatment with the extract on the alloxan-induced diabetic rats produced a consistent reduction in the glucose levels of blood (Table 3). It has shown a maximum reduction in the glucose level of blood by 215.9 mg/g l on the 10th day corresponding to a reduction of 55.3% compared to the diabetic control.

Taken together these preliminary results indicated that the methanolic extract of the *B. cheilandra* leaves possesses a significant hypoglycemic activity. It is generally accepted that the alloxan treatment causes a permanent destruction of β-cells [11,12]. It is, therefore, conceivable that the hypoglycemic principles in the methanolic extract of the *B. cheilandra* leaves exert their effect by an extrapancreatic mechanism in rats [12]. Further studies are needed to better evaluate the activity.

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