Research Article

Antidiabetic Activity of Alcoholic Extract of *Cinnamomum zeylanicum* Leaves in Alloxon Induced Diabetic Rats.

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Abstract:

The present study was carried out to investigate the antidiabetic potential of ethanolic extract of *Cinnamomum zeylanicum* leaves. Oral administration of ethanolic extract in the doses of 100, 150 & 200 mg/kg body weight to white Wistar albino rats significantly reduced their blood sugar level in allxon induced diabetic rats under acute and sub acute studies.

Key Words: *Cinnamomum zeylanicum,* Alloxon induced, Antidiabetic study, Glucose oxidase method.

Introduction:

Diabetes-mellitus is a chronic disease characterized by elevated blood glucose levels and disturbance in carbohydrate, fat and protein metabolism. These metabolic abnormalities result, in part, from a deficiency of the blood sugar-lowering hormone insulin. This deficiency in insulin results in type 1 diabetes or insulin dependent diabetes mellitus (IDDM). Type 2 diabetes or non-insulin dependent diabetes mellitus (NIDDM) is a result of hyperglycemia caused by overproduction of glucose at the hepatic level or because of abnormal β - cell function or insulin resistance at target cells.(Fajans et al, 1997). Currently available synthetic antidiabetic agents produce serious side effects like hypoglycemic coma (Stephen Davis, 2006) and hepatorenal disturbances (Suba et al, 2004). Moreover, they are not safe for use during pregnancy (Rahman & Zaman, 1989). Hence, the search for safer and more effective hypoglycemic agents has continued. Several investigations have been conducted related to antidiabetic activity of *Cinnamomum zeylanicum* bark (family Lauraceae) and have shown positive effect. Cinnamon has been reported to have remarkable pharmacological effects in the treatment of hyperglycemia (Kar et al, 2003;Verspohl et al, 2005).

The present study was aimed to investigate the anti-diabetic activity of an alcoholic extract of *Cinnamomum zeylanicum* leaves in alloxon induced diabetic rats.

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Material and Method:

1. Preparation of extract: The leaves of *Cinnamomum zeylanicum* (family Lauraceae) were procured from the local market of Bhopal. The dried leaves were pulverized and passed through 40 mesh sieve. The coarse powder was extracted with 95% v/v ethanol at 60^0 - 75^0 C for 48 hours. The extract was filtered, concentrated and dried under reduced pressure by rotating evaporator (yield 6.3%) and residue was kept in desicators. The suspension of ethanolic extract was prepared by using 0.5% Tween-80 in saline.

2. Animal: Healthy adult male Wistar albino rats between 2-3 months of age and weighing 150-200 gm were used for the present study. The animals were housed individually in polypropylene cages, maintained under standard conditions (12-hr light and 12-hr dark cycle, 25±5ºC and 40-60% humidity). They were fed with standard rat pellet diet (Hindustan Lever Limited. Mumbai) and provided water ad libitum.

3. Induction of non-insulin dependent diabetes mellitus (NIDDM): NIDDM was induced by a single intraperitonial injection of 150mg/kg body weight of alloxon monohydrate in normal saline solution. After two weeks, the surviving rats with fasting blood glucose level of more than 200mg/dl were considered as alloxon induced diabetic rats (Gidado et al, 2005).

4. Experimental design for antidiabetic study:

The animals were divided into six groups. Each group consisted of 6 animals.
Group I – Control, non-diabetic.
Group II – Control, diabetic.
Group III – Diabetic, treated with standard drug (Glibenclamide 10mg/kg body weight/day).
Group IV, V & VI – Diabetic, treated with ethanolic extract of *Cinnamomum zeylanicum* leaves (100, 150 & 200mg/kg body weight/day respectively) orally.

This treatment was continued for seven days.Blood samples from the rats were collected from the retro orbital plexus puncture method. Fasting blood glucose level was estimated at 0, 1, 3 & 5 hours for acute studies and on 0, 1st, 3rd, 5th & 7th day for sub-acute studies. The Blood glucose levels were determined by Glucose oxidase method (Varley, 1988).

Result:

The hypoglycemic effects of the ethanolic extract of *Cinnamomum zeylanicum* leaves on fasting blood glucose levels of diabetic rats for both acute and sub-acute studies are shown in Tables 1&2 respectively. On single oral administration of the extract for acute study a significant decrease in fasting blood sugar level was observed at dose 150 & 200 mg/kg body weight. The maximum reduction in blood glucose was observed after 5 hr at dose 200 mg/kg body weight. In sub acute treatment, on 7th day, the extract at dose of 150 & 200 mg/kg of body weight showed significant reduction in blood gulucose level as compared to that of diabetic control group.

Statistical Analysis:

The statistical analysis was carried out using the one way ANOVA, as primary test followed by Dunnett's test by graphpad Instate.

Discussion:

The present study has detected the antidiabetic effect of the ethanolic extract of *Cinnamomum zeylanicum* leaves in alloxon induced diabetic rats. Intraperitonial injection of alloxon monohydrate caused diabetes mellitus in adult male Wistar albino rats. In acute treatment, the ethanolic extract was administered to over night fasted diabetic rats. A decline in blood sugar level was observed after 1 hr, and the maximum effect was seen after 5 hr.

Table I (a) : Effect of ethanolic extract of *Cinnamomum zeylanicum* leaves on fasting blood glucose level of alloxan-induced diabetic rats (Acute studies).

Group n = 6	Blood Gulucose level mg/dl (Mean ± SD)			
	0hr	1hr	3hr	5hr
I	104.59±1.41	104.51±1.40	102.81±1.35	101.23±1.36
II	220.54±1.42	218.19±1.52	215.93±1.53	214.18±1.52
III	218.19±1.61	215.59±1.52	204.79±1.69	197.32±1.81
IV	223.32±1.25	221.51±1.68	214.34±1.24	202.14±1.42
V	217.41±1.52	211.59±1.65	203.47±1.71	195.31±1.58
VI	222.32±1.52	217.37±1.65	201.53±1.85	190.22±1.91

Table I (b) - Showing satistical significance between control diabetic and treated groups (Acute studies).

Group n = 6	One way analysis of variance (ANOVA)			
	0hr	1hr	3hr	5hr
II vs III (st. drug 10 mg/kg)	p<0.05	p<0.05	p<0.01	p<0.0
II vs IV (100 mg/kg)	p<0.05	p<0.01	ns	p<0.01
II vs V (150 mg/kg)	p<0.01	p<0.01	p<0.01	p<0.01
II vs VI (200 mg/kg)	ns	ns	p<0.01	p<0.01

Table II (a) : Effect of ethanolic extract of *Cinnamomum zeylanicum* leaves on fasting blood glucose level of alloxan-induced diabetic rats (Sub-acute studies).

Group n = 6	Blood Gulucose level mg/dl (Mean ± SD)				
	0day	1 day	3 day	5 day	7 day
I	104.59±1.41	104.10±1.51	103.79±1.62	103.59±1.82	105.10±1.52
II	220.54±1.42	220.32±1.58	221.30±1.65	220.71±1.58	222.31±1.69
III	218.19±1.61	202.91±1.35	185.46±1.59	163.73±1.52	152.53±2.13
IV	223.32±1.25	214.68±1.63	203.22±1.95	196.52±1.62	189.82±1.52
V	217.41±1.52	206.53±1.25	195.66±1.62	184.79±1.25	169.57±1.52
VI	222.32±1.52	206.68±1.62	186.68±1.55	162.22±1.52	148.90±1.65

Table II(b) : Showing satistical significance between control diabetic and treated groups (Sub-acute studies).

Group n = 6	One way analysis of variance (ANOVA)				
	0day	1 day	3 day	5 day	7 day
II vs III (st. drug 10 mg/kg)	p<0.05	p<0.01	p<0.01	p<0.01	p<0.01
II vs IV (100 mg/kg)	p<0.05	p<0.01	p<0.01	p<0.01	p<0.01
II vs V (150 mg/kg)	p<0.01	p<0.01	p<0.01	p<0.01	p<0.01
II vs VI (200 mg/kg)	ns	p<0.01	p<0.01	p<0.01	p<0.01

In sub acute study, after oral administration of *Cinnamomum zeylanicum* leaves extract at dose 150 & 200 mg/kg body weight, hyperglycemia was reduced approximately by 22% and 33% respectively on 7th day as compared to diabetic controls.

Whereas, the glibenclamide at a dose of 10mg/kg body weight reduced hyperglycemia by 30% on 7th day.

Conclusion:

The present study suggests that ethanolic extract of *Cinnamomum zeylanicum* leaves posses a potent antidiabetic property as it significantly reduced the fasting blood sugar level in alloxon induced diabetic rats as compared to diabetic control group.

Long term studies of *Cinnamomum zeylanicum* leaves and its isolated compounds are necessary to elucidate the exact mechanism of action so as to develop it as a potent antidiabetic drug.

Bibliography:

1. Fajans SS, Cloutier MC, Crowther RL **:** Clinical and etiological heterogeneity of idiopathic diabetes mellitus (Banting Memeoral Lecture). *Daibetes*, 1997;7:1112-1125.
2. Gidado A, Ameh, D.A., Atawodi, S.E **:** effect of Nauclea latifolia leaves aqueous extracts on blood glucose levels of normal and alloxon-induced diabetic rats. *African Journal of Biotechnology*, 2005; 4 (1):91-93
3. Kar A, Choudhary BK, Bandyopadhyay NG : Comparative evaluation of hypoglycemic activity of some Indian medicinal plants in alloxan diabetic rats *Journal of Ethenopharmacol*, 2003; 84(1):105-108.
4. Rahman Q, Zaman K : Medicinal Plants with hypoglycemic activity. *Journal of Ethnopharmacol*, 1989;26:1-55.
5. Stephen N. Davis : Insulin, Oral hypoglycemic agent and the Pharmacology of endocrine Pancreas. In: Goodman & Gillman's The Phamacological Basis of Therapeutics. Laurence L. Burnton, John S. Lazo, Keith L. Parker, Eds; 11th Edn; McGraw-Hill Medical Publishing Division, New York, 2006;pp.1613-1641.
6. Suba V, Murugesan T, Arunachalam G, Mandal SC, Sahu BP.: Antidaibetic potential of Barleria lupilina extract in rats. *Phytomed*, 2004;11:202-205
7. Varley Harold : Practical clinical biochemistry. 4th Edn. ; C B S Publishers & Distributors, Delhi, 1988; p 84.
8. Verspohl E.J, Katrin B, Neddermann E.: Anti-diabetic effect of *Cinnamomum cassia* and *Cinnamomum zeylanicum* in vivo and in vitro. *Phytotherapy Research*, 2005;19(3):203 - 206 .