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ANTI DIABETIC EFFECT OF ORAL ADMINISTRATION OF CINNAMON IN WISTAR ALBINO RATS

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Background: The present study was undertaken with an objective to observe effectiveness of oral administration of cinnamon extract to hyperglycemic induced rats using alloxan. Male and female Wistar Rats were injected with alloxan to induce hyperglycemia. **Methods:** This is an experimental study to determine whether cinnamon has an ability to combat hyperglycemic rats. Blood glucose was estimated by GOD-PAP method using diagnostic kit supplied by Agappe diagnostics, Maharashtra. **Results:** The present experimental study provides further evidence that oral administration of Cinnamon extract for 21 days produced a significant decrease in the blood glucose level in the model of alloxan induced diabetes rats. **Conclusion:** From this study, we can conclude that the oral administration of Cinnamon extracts have beneficial effect on blood glucose levels. However further pharmacological and biochemical investigations will clearly elucidate the mechanism of action and helpful in projecting these plant extracts as a therapeutic target in diabetes research.

Keywords: cinnamon, extract, anti-diabetic, effect.

INTRODUCTION

The word diabetes comes from Latin *diabētēs*, which in turn comes from Ancient Greek διαβήτης (*diabētēs*) which literally means "a passer through; a siphon".[1] Diabetes mellitus, is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not respond to the insulin that is produced.[2] This high blood sugar produces the classical symptoms of polyuria, polydipsia, and polyphagia .

Therapeutic agents like sulfonyl urea, biguanides etc are used to control blood glucose level in diabetic patients. However chronic usage of most of these agents produces side effects.[3] In addition, increase in the cost of the treatment and increase in failure rates made difficult to use these agents for prolonged period. Hence there is a need of a treatment which is having low side effects and affordable by general population.

Plants have been used for the treatment of diabetes since 1550 BC.[4] Spices have been used since ancient times not only for increasing the flavor of foods but also for their preservative and medicinal properties.

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A number of spices and herbs have a long history of traditional use in treating elevated blood sugar levels.[5] Cinnamon is one of the traditional folk herbs used in Korea, China and Russia for diabetes mellitus.[6] Cinnamon extract decreases blood glucose in Wistar rats[7] and cinnamon increase the insulin sensitivity and glucose uptake in adipocytes.[8]

The present study was undertaken with an objective to observe the anti diabetic effect of oral administration of cinnamon.

MATERIALS AND METHOD

Experimental Animals

Thirty adult male and female Wistar rats, weighing 150-200g, and 60 days of age were selected for this study. All rats were housed in polypropylene cages (30x22x14cm) and fed with commercial pellet rat chow and water and standard laboratory conditions are maintained with 12 :12 h light: dark cycle with a room temperature of 28±4°C.

Materials

Collection and preparation of plant extracts

Cinnamon extract

Cinnamon extract (Sample No: Cad-202A) was received as a gift from KANCOR-Ingredients Limited, Ingredient solutions partnership, Oleoresin Manufacturer and pioneers of spice extraction industry, Manufacturing & Export Kancoor Road, Angamaly South, Kerala, India.

Cinnamon extract is prepared by soaking 50 gm of grinded cinnamon in 150 ml hot water

(88°C) in water bath for 6 h. Then filtered by capron silica cloth and the filtrate was stored in dark bottles in the refrigerator at (4°C).

Chemicals and reagents

Alloxan

Alloxan (S D Fine- Chem, India) is used in this study. Alloxan is a urea derivative which causes selective necrosis of the β- cells of pancreatic islets. In addition, it has been widely used to produce experimental diabetes in animals such as rabbits, rats, mice and dogs with different grades of disease severity by varying the dose of alloxan used.[9, 10] Diabetes was induced in the rats by injecting alloxan intraperitonially (I.P) in a single dose of 150mg/kg of body weight.

Experimental design

Rats were divided into three groups containing six animals each. All animals were fasted eight hours before treatment. Diabetes was induced in the rats by injecting alloxan intraperitonially (I.P) in a single dose of 150mg/kg of body weight and the plant extracts are administered orally.

Control Group

Served as normal control and did not receive either alloxan or plant extract.

Hyperglycemic Group

Served as diabetic control and received alloxan only.

Cinnamon group

Alloxan + Cinnamon extract

After four hours of administration of alloxan, blood samples are collected from all the groups including control group for blood glucose estimation. This is considered as zero time. Blood glucose was estimated by GOD-PAP method using diagnostic kit supplied by Agappe diagnostics, Maharashtra. Oral administration of Cinnamon extract to cinnamon group for 3 weeks to treat hyperglycemia. Blood samples were collected from all the groups at the end of every week for the estimation of blood glucose. Blood glucose levels were compared in all the groups. All the blood samples were collected from the caudal vein using butterfly needle to reduce the infection and hemorrhage.

Data analysis

Two sample t- test, One way ANOVA, post hoc test is used to compare the number of trials.

RESULTS

The analysis of data is presented in Table 1, 2, 3, and 4. Single intraperitoneal administration of alloxan 150 mg/kg led to elevation of blood glucose level.

Table 1
Blood Glucose in control group rats
(pair = pair of blood glucose readings)

	Treatment	Mean blood glucose (mg%)	t	*p*
Pair 1	Zero time After 1 week	88.00±4.77 87.16±6.40	0.542	0.611
Pair 2	Zero time After 2 week	88.00±4.77 88.50±4.84	-0.227	0.829
Pair 3	Zero time After 3 week	88.00±4.77 88.50±4.84	-0.338	0.749
Pair 4	After 1 week After 2 week	87.16±6.40 88.50±4.84	-0.515	0.629
Pair 5	After 1 week After 3 week	87.17±6.40 88.50±4.84	-1.305	0.249
Pair 6	After 2 week After 3 week	88.50±4.84 88.50±4.84	0.001	1.000

Table 2
Blood Glucose level of Alloxan Induced Rats.
(pair = pair of blood glucose readings)

	Treatment	Mean blood glucose (mg%)	t	*p*
Pair 1	Zero time After 1 week	211.33±6.95 205.83±8.38	1.635	0.163
Pair 2	Zero time After 2 week	211.33±6.95 173.16±3.43	10.915	0.001
Pair 3	Zero time After 3 week	211.33±6.95 161.00±5.51	11.168	0.001
Pair 4	After 1 week After 2 week	205.83±8.38 173.16±3.43	11.565	0.001
Pair 5	After 1 week After 3 week	205.83±8.38 161.00±5.51	10.501	0.001
Pair 6	After 2 week After 3 week	173.16±3.43 161.00±5.51	4.386	0.007

Table 3
Blood Glucose level of Alloxan induced diabetic rats treated with Cinnamon
(pair = pair of blood glucose readings)

	Treatment	Mean blood glucose (mg%)	t	*p*
Pair 1	Zero time After 1 week	211.83±5.60 176.33±3.01	13.906	0.001
Pair 2	Zero time After 2 week	211.83±5.60 145.16±3.54	20.897	0.001
Pair 3	Zero time After 3 week	211.83±5.60 130.33±3.93	25.540	0.001
Pair 4	After 1 week After 2 week	176.33±3.01 145.16±3.54	35.725	0.001
Pair 5	After 1 week After 3 week	176.33±3.01 130.33±3.93	43.209	0.001
Pair 6	After 2 week After 3 week	145.16±3.54 130.33±3.93	19.802	0.001

The anti-diabetic effect of Cinnamon, extract on diabetic rats was significant. The zero time, after 1 week, after 2 week and after 3 week of these three groups compared by using a one way ANOVA indicates a significant difference with p = 0.001 is observed between the groups and within goup.

Table 4 Resume of One way ANOVA Analysis

Treatment		Sum of Squares	Mean Square	F	p
Zero time	Between Groups	71965.533	17991.383	553.695	0.001
	Within Groups	812.333	32.493		
	Total	72777.867			
After 1 week	Between Groups	50653.533	12663.383	381.504	0.001
	Within Groups	829.833	33.193		
	Total	51483.367			
After 2 week	Between Groups	26945.667	6736.417	506.497	0.001
	Within Groups	332.500	13.300		
	Total	27278.167			
After 3 week	Between Groups	19894.200	4973.550	258.501	0.001
	Within Groups	481.000	19.240		
	Total	20375.200			

DISCUSSION

Management of diabetes with the agents devoid of side effects is still a challenge to the medical system. This concern has led to an increased demand for natural products with anti-diabetic activity, having fewer side effects.

It was reported that plant extracts causes anti diabetic effect by promoting regeneration of beta cells or by protecting these cells from destruction.

Plant extracts may activate insulin receptors or affects beta cells to release insulin.[11] Administration of cinnamon decreases the sugar level in normal and diabetic rats.[12, 13, 14.] The present experimental study provides further evidence that oral administration of Cinnamon, extract for 21 days produced a significant decrease in the blood glucose level in the model of alloxan induced diabetes in rats.

CONCLUSION

From this study, we can conclude that the oral administration of Cinnamon extract have beneficial effects on blood glucose levels. However further pharmacological and biochemical investigations will clearly elucidate the mechanism of action and helpful in projecting these plant extracts as a therapeutic target in diabetes research**.**

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