

Hypoglycemic Effect of *Tinospora cardifolia* in Type II Diabetes Mellitus

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Abstract

Introduction: Aim of the present investigation is to evaluate the hypoglycemic effects of an alcohol extract of dried stem of *Tinospora cardifolia*, an indigenous plant used in Ayurvedic medicine in India.

Purpose: To establish the hypoglycemic effect of the drug. To evaluate if there are any renal or hepatic toxicity.

Materials and Methods: A total of 50 individuals, 15 normal and 35 diabetic in age group 35-65 were selected for study and extract of *T. cardifolia* in the dose 2 g and 4 g was administered for 2 weeks. Blood sugar was monitored after 1 week and 2 weeks of administration.

Results: Mean post prandial blood sugar after 1 h and 2 h was significantly reduced at the end of 2 weeks. Furthermore, there were no significant hepatic and renal toxicity.

Conclusion: The drug significantly reduced the blood sugar levels at the end of 2 weeks in the dose of 2-4 g per day. The drug is free from any liver or renal toxicity.

Key words: Aliphatic compounds, Alkaloids, Diterpene, Glycosides, Hypoglycemic, Lactones, Liver function test, Phenolics, Polysaccharides, Sesquiterpenoids, Steroids, *Tinospora cardifolia*

INTRODUCTION

Diabetes mellitus is a heterogeneous group of diseases with disorders metabolism and inappropriate hypoglycemic due to a deficiency either of insulin secretion or to a combination of insulin resistance and inadequate insulin secretion to compensate. It is due to the diversity of etiological, environmental, and genetic factors acting together. It is broadly classified into broad etiopathogenic categories.

Type I diabetes mellitus - the cause is absolute deficiency of insulin secretion and Type II diabetes mellitus - the cause is the combination of resistance to insulin action

and an inadequate compensatory insulin secretory response.

WHO diagnostic criteria for diabetes mellitus - plasma glucose level of 126 mg/dl or higher after an overnight fast on more than one occasion.

A value of 200 mg/dl or above within 2 h after 75 g of oral glucose is of diagnostic value in diagnosis of diabetes mellitus.

Role of *Tinospora cardifolia* as a hypoglycemic agent has been recognized since ancient times. It is a large glabrous deciduous climbing shrub belonging to the family Menispermaceae which is distributed throughout tropical Indian subcontinent and China. It is widely used for its general tonic, antipyretic, antispasmodic, anti-inflammatory, antiarthritic, anti-allergic, and antidiabetic properties. A variety of constituents have been isolated from this plant and their structures elucidated. They belong to different classes such as alkaloid, diterpenoids, lactones, glycosides,

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Table 1: Hypoglycemic effect of *Tinospora cardifolia* after 1 and 2 weeks of treatment in type 2 diabetes patients

Parameters	Initial readings	1 week of treatment	2 weeks of treatment	P value	Significance
	Mean±SD	Mean±SD	Mean±SD		
FBS	122.77±22.57	112.94±20.48	104.11±20.76	<0.001	Highly significant
1 h PPBS	226.87±59.7	217.77±54.9	205.61±56.03	<0.001	Highly significant
2 h PPBS	200.49±58.69	192±54.37	180.94±55.33	<0.001	Highly significant
Serum bilirubin	0.826±0.22	0.831±0.25	0.77±0.20	>0.05	Not significant
SGPT	17.60±7.21	16.86±7.01	16.49±7.08	>0.05	Not significant
Alkaline phosphatase	6.60±3.24	5.94±2.72	5.89±2.56	>0.05	Not significant
Blood urea	24.83±7.9	23.37±7.30	23±6.9	>0.05	Not significant
Serum creatinine	1.09±0.45	1.07±0.39	1.05±0.39	>0.05	Not significant

PPBS: Post prandial blood sugar, FBS: Fasting blood sugar, SGPT: Serum glutamic pyruvic transaminase, SD: Standard deviation

steroids, sesquiterpenoids, phenolics, aliphatic compounds, and polysaccharides.

MATERIALS AND METHODS

This study was conducted on 15 normal and 35 diabetic individuals in the age group of 35-60 years; they were maturity onset diabetics selected from the inpatient and outpatient department of Katihar Medical College, Katihar. A thorough medical checkup and medical history recording was done to know any major illness. These diabetics were free from infection or any major illness; they were taking some form of antidiabetic treatment. The control group was selected from medical students, staff, and other volunteers not suffering from any apparent disease. Each of these individuals was subjected to standard glucose tolerance test. Glucose was given orally in the dose of 1 g/kg body weight. Level of blood sugar was estimated from fasting as well as 1 h and 2 h after oral glucose. They were also subjected to various liver function tests (LFT).

Statistical Analysis

Results were presented as mean \pm standard deviation (SD). Comparison was made by unpaired *t* test. $P < 0.001$ was considered significant. Correlation between parameters was performed by Pearson correlation analysis.

RESULTS

Results are summarized in Table 1. The glucose levels decreased significantly after 1 week and 2 weeks of treatment with the extract of *T. cardifolia*. Furthermore, the LFT and renal function test were not significantly altered.

DISCUSSION

Mean fasting blood sugar (FBS) at the onset of treatment was 122.77 mg/dl. Mean FBS after 1 week of treatment was 112.94 mg/dl and after 2 weeks of treatment was

104.11 mg/dl. At the end of 1 week, there was a reduction in mean FBS by 10% and after 2 weeks there was a reduction by 18.66%. This was highly significant ($P < 0.001$).

Mean 1 h postprandial sugar at onset was 226.87 mg/dl after 1 week was 217.77 mg/dl and at the end of 2 weeks was 205.61 mg/dl. At the end of 1 week, there was reduction of 9.10% ($P < 0.05$) and after 2 weeks reduction of 21.26% noted ($P < 0.001$). This is highly significant.

Mean 2 h postprandial blood sugar at the onset was 200.49 mg/dl, after 1 week of treatment was 192 and after 2 weeks was 180.95 mg/dl. This reduction of 8.49% at the end of 2 weeks was significant ($P < 0.05$).

Thus from the above observation, the hypoglycemic effect of *T. cardifolia* is established. These findings are in accordance with Gupta *et al.*; Yajnic *et al.*; Khory *et al.*^{1-3,4,7,8}

Furthermore, the drug has no significant effect on LFT (serum bilirubin, serum glutamic pyruvic transaminase, alkaline phosphatase) and renal function test (blood urea and serum creatinin) levels during or after the treatment which is in agreement with Rege *et al.*; Bhasin; Yajnic *et al.*^{5,6,8}

CONCLUSION

It was found that the drug significantly lowered the blood sugar levels at the end of 2 weeks in the dose of 2-4 g/day. Possible mechanism of action could be by increasing endogenous insulin secretion increasing the uptake of glucose by peripheral tissues and by decreasing glycogenolysis and increasing glycogenesis. The drug is free from any liver or renal toxicity.

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