Research Article

# Antidiabetic activity of the aqueous extract of *Chlorophytum borivilianum* L. In Streptozotocin induced- hyperglycemic rats- A preliminary study

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**ABSTRACT**

The aqueous extract of roots of *Chlorophytum borivilianum* L. at a dose of 250 mg/kg and 500 mg/kg body weight respectively was tested for antidiabetic activity in streptozotocin (STZ)- induced hyperglycaemic rats. The blood glucose levels were measured at 0, 2h, 4h and 6h after the treatment. The aqueous extract reduced the blood glucose in STZ- induced diabetic rats from 285.56 to 206.82 mg/dl, 6h after oral administration of extract ($P<0.01$). The antidiabetic activity of aqueous extract of *Chlorophytum borivilianum* was compared with glibenclamide, an oral hypoglycaemic agent (3mg/kg).

**Key words**: Antidiabetic activity, *Chlorophytum borivilianum,* Streptozotocin, Glibenclamide.

## INTRODUCTION

Diabetes mellitus is a group of metabolic disorders characterized by hyperglycemia. 1.3 % of the population suffers from this disease throughout the world. Currently available synthetic antidiabetic agents like sulfonyl ureas, biguanides, α glucosidase inhibitors etc besides being expensive produce serious side effects . Further their use is not safe during pregnancy [1]. Thus due to an increase in demand by patients to use natural products with antidiabetic activity, investigations on hypoglycaemic agents derived from medicinal plants have gained popularity in recent years. Laboratories are conducting research on these medicinal plants in a scientific manner for the development of alternative drugs and strategies for better management of diabetes.

*Chlorophytum borivilianum* Linn. (Family; Liliaceae) commonly known as Safed musli in Hindi, is an annual herb with sub erect leaves and tuberous root system that grows well in tropical and subtropical climates with altitudes up to 1500m [2]. The plant is rich in many pharmaceutical active constituents, mainly glycosides which have been isolated from leaves and roots [3,4]. The roots of *Chlorophytum borivilianum* widely used as a natural sex tonic in Ayurveda and unani system of medicine is an integral part of more than 100 herbal drug formulations [5]. The other reported pharmacological activities include Antitussive [6], contraceptive [7], and antitumor activity [8]. In the present study the antihyperglycemic activity of aqueous extract of *Chlorophytum borivilianum* roots is investigated in a scientific manner in STZ – induced hyperglycaemic rats.

## MATERIALS AND METHODS

### Collection of Plant material

The roots of the plant *Chlorophytum borivilianum* were collected from Khari Baoli market, New Delhi, India and authenticated by the taxonomist of Department of Botany, Faculty of Science, Hamdard University. The voucher specimen was deposited in the herbarium of university for future reference (JHFP-2006).

### Preparation of Aqueous root extract

The aqueous extract was prepared by cold maceration of 100 g of shade dried root powder in 500 ml distilled water for 5 days. The extract was filtered, concentrated, dried in vacuo (yield 3.4 g) and the residue stored in a refrigerator at 2-8 $^0$C for use in experiment.

### Animals

The antidiabetic activity was carried out on Wistar rats of either sex and approximately the same age, weighing about 150-200 g, supplied by Central animal house facility of Jamia Hamdard, New Delhi (Registration no. 173/CPCSEA). They were maintained in a 12 h light/dark cycle at 25 ±2 $^0$C. They

were allowed free access to standard pellet diet (Amrut Laboratory Rat Feed, Navamaharashtra, Pune, India) and water *ad libitum*. The study was approved by institutional animal ethics committee and ethical norms were strictly followed during all experimental procedures.

**STZ induced hyperglycemia in rats**

Diabetes was induced experimentally in rats by a single ip injection of a freshly prepared solution of STZ (Sigma, USA) at a dose of 50mg/kg body weight in 0.1 M cold citrate buffer of pH 4.5. After 72 h, blood was collected from tail vein of the rats under ether anesthesia and blood glucose levels were estimated using a glu-oxidase peroxidase reactive strips and glucometer (one touch basic plus). The animals were considered to be diabetic if the blood glucose values were above 250 mg/dl, and those animals alone were used for the study. Control rats were injected with citrate buffer alone.

**Experimental design for antidiabetic activity**

The rats were divided into five groups comprising 6 animals in each group as follows

Group I: Normal control rats given only buffer.

Group II: Diabetic controls (STZ, 50 mg/kg body weight).

Group III: Diabetic rats treated with glibenclamide (3mg/kg b.w.)

Group IV and V: Diabetic rats treated with *Chlorophytum borivilianum* (250 mg/kg and 500 mg/kg b.w. respectively)

The blood glucose levels of experimental animals were determined at 0, 2, 4 and 6 h after feeding the plant extract by using glu-oxidase peroxidase reactive strips and glucometer (one touch basic plus).

**Statistical analysis**

Values are expressed as mean±S.E.M. (n=6). Statistical significance was determined by one way analysis of variance (ANOVA) followed by Dunnet's *t* test [9]. $P<0.01$ and $P<0.05$ were considered statistically significant when compared with diabetic control.

## RESULTS AND DISCUSSION

Oral treatment with aqueous extract of *Chlorophytum borivilianum* roots (250 and 500 mg/kg b.w.) to STZ induced diabetic rats produced dose dependant reduction of blood glucose levels particularly 6 h after treatment (n=6, $p<0.01$) (-63.77 to –74.80 g/dl, respectively) compared to diabetic control group (Table 1). Aqueous extract at a dose of 250 mg/kg b.w. and 500 mg/kg b.w. reduced the elevated level of blood glucose from 285.56 to 221.79 and 281.62 to 206.82 g/dl, respectively) 6 h after treatment. Glibenclamide (3 mg/kg b.w) also produced a significant reduction in blood glucose levels compared to control group (289.95 to 187.53 g/dl, $P<0.01$).

STZ induced diabetes mellitus and insulin deficiency lead to increased blood glucose level. When *Chlorophytum borivilianum* root extract was administered to diabetic rats, hypoglycaemia was observed after 2 h, with the maximum effect being seen at 6 h.

From the results it is assumed that the root extract could be responsible for stimulation of insulin release and observed restoration of blood glucose level. Further, the observed decreased blood glucose lowering effect of the extract in STZ-induced diabetic rats could also possibly be due to increased peripheral glucose utilization. It has been reported that using medicinal plant extract to treat STZ-induced diabetic rats results in activation of *ß*-cells and insulinogenic effects [10]. The antihyperglycemic activity of the Aq. extract of *Chlorophytum borivilianum* roots was comparable with glibenclamide, a standard hypoglycaemic drug.

## CONCLUSION

The present work has detected the antidiabetic activity of *Chlorophytum borivilianum* root extract in STZ- induced hyperglycemia in rats. Isolation of phytoconstituents responsible for the observed activity is currently under progress in our lab as further detailed studies are required to validate its use in traditional system of medicine.

**Table 1: Effect of *Chlorophytum borivilianum* on plasma glucose levels in streptozotocin –induced diabetic rats**

| S. No. | Group | Treatment | Blood glucose level in mg/dl after 0h | 2h | 4h | 6h |
|---|---|---|---|---|---|---|
| 1 | I | Normal control | 71.73±2.48 | 73.34±2.82 | 76.21±2.15 | 74.86±2.42 |
| 2 | II | Diabetic control | 284.53±8.74 | 280.11±7.62 | 278.25±7.54 | 281.71±8.07 |
| 3 | III | Diabetic control +Standard (3mg/kg) | 289.65±7.42 | 238.46±6.15* | 202.74±6.86* | 187.53±5.37* |
| 4 | IV | Diabetic control +Extract (250 mg/kg) | 285.56±7.35 | 260.57±7.81 | 248.82±6.42** | 221.79±6.15* |
| 5 | V | Diabetic control +Extract (500 mg/kg) | 281.62±8.05 | 244.61±6.85* | 216.24±5.32* | 206.82±5.78* |

Values are mean ±S.E.M. (n=6).*P<0.01; **P<0.05 Vs diabetic control. One way analysis followed by Dunnet's *t* test.

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