DOI: https://doi.org/10.52756/ijerr.2024.v38.003 *Int. J. Exp. Res. Rev.*, Vol. 38: 26-36(2024)

Original Article | *Peer Reviewed* | *Open Access*

International Journal of Experimental Research and Review (IJERR)

ISSN: 2455-4855 (Online)
www.iaph.in
ISSN 2455-4855

Antidiabetic and Antihyperlipidemic Effects of Crude Fractions from *Chlorophytum borivilianum* Root Methanolic Extract on Streptozotocin Induced Diabetic Rats and Phytochemical Investigation by LCMS Analysis

Sunayana Vikhe[1]*, Pravin Aladi[1] and Rahul Vikhe[2]

[1]Department of Pharmacognosy, Pravara Rural College of Pharmacy, Loni, Maharashtra, India;
[2]Department of Financial Management, Sir Vishveshwaraiya Institute of Technology, Sinnar, Maharashtra, India

E-mail/Orcid Id:

SV, sunainavikhe@gmail.com, https://orcid.org/0000-0001-5515-4005; *PA,* pravinaladi21@gmail.com, https://orcid.org/0000-0001-5515-4005;
RV, rahul31v@yahoo.com, https://orcid.org/0000-0001-5515-4005

Article History:

Received: 10th Dec., 2023
Accepted: 05th March, 2024
Published: 30th Apr., 2024

Keywords:

α-amylase, α-glucosidase, diabetes, hyperlipidemia, *Chlorophytum borivilianum*, root.

How to cite this Article:
Sunayana Vikhe, Pravin Aladi and Rahul Vikhe (2024). Antidiabetic and antihyperlipidemic effects of crude fractions from *Chlorophytum borivilianum* root methanolic extract on streptozotocin induced diabetic rats and phytochemical investigation by LCMS analysis. *International Journal of Experimental Research and Review*, *38*, 26-36.
DOI:
https://doi.org/10.52756/ijerr.2024.v38.003

Abstract: To evaluate the in vitro and in vivo pharmacological efficacy of the plant *Chlorophytum borivilianum* in diabetes and hyperlipidemia and to confine and describe the synthetic constituents from the roots that are in charge of the action. The present study was carried out to investigate the ethno-medical use of *Chlorophytum borivilianum* root methanolic extract as a potential anti-diabetic and antihyperlipidemic agent in STZ-induced diabetic rats. Extract was tested for *in vitro* and *in vivo* biological activities. Soxhlet extraction was carried out using methanol as a solvent, and TLC and column chromatography were used for fractionation. Liquid Chromatography and Mass Spectroscopic study confirmed the structures of isolated compounds. *Chlorophytum borivilianum* root methanolic extract showed the presence of phytoconstituents as *Dihydrocapsaicin, Reserpine, Deserpidine, Biliverdin-IX-α,* and Cassiamin C having a therapeutic effect. Dihydrocapsaicin was identified at RT 7.572 and the *Chlorophytum borivilianum* root chloroform methanolic extract fraction noticeably depleted increased blood glucose levels and had positive effects on altered lipid profile after administering a dose of 150 mg/kg orally compared with oral hypoglycemic drug metformin. All the results are dose-dependent. Active chloroform-methanol fraction from methanol extract showed the presence of anti-diabetic compound, *Dihydrocapsaicin*. The chloroform-methanol fraction from the methanolic extract of *Chlorophytum borivilianum* root can inhibit the parameters linked to diabetes and hyperlipidemia.

Introduction

Diabetes mellitus is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbed carbohydrates, fats and protein metabolism. Its result is defects in insulin secretion (Pramanik, 2018; Sarkar et al., 2022; Biswas et al., 2023). Diabetes means the human body's blood sugar level is too high (Roy et al., 2023; Jaiswal and Gupta, 2023). The high sugar level in the blood is not good for human health. Diabetes is a metabolism disorder, which is how our body uses digested food for growth and energy (Sarkar et al., 2022; Sur et al., 2023; Tyagi et al., 2024). Diabetes mellitus has been recognized as a growing worldwide epidemic by many health advocacy groups, including the World Health Organization (WHO). The WHO has estimated that diabetes will be one of the world's leading causes of death and disability within the next quarter century (Aloke et al., 2022) In the Indian system of Ayurveda, tubers of *Chlorophytum borivilianum Santapau and Fernandes* are very famous for their apoptogenic and aphrodisiac properties. *Chlorophytum borivilianum*, commonly known as Safed Musli, is a genus of at least 200-220 species of recurrent flowering plants in the Asparagaceae family, native to the humid and subtropical area of Asia and Africa (Kaushik, 2005; Sundaram et al., 2011). It is found in the oldest mountain ranges on the continent, the Aravalli's, from where it spread to the nearby areas of the sub-continent, currently known as

***Corresponding Author:** sunainavikhe@gmail.com

states such as Madhya Pradesh, Rajasthan and Haryana with, ending in Delhi. They grow to 30 cm high, with long, lanceolate leaves 20-70 cm long and 0.5-2 cm broad, inducing from a thick, fleshy rhizome. The small-sized white flowers are of 120 cm long. The panicle species sometimes contains plantlets with roots spreading in the ground. *Chlorophytum borivilianum* contains many chemical constituents such as vitamins, proteins (5-10%), Alkaloids (30%), Steroids, Saponins (10-20%), Potassium, Calcium, Magnesium, Polysaccharide (40-45%), Phenols, Mucilage (Deore and Khadabadi, 2008; Habeeb et al., 2007; Mayank and Dixit, 2008; Sundaram et al., 2011; Tandon et al., 1992). The chemical constituents show Anthelmintic Activity, Antioxidant Activity, Antibiotic Activity, Antimicrobial Activity, Antiviral activity, Antifungal Activity, Antihypertensive, Aphrodisiac activities, Immune System Modulator, and prevent gastric ulcer (Li et al.,1990; Sundaram et al., 2011; Acharya et al., 2023; Dhakar and Tare, 2023). This article briefly explains infectious diseases such as urinary tract infections, respiratory tract infections, and gastrointestinal tract infections (Sundaram et al., 2011).

Material and method

Collection and Authentication of Plant

The roots of the plant *Chlorophytum borivilianum* were collected from Mahatma Phule Krishi Vidyapeeth Rahuri, Ahmednagar. Maharashtra and authenticated by the botanist of Department of Botany, Dr A.S. Wable. A specimen sample was deposited at Department of Botany, PVP College Pravaranagar, Loni Ahmednagar (Ref.no./PVPC/Bot/2021-22/91).

Chemicals and reagents

Major chemicals like chloroform and methanol were used to carry out the research. And reagent like Mayer's reagent, Fehling's reagent, Benedict's reagent, Drangdroff's reagent and ruthenium red were used whole research work.

Processing and extraction

Chlorophytum borivilianum roots [100gm]

⬇

Dried in shade and powdered

⬇

Extracted with methanol in Soxhlet extractor for 12 hours.

⬇

Extract will concentrated by vacuum distillation.

⬇

Dried in desiccator

⬇

Percentage yield of *methanolic* extract

⬇

The completion of extraction will be indicated by taking samples from siphon tube on TLC plate and place it in iodine chamber

⬇

Absence of colored spot on plate indicates complete extraction.

⬇

Extracts are stored in an airtight container until further use (Baye et al., 2022)

Physico-chemical parameters and preliminary phytochemical screening

Root powder's different physicochemical parameters (such as moisture content, total ash, acid insoluble ash, water soluble ash and extractive values) were estimated using the standard method. The methanolic root extract of *Chlorophytum borivilianum* was subjected to different qualitative tests to determine the presence of various phytoconstituents (Tandon et al., 1992).

Column Chromatography

The slurry of adsorbent (the activated silica for the column) was prepared by mixing it with the solvent (mobile phase) & pouring the mixture into the glass tube containing solvent. The cotton gave a flat base to the adsorbent column, which was placed into the tube before pouring the slurry. Adsorbent was allowed to settle & sample was loaded. The sample was prepared by mixing the extract with silica until it became free-flowing. Cotton was placed above the sample loaded to avoid disturbances to the sample as a fresh mobile phase was added to the column. The level of the solvent was never allowed to fall below the level of the sample. Then, the column was eluted with a mobile phase using a gradient. Fractions of the desired volume were collected & dried at room temp. The fraction collected from column depended on their colour. Three fractions were collected. Adsorbent Silica gel 60 – 120 mesh activated at for 110^0C 1 hr. Length of column 40 cm. Diameter of column is 1 cm. Rate of elution 20 drops/min. Mobile Phase - Chloroform: methanol (50:30) (Gokhale et al., 2007).

Liquid Chromatography- Mass Spectroscopy

Three fractions were collected Fraction A, Fraction B and Fraction C and thin layer chromatography (TLC) was done of these fractions using stationary phase silica gel G and mobile phase Chloroform: methanol (9.5: 0.5). The Fraction B showed better spot was observed in TLC and that spot was observed in under UV Light. After TLC the

DOI: https://doi.org/10.52756/ijerr.2024.v38.003

fraction B was kept for natural evaporation for LC-MS analysis. The observed spot of fraction B is sent for LC-MS Analysis to IIT Bombay (Khandelwal et al., 2005).

In-vitro Antidiabetic activity

A) Alpha amylase inhibition

Assay of Amylase Inhibition

The Bernfeld method was used to study the inhibition of amylase. In brief, 20,40,80,100 µg/ml of the *Chlorophytum borivilianum* (Safed Musli) was allowed to react with 500 µL of 0.1M phosphate buffer pH 6.9 containing α-amylase enzyme (fungal diastase (0.5%)) After 10-minute incubation at 250C, 500 µL of 1% starch solution in 0.1M phosphate buffer pH6.8 was added. Again, incubated at 250c for 10 min. The same was performed for the controls where 500 µL of the enzyme was replaced by buffer. After incubation, 1000 µL of dinitro salicylic acid reagent was added to both control and test. They were kept in boiling water bath for 10 min and cooled (Remok et al., 2023). The absorbance was recorded at 540 nm using a spectrophotometer and the percentage inhibition of α-amylase enzyme was calculated using the formula

Inhibition (%) = Absorbance 540 (control) sample – Absorbance 540 (extract) * 100

Absorbance 540 (control) sample

Simultaneously, appropriate blank reagent and inhibitor controls were carried out (Kirankumar Hullatti et al., 2015).

B) Alpha-glucosidase inhibition assay

Inhibitory activity of α-Glycosidase was performed using a previously published method with some modifications. Sample solution of *Chlorophytum borivilianum* (Safed Musli) (20, 40, 80, 100 µg/ml) was mixed with glutathione (50 µL), α-glucosidase solution (50 µL) in phosphate buffer (pH = 6.8) and pNPG (4-Nitrophenyl β-D-glucopyranoside) (50µL) in a 96-well microplate and incubated for 15 min at 37°C. While, a blank was prepared with sample and reaction reagents with no enzyme (α - glucosidase) solution. Then, the reaction is ended with the addition of sodium carbonate (50 µL, 0.2 M). Then, the absorbance was calculated at 400 nm (Daou et al., 2022).

% inhibition = control OD - Test OD / Control OD x100 (Madhusudhan Telagari et al., 2015)

In-vivo Antidiabetic activity

Induction of experimental diabetes

Male Wistar rats were given a single intraperitoneal injection of newly prepared streptozotocin (STZ) solution (55 mg/kg body weight) after being fasted for 12–14 hours. This caused the rats to develop diabetes. Weight and fasting blood glucose levels were then measured using a glucometer. Alloxan was prepared according to the weight of each particular animal. After streptozotocin was given, they were given food and drank 30 minutes later (Srivastava et al., 2020). Each animal's plasma blood glucose level was assessed by drawing blood from the tail and the animals 4 to 5 days after streptozotocin injection. Fasting blood sugar readings of 99 mg/dL or less are regarded as normal, 100 mg/dL to 125 mg/dL as prediabetic readings, and 126 mg/dL or higher as diabetes readings (Safitri et al., 2021).

Experimental design

Male Wistar Rats were divided into nine groups. Each group contained six animals (n=6) and was treated for 21 days. Diabetes was induced by streptozotocin (STZ) with normal saline in experimental animals. Group I was a normal control (NC) with non-diabetic animals who were kept on regular food and drinking water ad libitum. Group II to Group IX was diabetic control (DC) in which diabetes was induced by injecting streptozotocin (55 mg/kg b. w). Group III Positive Group (PC) received the standard drug metformin. Orally administered at 150 mg/kg b.w., Group IV to Group IX was a treatment group and Group IV was treated with *Chlorophytum borivilianum* root methanolic extract orally administered at 150 mg/kg b.w., Group V was treated with *Chlorophytum borivilianum* root methanolic extract 200mg/kg b.w., Group VI was treated with *C. borivilianum* root methanolic extract 250mg/kg b.w., Group VII was treated with *C. borivilianum* chloroform-methanol fraction 50 mg /kg b.w., Group VIII was treated with *C. borivilianum* chloroform-methanol fraction 100 mg/kg b.w., Group IX was treated with *C. borivilianum* chloroform-methanol fraction 150 mg/kg body-weight. The blood glucose level was measured on days 1, 5, 10, 15, 20. During treatment, rat blood was taken from the vein part of the tail and measured using a glucometer.

Statistical Analysis

The final readings were reported as mean ± standard error mean (SEM) or standard deviation (SD). Graph Pad Prism 8.02; one-way analysis of variance (ANOVA) followed by student t-test was used to investigate the statistical analysis of all the data. Dunnett's comparison test calculated statistical significance between drug-treated and negative control groups ($p<0.05$ was considered significant).

Results

Physicochemical parameters

Different Physicochemical Parameters *of Chlorophytum borivilianum* of the root were studied such

as loss on drying, total ash, Acid insoluble ash and water-soluble ash.

Table 1. Physicochemical parameters.

Sr.no	Parameter	Value (% w/w)
1	Loss on drying	13
2	Total ash	0.85
3	Acid insoluble ash	0.14
4	Water soluble ash	0.14

Preliminary phytochemical screening

Photochemical test was performed for methanolic extract of *Chlorophytum borivilianum* root and it showed the presence of alkaloids, saponins, steroids, tannins, mucilage, carbohydrates etc.

Table 2. Preliminary Phytochemical screening.

Phytoconstituents	Test	Methanolic extract
Carbohydrates	Benedict's test	+
	Fehling's test	+
Steroids	Salkowski test	+
	Liebermann's test	+
Saponin	Foam test	+
Tannins and phenols	Lead acetate test	-
	Dilute HNO_3 solution	-
Alkaloids	Drangdroff's test	+
	Mayer's test	+
	Hager's test	-
Mucilage	Powder + ruthenium red	+

Column Chromatography

Figure 1. Column Chromatography.

Liquid Chromatography-Mass Spectroscopy

Figure 2. TLC of Fraction B.

The results of LC – MS analysis led to the identification of several compound form LC Fraction of the chloroform methanol fraction of methanolic root extract of *Chlorophytum Borivilianum.* These compounds were identified through mass spectroscopy attached to LC.

DOI: https://doi.org/10.52756/ijerr.2024.v38.003

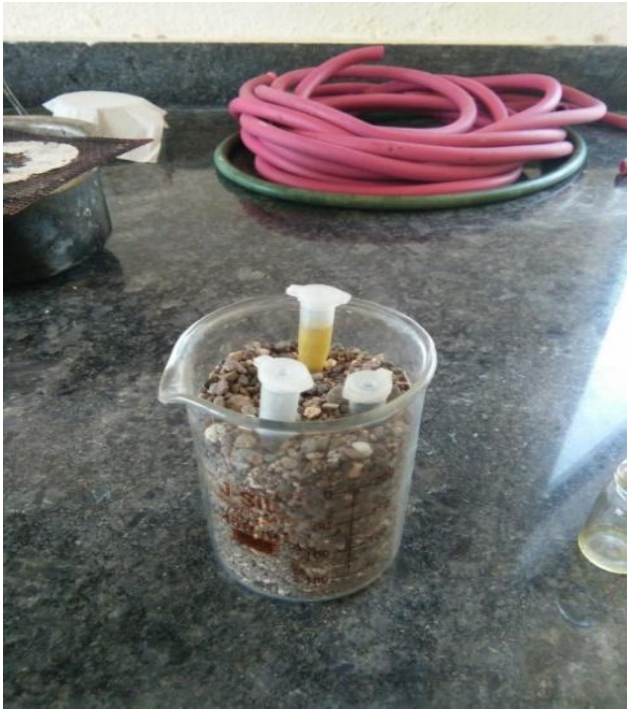

Figure 3. Collected samples kept for evaporation.

Table 4. MS Spectrum Peak.

m/z	*Calc m/z*	Diff(ppm)	z	Abund.	Formula	Ion
280.1213	308.211	8.40	1	49328.61	$C_{18}H_{29}NO_3$	(M+H)+
308.2194	308.222	8.41	1	50481.82	$C_{18}H_{29}NO_3$	(M+H)+
309.2227	309.2253	8.44	1	11227.69	$C_{18}H_{29}NO_3$	(M+H)+
310.2258	310.228	7.15	1	1581.11	$C_{18}H_{29}NO_3$	(M+H)+

Table 3. Phyto components identified in the chloroform-methanol fraction of methanolic root extract of *Chlorophytum borivilianum*.

Sr. No.	Compound Label	RT	Mass	Name	Formula
1	Cpd 34: Dihydrocapsaicin	7.572	307.2122	Dihydrocapsaicin	$C_{18}H_{29}NO_3$
2	Cpd 42: Reserpine	8.683	608.2693	Reserpine	$C_{33}H_{40}N_2O_9$
3	Cpd 43: Deserpidine	8.784	578.2588	Deserpidine	$C_{32}H_{38}N_2O_8$
4	Cpd 47: Biliverdin-IX-α	9.091	582.2646	Biliverdin-IX-α	$C_{33}H_{34}N_4O_6$
5	Cpd 62: Cassiamin C	11.518	506.0964	Cassiamin C	$C_{30}H_{18}O_8$

Compound No. 1

Compound Label	Name	*m/z*	RT	Algorithm	Mass
Dihydrocapsaicin	**Dihydrocapsaicin**	308.2194	7.572	Auto MS/MS	307.2122

MS Zoomed Spectrum -

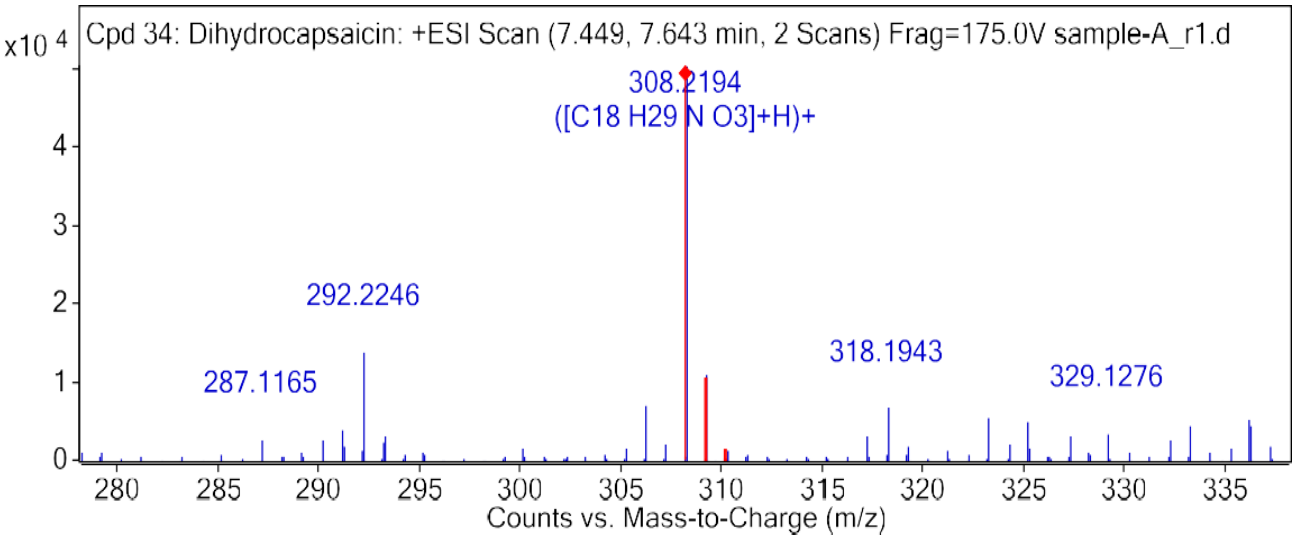

Figure 4. MS Zoomed Spectrum.

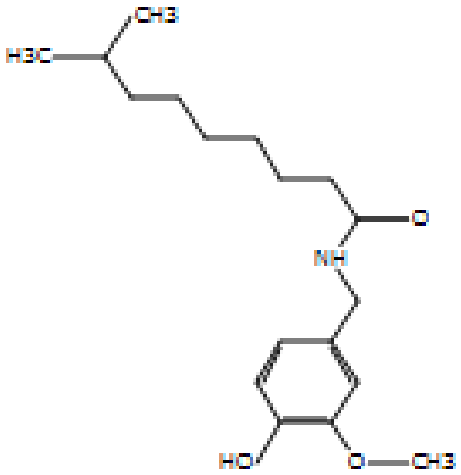

Figure 5. Dihydrocapsaicin.

Pharmacological activity

In vitro Anti-diabetic Activity

Table 5. Observation of alpha-amylase inhibition.

Sr No.	SAMPLE	Concentration (µg/ml)	Absorbance at 540 nm	% Inhibition
	Control	-	1.29	-
1	Acarbose	20	0.83	35.65
		40	0.76	41.08
		80	0.63	51.16
		100	0.31	75.96
2	*Chlorophytum borivilianum* chloroform methanol fraction	20	0.76	41.08
		40	0.63	51.16
		80	0.54	58.13
		100	0.49	62.01

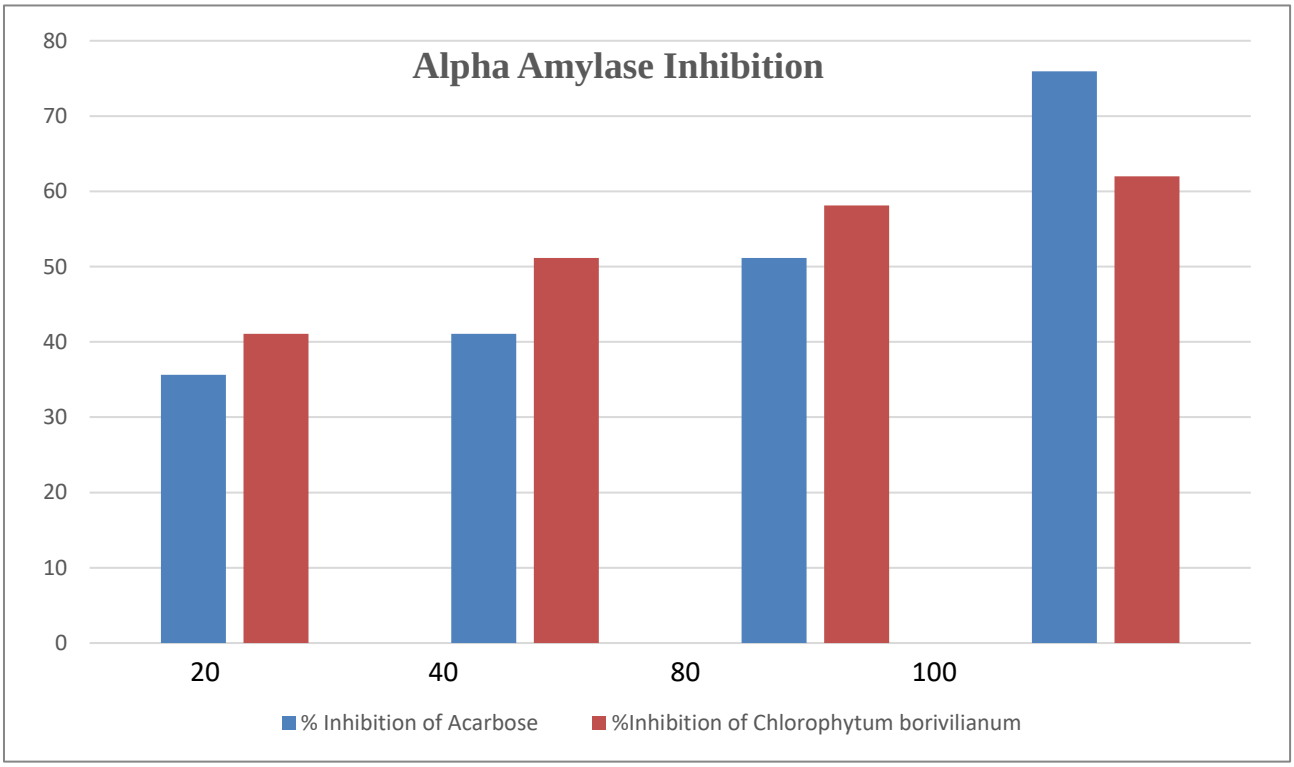

Figure 6. Graph of Alpha-amylase inhibition.

In vivo Anti-diabetic activity:

In order to monitor the anti-diabetic potential of the extract and fractions, the effect of the extract and fractions on all the parameters were compared to that of the PC (metformin-treated), NC and DC groups. The effect of extract and its fractions on BGL, VU, IN, BW, and are depicted in table 6. In this experimental study shows the less body weight of diabetic rats. Diabetic group rats had less body weight than the normal control (group I) rats. In the normal group, the blood glucose level is lower than in the other diabetic group. Group DC showed the proper BGL than others because they were given STZ drugs. Extracts were given to three different groups for the treatment and it was found that the CBME (chloroform-methanol fraction of methanolic root extract

of Chlorophytum Borivilianum) group showed better results. Results were dose-dependent, as shown in Table 6.

extraction to obtain methanolic extract, and the same was screened by preliminary phytochemical screening to identify the chemical constituents required for further

Table 6. Observation of alpha-glucosidase inhibition.

Sr No.	Sample	Concentration (µg/ml)	Absorbance at 540 nm	% Inhibition
1	Control	-	0.54	-
2	Acarbose	20	0.28	48.15
		40	0.17	68.51
		80	0.14	74.07
		100	0.11	79.62
3	*Chlorophytum borivilianum* chloroform methanol fraction	20	0.43	20.37
		40	0.36	33.33
		80	0.27	50.00
		100	0.23	57.40

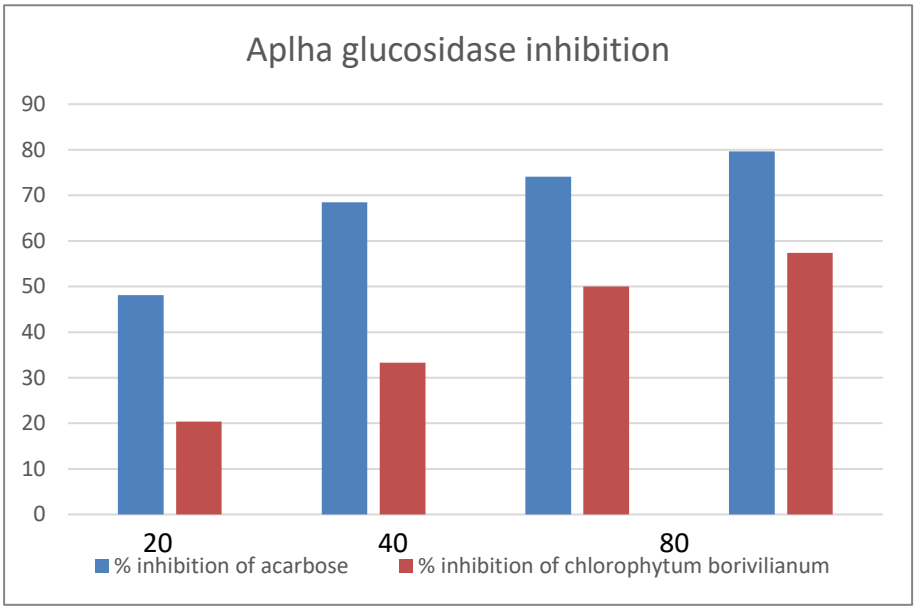

Figure 7. Graph of Alpha-glucosidase inhibition.

Discussion

Literature survey revealed that different parts of *Chlorophytum borivilianum* plant i.e., roots, leaves etc. are used in an alternative system of medicine by different kinds of conventional medicinal practitioners like homeopathic, ayurvedic, siddha and unani. Crude drugs are derived from natural sources and belong to the vegetable kingdom consisting of different kinds of parts of plants. The microscopic or macroscopic characteristics of plants are completely responsible for the botanical authentication of plants. Natural or herbal plants consist of inorganic radicals like phosphate, silica of potassium, silicates, magnesium, calcium, and sodium, which are present together in total ash. The ash values are helpful to check the quality and purity of powdered crude drugs. The roots of the plant were subjected to Soxhlet study. Photochemical test was performed for the methanolic extract of *Chlorophytum borivilianum* root and it showed the presence of alkaloids, saponins, steroids, tannins, mucilage, carbohydrates etc. *Chlorophytum borivilianum* root shows different kinds of activity, such as analgesic, anti-inflammatory, anti-stress, antioxidant, etc., as per the literature study. We used the in vitro method for the experimental study and selected the alpha-amylase inhibition assay and alpha-glucosidase inhibition models. For that method, the test drug, i.e., *Chlorophytum borivilianum* was compared with the standard drug Acarbose. In vitro activity was the most suitable and commonly observed method, yet it was extremely useful before the study of the in vivo method. The research shows that *Chlorophytum borivilianum*'s roots show moderate effect as an antidiabetic agent.

DOI: https://doi.org/10.52756/ijerr.2024.v38.003

Table 7. Antidiabetic parameters.

Parameter	Day	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII	Group IX
		NC	DC (STZ 55 mg/kg)	PC (Metformin 150 mg/kg)	CBME 150 mg/kg	CBME 200 mg/kg	CBME 250 mg/kg	CBCMF 50 mg/kg	CBCMF 100 mg/kg	CBCMF 150 mg/kg
Parameters for Anti-diabetic potential										
BGL (mg/dl)	1	81.42 ± 3.87	286.21 ± 3.49	278.6± 2.77	284.25 ±4.51	282.11 ±4.14	276.68 ± 3.03	288.41 ± 3.14	274.88± 3.09	279.79± 3.86
	5	82.38 ±3.45	293.07 ± 0.77	272.22± 2.75	274.45 ±0.84	286.3± 2.02	281.08 ± 1.09	274.98 ± 1.25	262.85± 1.42	255.54± 2.14
	10	81.44 ± 3.72	297.86 ± 1.91	231.63± 3.19***	287.83 ±2.25	283.96 ±3.05	277.7± 2.58	282.39 ± 2.09	241.99± 1.75	248.91± 2.12**
	15	81.16 ± 3.91	310.72 ± 2.98	147.86± 5.45***	284.45 ±1.94	284.65 ±1.12	280.62 ± 3.25	277.53 ± 2.79	236.38± 1.13*	153.53± 5.64***
	20	82.55 ± 3.44	328.93 ± 5.02	109.21± 3.96***	294.1± 3.19	301.55 ±4.02	284.71 ± 8.05	229.38 ± 6.07*	227.26± 6.4*	133.21± 7.88***
BW (gm)	1	273.36 ±5.54	278.89 ±3.87	277.83±2 .5	268.44 ±3.05	277.13 ±4.58	270.37 ±3.19	264.88 ±4.84	266.13± 2.31	277.22± 4.48
	5	274.62 ±5.3	225.79 ±5.7	261.59±4 .31	237.72 ±4.8	246.71 ±5.07	243.29 ±5.09	255.49 ±5.25	244.3±3. 81	262.18± 5.2
	10	278.43 ±5.63	234.67 ±5.85	277.91±3 .11**	206.25 ±3.87	245.36 ±10.74	238.03 ±3.78	243.06 ±6.95	250.57± 8.86	268.56± 4.01
	15	279.78 ±5.95	222.42 ±4.78	285.92±7 .75**	218.57 ±2.78	234.25 ±10.63	225.01 ±6.54	249.69 ±11.97	246.37± 2.87	287.87± 6.08**
	20	283.33 ±5.01	205.09 ±4.23	301.89±8 .06***	223.02 ±7.61	226.43 ±14.34	222.46 ±5.32*	251.67 ±10.1	232.43± 4.69	296.62± 6.71***
Insulin (µU/ml)	1	17.21± 0.22	7.74±0 .17	7.61±0.3 7	7.33±0 .37	7.14±0. 28	7.49±0. 1	7.12±0. 34	7.12±0.3 6	7.32±0. 31
	20	17.24± 0.11	7.71±0 .25	16.61±0. 37	8.14±0 .37	8.13±0. 28	7.95±0. 1	9.71±0. 34*	8.11±0.3 6	14.13±0 .31***
Urine Volume (ml/5 h)	1	1.10±0 .14	7.15±0 .24	6.65±0.3 9	7.50±0 .2	7.80±0. 42	6.60±0. 47	7.55±0. 41	7.50±0.3 4	7.20±0. 49
	5	1.40±0 .11	8.15±0 .44	4.50±0.4 4	7.55±0 .36	6.70±0. 64	7.30±0. 35	6.45±0. 56	7.30±0.2 8	8.10±0. 76
	10	1.45±0 .13	9.75±0 .69	5.45±0.6 3	7.30±0 .34	6.50±0. 65	7.2±0.2 7	7.1±0.4 4	6.10±0.2	6.20±0. 71
	15	1.50±0 .2	9.50±0 .39	6.70±0.1 5	7.20±0 .36	7.50±0. 31	7.77±0. 44	7.60±0. 6	7.50±0.4 3	6.60±0. 6**
	20	1.45±0 .13	10.30± 0.06	5.50±0.2 2	8.70±0 .44	8.50±0. 63	8.75±0. 42	7.10±0. 67*	8.00±0.3 6	5.91±0. 4***

CBME: *Chlorophytum Borivilianum* methanolic extract; **CBCMF:** *Chlorophytum Borivilianum* chloroform-methanol fraction

DOI: https://doi.org/10.52756/ijerr.2024.v38.003

For the Qualitative analysis of phytoconstituents, the methanolic extract was sent to the SAIF department in Powai for further LCMS studies. Results were received, and interpretation showed the presence of phytoconstituents responsible for the antidiabetic activity. In LCMS analysis the above-identified compound is Dihydrocapsaicin, reserpine, Derespina, Biliverdin lxα, Sphingosine Cassiamin, Betaxolol, Cilazapril as per qualitative analysis, Phytochemical study, pharmacological activity i.e., in vitro and in vivo activities methanolic root extract of *Chlorophytum borivilianum* shows moderate effect of antidiabetic activity.

Conclusion

Methanolic extract of *Chlorophytum borivilianum* roots shows moderate effect as an antidiabetic agent. In preliminary test of the root of *Chlorophytum borivilianum* methanolic showed presence of alkaloids and saponins. In the confirmed pharmacological study, it is strongly believed that the detailed information indicated in this review on various therapeutic and pharmacological actions of the constituents might provide complete evidence for the use of different medicines in vitro antidiabetic activity in this plant. It was concluded that methanolic extract showed a positive result. In LCMS analysis, the identified compound are Dihydrocapsaicin, reserpine, Derespina, Biliverdin lxα, Sphingosine Cassiamin, Betaxolol, Cilazapril as per qualitative analysis, Phytochemical study, pharmacological activity i.e., in vitro and in vivo activities methanolic root extract of *Chlorophytum borivilianum* shows the moderate effect of antidiabetic activity. However, further studies are essential to know other chemicals of the plant that individually or synergistically show the activities. It is also important to investigate the clinical study of these chemicals.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

The authors wish to express their gratitude to the Management of Pravara Rural College of Pharmacy, Loni, for providing facilities and necessary support.

References

Acharya, C.K., Das, B., Madhu, N.R., Sau, S., Manna De, M., & Sarkar, B. (2023). A Comprehensive Pharmacological Appraisal of Indian Traditional Medicinal Plants with Anti-diabetic Potential. Springer Nature Singapore Pte Ltd., Advances in Diabetes Research and Management, pp. 163–193, Online ISBN-978-981-19-0027-3. https://doi.org/10.1007/978-981-19-0027-3_8

Aloke, C., Egwu, C. O., Aja, P. M., Obasi, N. A., Chukwu, J., Akumadu, B. O., Ogbu, P. N., & Achilonu, I. (2022). Current Advances in the Management of Diabetes Mellitus. *Biomedicines*, *10*(10), 2436. https://doi.org/10.3390/biomedicines10102436

Basu, B.D., & Kirtikar, K.R. (1987). Indian Medicinal Plants, Lalit Mohan Basu publications, Allahabad, pp. 2508 – 2509.

Baye, Y.A., Getinet, M.A., Kefyalew, A.G., Abyot, E.G., Alemshet, Y. B., Tewachew, A., & Getaye, T. D. (2022). Evaluation of the Antidiabetic Activity of Hydromethanolic Roots Extracts of *Rumex abyssinicus* Jacq: (Polygonaceae) in Swiss Albino Mice. *Evidence-Based Complementary and Alternative Medicine, 2022*, 5193250, 11 pages. https://doi.org/10.1155/2022/5193250

Biswas, T., Behera, B. K., & Madhu, N.R. (2023). Technology in the Management of Type 1 and Type 2 Diabetes Mellitus: Recent Status and Future Prospects. 26 pages, Springer Nature Singapore Pte Ltd., Advances in Diabetes Research and Management. pp. 111–136. Online ISBN-978-981-19-0027-3. https://doi.org/10.1007/978-981-19-0027-3_6

Daou, M., Elnaker, N. A., Ochsenkühn, M. A., Amin, S. A., Yousef, A. F., & Yousef, L. F. (2022). In vitro α-glucosidase inhibitory activity of Tamarix nilotica shoot extracts and fractions. *PloS One*, *17*(3), e0264969. https://doi.org/10.1371/journal.pone.0264969

Deore, S., & Khadabadi, S. (2008). Standardisation and pharmaceutical evaluation of *Chlorophytum borivilianum* mucilage. *Rasayan Journal of Chemistry*, 1.

Dhakar, S., & Tare, H. (2023). Therapeutic Potential of Polyherbal Tablets: A Comprehensive Assessment of Pharmacological Activity. *Int. J. Exp. Res. Rev.*, *34*(Special Vol.), 97-105. https://doi.org/10.52756/ijerr.2023.v34spl.010

Dixit, V.K., & Mayank, T. (2008). A review on some important medicinal plants of *Chlorophytum* spp., *Plant Rev.*, *2*, 168-172.

Eskandani, M., Bahadori, M.B., Zengin, G., Dinparast, L., & Bahadori, S. (2016). Novel Natural Agents

from Lamiaceae Family: An Evaluation on Toxicity and Enzyme Inhibitory Potential linked to Diabetes Mellitus. *Current Bioactive Compounds, 12*, 34-38. https://doi.org/10.2174/1573407212666151231183118

Gokhle, S.B., Kokate, C. K., & Purohit, A. P. (2007). Pharmacognosy, nirali prakashan, pune, 37th ed., pp.105-108.

Jaiswal, S., & Gupta, P. (2023). GLSTM: A novel approach for prediction of real & synthetic PID diabetes data using GANs and LSTM classification model. *Int. J. Exp. Res. Rev., 30*, 32-45. https://doi.org/10.52756/ijerr.2023.v30.004

Iyangar, M.A. (1986). Pharmacognosy of powdered cruds drugs, reprint IInd ED., Published by Iyangar M.A., Kasturba Medical College, Manipal.

Kaushik, N. (2005). Saponins of Chlorophytum species. *Phytochem, Rev., 4*, 191-196.

Khandelwal, K.R. (2005). Practical Pharamacognosy 14th Edn., Nirali Prakashan, Pune. 149, 157.

Kokate, C.K. (1989). Practical pharmacognosy, IInd Ed., Nirali Prakashan, Pune.

Kunkulol, R., & Vikhe, S. (2020). Microscopic Investigations and Pharmacognosy of *Striga orobanchioides* Benth. *Pharmacogn. J., 12*(6), 1325-1331.

Pharmacopoeia of India (1966). IInd Ed., published by Controller of Publication, Govt. of India, New Delhi pp. 947.

Pramanik, B. (2018). A comparative study on the knowledge, attitude and risk perception regarding complications of type-2 diabetes mellitus between male and female diabetic patients attending diabetic clinics in selected hospital of West Bengal, India. *Int. J. Exp. Res. Rev., 15*, 16-27. https://doi.org/10.52756/ijerr.2018.v15.004

Remok, F., Saidi, S., Gourich, A.A., Zibouh, K., Maouloua, M., Makhoukhi, F.E., Menyiy, N.E., Touijer, H., Bouhrim, M., & Sahpaz, S. (2023). Phenolic Content, Antioxidant, Antibacterial, Antihyperglycemic, and α-Amylase Inhibitory Activities of Aqueous Extract of *Salvia lavandulifolia* Vahl. *Pharmaceuticals, 16*(3), 395. https://doi.org/10.3390/ph16030395

Roy, R., Chakraborty, A., Jana, K., Sarkar, B., Biswas, P., & Madhu, N.R. (2023). The Broader Aspects of Treating Diabetes with the Application of Nanobiotechnology. Springer Nature Singapore Pte Ltd., Advances in Diabetes Research and Management, pp. 137–162, Online ISBN-978-981-19-0027-3, https://doi.org/10.1007/978-981-19-0027-3_7

Safitri, A., Tirto Sari, D. R., Refsilangi, B., Roosdiana, A., & Fatchiyah, F. (2021). Histopathological Profiles of Rats (*Rattus norvegicus*) Induced with Streptozotocin and Treated with Aqueous Root Extracts of *Ruellia tuberosa* L. *Veterinary Medicine International*, *2021*, 6938433. https://doi.org/10.1155/2021/6938433

Sarkar, B., Bhattacharya, P., Yen Chen, C., Maity, J., & Biswas, T. (2022). A comprehensive characterization and therapeutic properties in ripened Noni fruits (*Morinda citrifolia* L.). *International Journal of Experimental Research and Review*, *29*, 10-32. https://doi.org/10.52756/ijerr.2022.v29.002

Sarkar, S., Sadhu, S., Roy, R., Tarafdar, S., Mukherjee, N., Sil, M., Goswami, A., & Madhu, N.R. (2023). Contemporary Drifts in Diabetes Management. *Int. J. App. Pharm., 15*(2), 1-9. https://doi.org/10.22159/ijap.2023v15i2.46792

Srivastava, A.K., Mukerjee, A. & Tripathi, A. (2020). Antidiabetic and antihyperlipidemic activities of *Cucumis melo* var. *momordica* fruit extract on experimental animals. *Futur. J. Pharm. Sci., 6*, 92. https://doi.org/10.1186/s43094-020-00116-z

Sunayana, V., & Sunil, N. (2018). Antiallergic and antihistaminic actions of *Ceasalpinia bonducella* seeds: Possible role in treatment of asthma. *Journal of Ethnopharmacology, 216*, 251-258. https://doi.org/10.1016/j.jep.2017.12.007.

Sundaram, S., Dwivedi, P., & Purwar, S. (2011). Antibacterial Activities of Crude Extracts of *Chlorophytum borivilianum* to Bacterial Pathogens. *Research Journal of Medicinal Plant, 5*, 343-347. https://doi.org/10.3923/rjmp.2011.343.347.

Sur, T., Das, A., Bashar, S., Tarafdar, S., Sarkar, B., & Madhu, N.R. (2023). Biochemical Assay for Measuring Diabetes Mellitus. Springer Nature Singapore Pte Ltd., Advances in Diabetes Research and Management, pp. 1–20, Online ISBN-978-981-19-0027-3, https://doi.org/10.1007/978-981-19-0027-3_1

Tandon, M., Thakur, R. S., & Shukla, Y. N. (1992). 4-Hydroxy, 8-11 oxidoheneicosanol and other constituents from *Chlorophytum arundinaceum* roots. *Phytochemistry, 31*, 2525-2526.

Telagari, M., & Hullatti, K. (2015). In-vitro α-amylase and α-glucosidase inhibitory activity of Adiantum caudatum Linn. and Celosia argentea Linn. extracts and fractions. *Indian Journal of*

Pharmacology, *47*(4), 425–429. https://doi.org/10.4103/0253-7613.161270

The Indian Pharmacopoea (1966). 2nd Edn., Govt. of India, publications, Delhi. pp.947 – 948.

Tyagi, K., Kumar, D., & Gupta, R. (2024). Application of Genetic Algorithms for Medical Diagnosis of Diabetes Mellitus. *International Journal of Experimental Research and Review*, *37*(Special Vo), 1-10. https://doi.org/10.52756/ijerr.2024.v37spl.001

How to cite this Article:

Sunayana Vikhe, Pravin Aladi and Rahul Vikhe (2024). Antidiabetic and antihyperlipidemic effects of crude fractions from *Chlorophytum borivilianum* root methanolic extract on streptozotocin induced diabetic rats and phytochemical investigation by LCMS analysis. *International Journal of Experimental Research and Review*, *38*, 26-36.

DOI : https://doi.org/10.52756/ijerr.2024.v38.003