https://doi.org/10.48047/AFJBS.6.12.2024.559-569

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Invitro Free Radical Scavenging, AntidiabeticAnd Hypolipidemic Potential Of Hydro Ethanolic *Barleria cristata* L. Stem Extract In Alloxan Induced Wister Albino Diabetic Rats

K. Amutha[1*] and D. VA. Doss[2]

1*. Department of Biochemistry, RVS College of Arts and Science, Sulur, Coimbatore 641 402.

2. Department of Biochemistry, PSG College of Arts and Science, Civil Aerodrome Post, Coimbatore- 641 014, Tamil Nadu.

*Corresponding Author: Dr. K. Amutha
Department of Biochemistry,
RVS College of Arts and Science,
Sulur, Coimbatore 641 402.
Tamil Nadu.
India.
E- mail: amuthabiochemistry@gmail.com.

Article History
Volume 6 Issue 12, 2024
Received: 25 May 2024
Accepted : 25 June 2024
doi:
10.48047/AFJBS.6.12.2024.559-569

ABSTRACT

The current study was aimed to evaluate the 50% hydroethanolic *Barleria cristata L.* stem extract's in vitro free radical scavenging, hypoglycemic, and hypolipidemic potential in diabetic rats induced by alloxan. Presence of alkaloids, flavonoids, glycosides, phenols, saponins, tannins, carbohydrates, and protein were determined by phytochemical analysis.The plant extract's physiochemical composition supported its long-term storage. Better DPPH, H2O2, NO, and SO radical scavenging activity of plant extract supported its antioxidant potential. The plant extract did not exhibit any negative effects during the course of the trial in an acute toxicity study. Alloxan monohydrate was used to induce diabetes in rats. Glibenclamide serving as the usual standard treatment. 200 and 400 mg/kg b.w. of 50% hydroethanolic stem extract treatment is given to diabetic Wister albino rats. In diabetics, the fasting blood glucose, gHB, urea, creatinine, glucose 6 phosphatase, MDA, TC, TG, LDL, and VLDL levels were decreased. In plant extracts treated rats, levels of glycogen, insulin, body weight, and HDA were elevated. It was also discovered that transaminase activity had been restored. This study demonstrates that plant extracts include phytocomponents with potential for lowering blood sugar and cholesterol that can be taken as supplements to treat diabetes.

KEYWORDS: Antioxidant, Alloxan, Total Cholesterol, Antidiabetic, Phytochemicals, Wister albino rats

INTRODUCTION

Diabetes mellitus is a chronic metabolic disease with a wide range of symptoms. Either insulin resistance, damage to pancreatic cells, or insufficient insulin secretion are the causes of it. Diabetes mellitus is characterized by chronic hyperglycemia and alterations in the metabolism of proteins, carbohydrates, and lipids. The kidneys, eyes, nerves, heart, and blood vessels are just a few of the organs that are permanently damaged, dysfunctional, or fail as a result of this condition (Nabarun Mukhopadhyay et al., 2019). Diabetes mellitus is a significant problem for public health. In the entire world, it ranks as the tenth most prevalent cause of death (Moien Abdul Basith Khan et al., 2020).

There are numerous different anti-diabetic medications on the market. Sulfonylurea, biguanides, alpha-glycosidase inhibitors, and thiazolidinedione's are a few of them. They each have a different impact on the treatment of diabetes. However, prolonged use of them led to a number of negative side effects, including high costs for patients as well as weight gain, headaches, dizziness, hypersensitivity reactions, and nausea. WHO advises using the conventional approach to treating diabetes. Diabetes herbal treatment is nothing new. About 600 medicinal plants are said to have antidiabetic activity in the ayurvedic medical system. They seldom ever cause any negative effects. Many rural and underprivileged people who might not be able to buy the expensive synthetic pharmaceuticals profit greatly economically from them. Moreover, novel anti-diabetic medications are being developed from medicinal plants ((Rasidat O Tijaniet al., 2021).

The medicinal plants' phytocomponents are what give them their antidiabetic properties. Not all plants have yet received a complete scientific determination of their active ingredients. Diabetes can be prevented by leading a balanced lifestyle, getting regular exercise, and eating right (Loubna Ait Draet al., 2019). Drugs having strong antioxidant properties are required for the management of diabetes mellitus in order to prevent the condition's oxidative stress.

The plant *Barleria cristata L*., also known as Philippine violet or Kodilkannu (in Southern India), is native to subtropical Himaaya, Sikkim, and Southern India. The plant can reach heights of 6 to 10 metres. The stems and leaves also have antiplasmodial, cytotoxic, and anti-oxidant activity and are used to treat anaemia, toothaches, and inflammatory illnesses. The goal of the current study wasto analyses the stem extract of *Barleria cristata L.'s* hypoglycemic and hypolipidemic effects in diabetic rats produced by alloxan (Amutha and Doss., 2022).

METHODOLOGY

AUTHENTICATION AND PLANT COLLECTION

The plant *Barleria cristata L.*, which was acquired from the Erode district of Tamil Nadu, was identified and confirmed by the Botanical Survey of India (BSI), Tamil Nadu Agricultural University (TNAU), Coimbatore, Tamil Nadu, India (N.BSI/SC/5/23/08-09/Tech.175).

SCREENING FOR PHYTOCHEMICALS IN PLANT SAMPLES

An 18-hour soxhlet extraction procedure employing ethanol, acetone, chloroform, distilled water, petroleum ether, and benzene as various solvents was performed on powdered, shade-dried plant stem material. A rotary evaporator was used to concentrate the extracts before they were used for phytochemical screening.The presence of carbohydrates, proteins, alkaloids, flavonoids, phenols, glycosides, and steroids was assessed using a variety of qualitative phytochemical screening tests, including Molisch's, Fehling's, Benedict's, Shinoda, and Zinc Hydrochloride tests (Amutha and Doss, 2022).

PLANT SAMPLE PHYSIOCHEMICAL EVALUATION

The quality of the plant sample was evaluated in accordance with the standard Ayurvedic methodology (Pharmacopoeia of India, 1996), and total ash was calculated using moisture content, ethanol soluble extractive, water soluble extractive, and water soluble ash value (African Pharmacopoeia, 1986).

ACTIVITY OF FREE RADICAL SCAVENGING (INVITRO)

Diphenyl-picrylhydrazine (DPPH) (Mensor et al., 2001), Superoxide (Gulcin et al.,2005), Nitricoxide (Green et al., 1982)and Hydrogen Peroxide (Ruch et al., 1989) scavenging assays were used to determine the sample's in vitro free radical scavenging capacity.

CHEMICALS AND DRUGS

We bought alloxan monohydrate from sigma chemical in Bangalore. Standard analytical grade chemicals and reagents were also used in this study.

HYDROETHANOLIC STEM EXTRACT PREPARATION

Five kilograms of plant stem powder were cold-macerated in 50% hydro ethanol for three days, occasionally stirring. After that, the suspension was filtered. The extract was evaporated in a rotary evaporator at 400C and lowered pressure to produce dry extract. Dark brown crystals with a yield of 0.9 g were produced. This extract was dissolved in distilled water and kept in a desiccator before being used for the experiment.

ANIMALS

Male albino Wister rats of the 120–150g weight range were bought from the animal house at the PSG Institute of Medical Science and Research in Coimbatore, India (No: 158/1999/CPCSEA). The rats were housed in custom-made polyacrylic cages and kept in a typical habitat (25°C with a 12-hour cycle of light and dark). The animals were fed rat pellets and had limitless water from Hindustan Lever Ltd. in Bangalore, India. All experimental procedures were carried out after the ethics committee's suggestions were authorized.

STUDY ON ACUTE TOXICITY

Test sample's acute toxicity was investigated using the Miller and Tainter method (1944). Five albino wister rats that had been fasted the previous night were sorted into 6 groups after being weighed. As a control, normal rats (group I) were used. Groups II, III, IV, V, and VI received oral doses of the test sample ranging from 2, 4, 6, 8, and 10 g/kg body weight. Acute poisoning deaths and abnormal behavior in the rats were constantly monitored.

EXPERIMENTAL DIABETES INDUCTION

Rats were intraperitoneally treated with 120 mg/kg of alloxan monohydrate (Kameswararao et al., 2003). Blood samples were taken after 72 hours, and serum glucose levels were measured. For the investigation, rats with hyperglycemia (fasting blood glucose levels greater than 350 mg/dl) were used.

TREATMENT GROUPS

After a two-week acclimatization period, the experimental rats were split into five groups, each with six animals..

Group I	-	Normal Control
Group II	-	Diabetic control
Group III	-	Drug Control (glibenclamide 600 µg/kg body weight)
Group IV	-	Diabetic rats received 50% hydroethanolic extract of *Barleria cristata* L.stem (200 mg/kg body weight)

Group V - Diabetic rats received 50% hydroethanolic extract of *Barleria cristata* L.stem (400 mg/kg body weight)

BIOCHEMICAL EXAMINATION

Following a 28-day treatment period, a cardiac puncture under moderate chloroform anesthesia, and the collection of blood samples was done (1 to 1.5 ml). Serum was collected from blood by centrifuging (3000 rpm for 20 mins) at room temperature. For enzyme analysis centrifugation is carried out at 4^0 C.Serum fasting glucose(Trinder, 1969), Glycosylated Hb(Jim Standeferand Phillip Eaton, 1983), Insulin(Clark and Hales, 1991), Glycogen (Vander Vries**,** 1954, Body weight, Urea (Wybeng et al., 1971), Creatinine(Slot and Scand, 1965),TG(Philip and Mayne, 1994), HDL-cholesterol (Castelli et al., 1977), Total cholesterol (Richmond, 1973),Hexokinase (Brandstrup, 1957), and Glucose 6 phosphatase, Phosphatases(King et al., 1951) andTransaminases(Reitman and Frankel, 1957)were biochemically analyzed.

STATISTICAL ANALYSIS

With the help of the statistical software SPSS, data were reported as means, SDthe data were examined using ANOVA, and the group averages were compared using the Duncan's Multiple Range Test (DMRT). The values were deemed statistically significant at P 0.05.

RESULTS

SCREENING FOR PHYTOCHEMICALS IN PLANT SAMPLES

Alkaloids, flavonoids, glycosides, phenols, saponins, tannins, carbohydrates, and protein were detected in plant extracts during the initial qualitative phytochemical screening process, however safronins were not present.

PHYSIOCHEMICAL EVALUATION OF *Barleria cristata* L. STEM POWDER

The results of the proximate composition of the stem of *Barleria cristata L*. are shown in Table 1. The moisture content value in the plant sample was close to 2.5% w/w.

Table 1. Proximate composition of *Barleria cristata* L. stem

Ash and yield value (% w/w)	*Barleria cristata* L.
Total Ash	7.90 ± 0.0321
Ash that dissolve in water	5.0 ± 0.10
Ash soluble in acid	0.9 ± 0.032
Water soluble extractive	26.8 ± 0.078
Alcohol soluble extractive	1.8 ± 0.032
Moisture content	2.5 ± 0.010

Values were reported as mean ± SEM of 5 determinations. * $p< 0.05$ was regarded as statistically significant.

FREE RADICAL SCAVENGING ASSAY (in vitro).

Plant 50% hydroethanolic stem extract showed superior DPPH and H2O2 radical scavenging activity than NO and SO radical scavenging activity (table 2).*Barleria cristata* L. stem extract at 50% hydro ethanol had IC_{50} values of 12 g/ml for DPPH and H2O2 and 9 g/ml for NO and SO.

Table 2. Free radical scavenging effect of plant stem extract

Concentration (µg/ml)	DPPH (%)	H_2O_2(%)	NO (%)	SO(%)
100	9.2	26.3	18.0	18.0
200	16.7	56.2	39.2	39.2
300	26.9	80.6	62.3	62.3
400	35.1	99.5	95.8	95.8
500	43.5	118.5	118.4	118.4
$IC_{50\ \mu g/ml}$	12	12	9	9

Values were reported as mean ± SEM of 5 determinations. * $p< 0.05$ was regarded as statistically significant

ACUTE TOXICITY STUDY

The toxicity of *Barleria cristata L.* stem extract (50% hydroethanolic) was evaluated in plant samples at doses of 2, 4, 6, 8, and 10 g/kg b.w. The sample's LD50 value was determined to be 0.94g/kg b.w.

ANTIDIABETIC EFFECT OF 50% HYDROETHANOLIC STEM EXTRACT OF *Barleria cristata* L.

EFFECT ON FASTING BLOOD SUGAR

In contrast to normal control rats, alloxan-induced diabetic rats displayed hyperglycemia, as seen in table 3. Blood glucose levels were reduced by 34% in treated rats receiving a 200 mg/kg b.w. dose of plant extract, and by 71% in those receiving a regular dose of the medication glibenclamide. Plant extract administered at 400 mg/kg body weight resulted in a better return of blood sugar levels to normal. Animals in Group I displayed minimal change in blood glucose levels.

Table 3. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on fasting serum glucose level.

Groups	Blood Glucose (mg/dl)				
	Day-0	Day -7	Day-14	Day-21	Day-28
Group-I	103.0 ± 2.45	98.0 ± 2.45	95.0 ± 2.45	96.0 ± 0.82	105.0 ± 0.82
Group-II	392.0 ± 1.63	387.0 ± 8.16	372.0 ± 8.16	373.0 ± 8.16	390.0± 4.08
Group-III	390.0 ± 3.27	312.0 ± 8.16	238.0 ± 6.53	165.0 ± 4.08	115.0 ± 0.82
Group-IV	391.0 ± 8.16	368.0 ± 6.53	330.0 ± 8.16	290.0 ± 8.16	257.0± 1.63
Group-V	393.0 ± 2.26	350.0 ± 4.08	289.0 ± 7.35	157.0 ± 5.7	91.0 ± 0.82

G-I- Normal Control; G-II- Diabetic Control; G-III- Glibenclamide Control; G-IV- Treatment 1 (200 mg/kg b.w. dose); G-V- Treatment 2 (400 mg/kg b.w. dose).

EFFECT ON LIVER GLYCOGEN, INSULIN, BODY WEIGHT, AND GLYCOSYLATED HB

In diabetic rats, the level of glycosylated Hb rose (G II). Plant extract dosages of 200 mg/kg body weight and 400 mg/kg body weight significantly (P 0.05) reduced the amount of glycosylated haemoglobin from 12.7% (DC) to 9.9% and 8.08%, respectively. Table 4 and 5showed that rats given alloxan to cause diabetes had low levels of hepatic glycogenand serum insulin. Rats given plant extracts showed increases in liver glycogen and insulin that were statistically significant (P0.05). Following treatment with doses of 200 and 400 mg/kg b.w., the levels of glycogen increased by 89% and 109%, respectively. We discovered that giving plant extracts to diabetic rats increased their insulin levels noticeably by 236% at 200 mg/kg body weight and 278% at 400 mg/kg body weight.

Table 4. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on gHb, liver glycogen, urea and creatinine

Groups	Glycosylated Hb	Liver glycogen (mg/g)	Urea (mg/dl)	Creatinine (mg/dl)
Group-I	4.8 ± 1.0	44.56 ± 0.25	26.12 ± 0.16	08.5 ± 1.63
Group-II	12.7 ± 5.8	20.01 ± 0.20	47.24 ± 0.03	2.83 ± 1.14
Group-III	8.8 ± 0.15	39.09 ±0.07	35.04 ± 0.01	0.8 ± 0.82
Group-IV	9.9 ± 2.5	39.14 ± 0.08	37.72 ± 0.02	1.06 ± 0.13
Group-V	8.08 ± 1.68	43.07 ±0.07	30.12 ± 0.76	0.756 ± 0.82

G-I- Normal Control; G-II- Diabetic Control; G-III- Glibenclamide Control; G-IV- Treatment 1 (200 mg/kg b.w. dose); G-V- Treatment 2 (400 mg/kg b.w. dose).

EFFECT ON UREA, CREATININE AND BODY WEIGHT

As seen in table 4, diabetes-induced rats had greater blood levels of urea and creatinine than normal control rats did. Following treatment with plant extract, these increases were significantly reduced (P 0.05). After receiving a dose of 200 mg/kg b.w. of plant extract, the levels of blood urea and creatinine were reduced by 20% and 56%, respectively, and by 36% and 65%, respectively, after receiving a dose of 400 mg/kg. Glibenclamide reduced the serum urea and creatinine levels by 18% and 72%, respectively.

When compared to normal control rats (G I) on day 28, after rats were given alloxan to induce diabetes, a significant decrease in body weight was observed (table 4). When compared to diabetic control, the 400 mg/kg treated animal group showed a 34% improvement in body weight (table 5), whereas the 200 mg/kg b.w plant extract dosage treated animals showed a 21% improvement.

Table 5. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on serum insulin and body weight.

Groups	Serum insulin (µU/ml)	Body weight (gms)
Group-I	27.10 ± 0.03	95.00 ± 0.02
Group-II	6.2 ± 0.07	100.12 ± 0.10
Group-III	22.53 ± 0.02	135.08 ± 0.10

Group-IV	20.86 ± 0.13	121.85 ± 0.05
Group-V	23.44 ± 0.03	134. 70 ± 0.40

Values were reported as mean ± SEM of 5 determinations. * p< 0.05 was regarded as statistically significant

EFFECT ON CARBOHYDRATE METABOLISE ENZYME

Hexokinase and glucose 6 phosphatases, two enzymes that break down carbohydrates, are active, as shown in table 6. Hexokinase activity in the liver significantly decreased in diabetic control rats compared to normal rats, although glucose 6 phosphatase activity increased (P 0.05) (G I). By giving plant extract, this change was reverted in a dose-dependent manner.

Table 6. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on the activity of hexokinase and glucose-6-phosphatase.

Groups	Hexokinase (units^{A}/gm protein)	Glucose 6 Phosphatase (units^{B}/gm protein)
Group-I	126.87 ± 0.01	0.148 ± 0.02
Group-II	76.02 ± 0.01	0.232 ± 0.10
Group-III	120.53 ± 0.03	0.189 ± 0.10
Group-IV	109.04 ± 0.03	0.185 ± 0.05
Group-V	121.03 ± 0.03	0.174 ± 0.40

A - µmoles of glucose phosphorylated/minute. B - µmoles of phosphate liberated/minute

EFFECT ON LIPID PROFILE

The serum cholesterol, triglyceride, VLDL, and LDL levels of diabetic rats were greater than those of normal control rats throughout the investigation (table 7). The rats showed dose-dependent decreases in cholesterol, TG, LDL, and VLDL cholesterol after a 28-day treatment with plant extract at doses of 200 and 400 mg/kg body weight, which also boosted blood HDL cholesterol.

Table 7. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on serum lipid profile.

Groups	Total Cholesterol (mg/dl)	Triglycerides (mg/dl)	HDL-Cholesterol (mg/dl)	VLDL-Cholesterol (mg/dl)	LDL-Cholesterol (mg/dl)
Group-I	158 ± 2.0	158 ± 1.6	50 ± 1.63	28.0 ± 1.63	76.40 ± 0.82
Group-II	368 ± 8.2	297 ±2.5	17 ± 1.62	59.0 ± 1.14	280.6 ± 4.08
Group-III	240 ± 2.5	136 ± 3.3	30 ± 1.63	20.6 ± 0.82	165.0 ± 2.45
Group-IV	215 ±4.1	155 ± 2.5	28 ± 2.45	36.6 ± 0.13	179.4 ± 8.16
Group-V	189 ± 3.3	112 ± 4.1	18 ± 4.08	25.6 ± 0.82	101.0 ± 3.82

G-I -Normal Control; G-II-Diabetic Control;G-III-Glibenclamide Control;G-IV- Treatment 1 (200 mg/kg b.w. dose); G-V-Treatment 2 (400 mg/kg b.w. dose)

EFFECT ON PHOSPHATASES

Table 8 shows the concentrations of the liver-marker enzymes ACP and ALP in the serum from the liver and kidney. The level of phosphatases significantly increased in alloxan-treated animals (DC) when compared to control rats (NC), indicating liver damage. These enzyme levels were dramatically increased after receiving a dose-dependent 50% hydroethanolic extract of *Barleria cristata* L.

Table 8. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on the activity of phosphatases

Groups	Acid Phosphatase			Alkaline Phosphatase		
	Serum (U/dl)	Liver (U/mg protein)	Kidney (U/mg protein)	Serum (U/dl)	Liver (U/mg protein)	Kidney (U/mg protein)
Group-I	40.0 ± 0.02	72.21 ± 0.01	60.08 ± 0.11	52.07 ± 0.01	83.08 ± 0.01	123.2 ± 0.02
Group-II	92.56 ± 0.0	202.84 ± 0.02	130.09 ± 0.0	128.2 ± 0.04	180.04 ± 0.0	270.2 ± 0.0
Group-III	60.65 ± 0.0	105.66 ± 0.0	81.41 ± 0.01	95.67 ± 0.3	80.07 ± 0.00	150.17 ± 0.0
Group-IV	73.16 ±0.0	173.41 ± 0.01	103.8 ± 0.01	102.54 ± 0.0	105.25 ± 0.0	203.5 ± 0.0
Group-V	60.63 ± 0.0	95.97 ± 0.01	76.88 ± 0.02	83.2 ± 0.07	92.01 ± 0.01	142.1 ± 0.03

U-n moles of phenol liberated

EFFECT ON TRANSAMINASES

Transaminases (SGOT and SGPT) were shown to be increased in diabetic rats (table 9). Due to the increased activity of these enzymes, glucose and ketogenesis are increased in diabetes. Treatment of diabetic rats with plant extract at a dose of 400 mg/kg led to a modest restoration of the transaminase level in serum, the liver, and the kidney, in contrast to therapy at a dose of 200 mg/kg.

Table 9. Effect of 50% hydroethanolic stem extract of *Barleria cristata* L. on the activity of transaminases in serum, liver and kidney.

Groups	SGOT			SGPT		
	Serum (U/L)	Liver (U/mg protein)	Kidney (U/mg protein)	Serum (U/L)	Liver (U/mg protein)	Kidney (U/mg protein)
Group-I	20.5 ± 0.1	19.6 ± 0.01	9.6 ± 0.05	28.8 ± 0.01	33.5 ± 0.01	22.0 ±0.03
Group-II	40.8 ± 0.0	35.5 ± 0.19	32.4 ± 0.01	68.0 ± 0.05	62.0 ± 0.04	65.2 ± 0.0
Group-III	21.4 ± 0.05	26.6 ± 0.02	12.0 ± 0.01	29 ± 0.04	36.1 ± 0.01	28.8 ± 0.02
Group-IV	31.6 ± 0.0	30.0 ± 0.01	25.0 ± 0.01	47.5 ± 0.02	46.2 ± 0.07	50 ± 0.04
Group-V	18.6 ± 0.01	20.1 ± 0.02	12.6 ± 0.01	32.6 ± 0.01	38.1 ± 0.03	36.2 ± 0.02

G-I -Normal Control; G-II-Diabetic Control;G-III-GlibenclamideControl;G-IV- Treatment 1 (200 mg/kg b.w. dose); G-V-Treatment 2 (400 mg/kg b.w. dose)

DISCUSSION

The current study's findings demonstrated that the plant extract's phytoconstituents have strong disease-curing potential. The sample's physiochemical characteristics demonstrated its veracity and preserved the quality of the plant sample for the study. These first screening assays

are helpful in identifying bioactive elements and may result in the discovery and creation of novel medications.

An acute toxicity research that identified no major signs (or symptoms) of poisoning in healthy rats served as evidence of the exceptional safety of 50% hydroethanolic extract for long-term oral treatment. Rats with diabetes had higher levels of blood sugar, haemoglobin, urea, and creatinine while having lower levels of liver glycogen, insulin, and body weight. In diabetic rats, there was a decrease in hexokinase activity and enzymic antioxidants but an increase in glucose 6 phosphatase activity, phosphatase (ACP, ALP), and transaminase activity (SGOT,SGPT). These conditions are reversed after treatment with plant extract, with rats showing signs of almost normalcy.

The blood cholesterol, triglycerides, VLDL, and LDL levels in diabetic rats were higher than those in normal control rats. The fundamental reason for the high level of serum lipid is a decrease in the effect of lipolytic hormones on fat depots. In the present study, diabetic rats had greater triglyceride and cholesterol levels than did non-diabetic rats.In diabetic rats given plant extract treatment, the levels of TC and TG were significantly lowered. The good cholesterol HDL-C level also rose. Increased lipolysis or decreased activity of the enzymes that make cholesterol could both have these consequences. Under normal circumstances, insulin normally stimulates the lipoprotein lipase enzyme and hydrolyzes TG (Ji Su Kim et al., 2006). Such an increase in TG may be brought on by diabetes-related insulin deficiency.

After consuming *Barleria cristata L.* stem extract, blood glucose and lipid indices drastically dropped, showing that it possesses hypoglycemic and hypolipidemic effects. *Sphaeranthus indices Linn*. (Ramachandran et al., 2011), *Lycium barbarum*(Longjun jing and Libo yin, 2010), *Ficus glomerata*(Vivek Kumar Sharma et al., 2010), and *Chrysanthenum unshiu*(Ji Su Kim et al., 2006) have all been the subject of similar findings.

CONCLUSION

Strong therapeutic substances are developed with the help of medicinal plants. Drugs made from plants are being used in modern medicine. So, further research on the *Barleria cristata* L. stem extract is necessary to determine the bioactive component that gives it its pharmacological activity.

ACKNOWLEDGEMENT

The management of PSG CAS, Coimbatore and RVS College of Arts and Science, Coimbatore are gratefully acknowledged by the authors for their assistance.

CONFLICT OF INTEREST – None declared.

REFERENCES

1. Nabarun Mukhopadhyay, Sampath,V., Sameer Pai, Babu UV. and Richard Lobo. (2019). Antidiabetic medicinal plants: a review.*International research journal of pharmacy*,10 (2), 31-37.
2. Moien Abdul Basith Khan, Muhammad JawadHashim, Jeffrey Kwan King, Romona Devi Govender, Halla Mustafa. and Juma, A.Kaabi. (2020). Epidemiology of Type 2

Diabetes – Global Burden of Disease and Forecasted Trends. *Journal of Epidemiology and Global Health*,10(1), 107–111. DOI: https://doi.org/10.2991/jegh.k.191028.001

3. Rasidat O Tijani, Lawal SO, Oyekan JO, Koleoso OK, Onasanya SS. and Fasasi, AA. (2021). Anti-Diabetic Effect of Methanolic Extract of Aristolochiaringens Leaf. *Biochemistry and Analytical Biochemistry*, 10(7), 1-11.
4. LoubnaAitDra, SouadSellami, HananeRais, Faissal Aziz, AbdallahAghraz, Khalid Bekkouche, Mohamed Markouk, and Mustapha Larhsini. (2019).Antidiabetic potential of Carallumaeuropaea against alloxan-induced diabetes in mice. *Saudi Journal of Biological Sciences*, 26, 1171–1178.
5. Amutha, K. and D. VA. Doss. (2022). Evaluation of hypoglycemic and hypolipidemic activity of 50% hydro ethanolic leaf extract of *barleriacristata*l. In alloxan induced diabetic and high lipid diet fed rats. *IJPSR*, 13(9), 3754-3761.
6. Pharmacopoeia of India. (1996). Ministry of Health and Family Welfare, Government of India, New Delhi, Vol. II, Appendix 3, A-53-54.
7. African Pharmacopoeia. (1986).OAU/STRC Publications Division, Lagos, Nigeria, Vol. 2, 1st ed. pp128-144.
8. Mensor, L.I., Menezes, F.S., Leitao,G.G., Reis, A.S., Dos Santos, T., Coube, C.S. and Leitao, S.G. (2001). Screening of Brazillian plant extracts for antioxidant activity by the use of DPPH free radical method. *Phytother. Res,* 15, 127-130.
9. Gulcin, I., Berashvili, D. and Gepdiremen, A. (2005). Antiradical and antioxidant activity of total anthocyanidins from *Perlliapankinensis*. *J. Ethnopharmacol*, 101, 287-293.
10. Green, L.C., Wagner, D.A., Glogowiski, J., Skipper,P. L, Wishnok, J.S., Tannenbaum, S.R. (1982).*Analytical Biochemistry*, 126- 131.
11. Ruch, R,J., Cheng, S.J. and Klaunig, J.E.(1989). *Carsinog*, 10, 1003.
12. Miller, L.C. and Tainter, M.L.(1944). Proc. Soc. *Exptl. Biol. Med*, 57, 261
13. Kameswararao, B., Kesavulu, M.M. and Apparao, C. (2003). Evaluation of antidiabetic effect of Momordica*cymbalaria*fruit in alloxan diabetic rats. *Fitoterapia*, 74, 7-13.
14. Trinder, P.(1969).Glucose oxidase method. *Ann ClinBiochem*, 6,24.
15. Jim Standeferand Phillip Eaton R. (1983). Evaluation of a colorimetric Method for Determination of Glycosylated Hemoglobin. *J Clinical Chemistry*, 1 (29), 135-137.
16. Clark, P.M.S. and Hales, C.N.(1991). Assay of insulin In: PC pickup and G Williams eds. Textbook of Diabetes. *Blackwell Scientific Publications*, (1), 335-347.
17. Vander Vries,J. (1954). Two methods for the determination of glycogen in liver. *Biochemistry Journal*, 57,410 – 416
18. Wybenga, D.R., Di Glorgio, J. and Pileggi, V.J. (1971).*Clinical Chem.*,17, 891-895
19. Slot, C. and Scand,J. (1965).*Clin. Lab Invest*, 17, 381-387
20. Philip, D. and Mayne.(1994).Clinical Chemistry in diagnostic and treatment. Radical-scavenging activity of foods by using 1, 1-diphenyl-2-picrylhydrazyl. *Biosci. Biotechnol.*, 11, pp 224.
21. Castelli, W.P., Doyle, J.T., Gordon, T., Hames, C.G., Hjortland, M.C., Hulley, S.B., Kagen, A. and Zukel, W.J. (1977). *Circulation*,55, 787.
22. Richmond, N. (1973). Preparation and properties of a cholesterol oxidase from *Nocardia sp*. and its application to the enzymatic assay of total cholesterol in serum. *Clin Chem.*, 19,1350 – 1356.

23. Brandstrup, N., Kirk, J. and Bruni, C. (1957). The hexokinase and phosphoglucoisomerase activities of aortic and pulmonary artery tissue in individuals of various ages. *J. Gerentol*, 12,166-71.
24. King, E.J., Abul-Fadl MAM. and Walker, P.G.(1951). King-Armstrong Phosphatase Estimation by the Determination of Liberated Phosphate. *J ClinPathol*,4(1), 85–91. doi: 10.1136/jcp.4.1.85
25. Reitman, S.and Frankel, S.A. (1957). Colorimetric method for the determination of serum glutamic oxaloacetic, glutamic pyruvic transaminases. *A. J. Clinical Pathol*,8,pp 56-63.
26. Ji Su Kim,Jung Bong Ju, Chang Won Choi and Sei Chang Kim. (2006). Hypoglycemic and Antihyperlipidemic Effect of Four Korean Medicinal plants in Alloxan Induced Diabetic Rats. *American Journal of Biochemistry and Biotechnology*, 2 (4), 154-160.
27. Ramachandran, S., Asokkumar, K., Uma Maheswari, M., Ravi, T.K., Sivashanmugam, A.T., Saravanan, S., Rajasekaran, A. and Dharman, J. (2011). Investigation of Antidiabetic, Antihyperlipidemic and Invivo Antioxidant properties of *Sphaeranthusindicus*Linn. in Type I Diabetic Rats: An identification of possible Biomarkers.2011.
28. Longjun jing and Libo yin. (2010). Antihyperglycemic activity of polysaccharide from *Lycium barbarum.Journal of Medicinal plants Research*, 4(1), 023-026.
29. Vivek Kumar Sharma, Suresh Kumar, Hitesh Jayantibhai Patel and ShivaKumarHugar. (2010). Hypoglycemic activity of Ficus Glomerata in alloxan induced diabetic rats. *International Journal of Pharmaceutical Sciences Review and Research*, 1(2), 4.