PHARMACOLOGICAL EVALUATION OF QUISQUALIS INDICA BARK EXTRACT: PHYTOCHEMICAL CHARACTERIZATION, SAFETY, AND ANTI-DIABETIC ACTIVITY IN CHOLESTEROL-INDUCED DIABETIC RATS

Atish Pandey[1]*, Kuldeep Singh[2], Arvind Kumar Srivastava[3]

1. Scholar, Department of pharmacology Shambhunath Institute of Pharmacy , Jhalwa, Allahabad, U.P, India
2. Assistant Professor, Department of pharmacology Shambhunath Institute of Pharmacy , Jhalwa, Allahabad, U.P, India
3. Director, Department of pharmacology Shambhunath Institute Of Pharmacy , Jhalwa, Allahabad, U.P, India

Abstract

The present study investigates the Phytochemical profile, safety, and anti-diabetic potential of *Quisqualis indica* bark extract using cholesterol-induced diabetic Wistar rats. Initial pharmacognostic evaluation revealed the presence of several bioactive constituents, including alkaloids, flavonoids, tannins, saponins, and phenolic compounds. Physicochemical parameters such as moisture content, ash values, and extractive yields were determined in accordance with Ayurvedic Pharmacopoeia standards. Acute oral toxicity studies confirmed the extract's safety at 200 mg/kg, with no signs of behavioural or physiological abnormalities. In a 15-day treatment protocol, diabetic rats receiving 100 mg/kg and 250 mg/kg doses of the extract exhibited significant reductions in fasting blood glucose levels, improved serum biochemical markers (ALT, AST, cholesterol, total protein), and moderate gains in body weight, indicating therapeutic benefit. The extract demonstrated a dose-dependent hypoglycemic effect comparable to standard antidiabetic medication. These findings suggest that *Quisqualis indica* possesses promising anti-diabetic and hepatoprotective properties, supporting its potential development as a natural therapeutic agent.

Keywords: *Quisqualis indica, Anti-diabetic activity ,Phytochemical screening ,Cholesterol-induced diabetes, Wistar rats, Herbal medicine.*

Corresponding Author

Atish Pandey, Scholar,
Department of pharmacology Shambhunath Institute of Pharmacy , Jhalwa, Allahabad, U.P, India
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1. Introduction:

Diabetes mellitus is a multifactorial endocrine disorder marked by elevated blood glucose levels resulting from insulin insufficiency, insulin resistance, or both. It is broadly categorized into Type 1 diabetes (T1DM) and Type 2 diabetes (T2DM), the latter accounting for over 90% of global cases. The pathogenesis of T2DM involves chronic low-grade inflammation, oxidative stress, and pancreatic β-cell dysfunction, contributing to metabolic complications such as dyslipidemia and hepatocellular injury (Singh et al., 2020). According to the International Diabetes Federation (IDF), the global diabetic population is projected to rise to 643 million by 2030, posing an enormous burden on healthcare systems (IDF, 2021). Despite the availability of oral hypoglycemics and insulin therapy, long-term use often leads to drug resistance, adverse effects, and economic constraints, necessitating safer and more sustainable alternatives (Chaudhury et al., 2017).

Over the past few decades, there has been a resurgence of interest in ethnobotany and traditional medicine, particularly in identifying plant-derived bioactives with anti-diabetic potential. More than 1,200 species of medicinal plants have been traditionally used for treating diabetes across various cultures, including Ayurveda, Unani, and Traditional Chinese Medicine (Modak et al., 2007). Among them, *Quisqualis indica* Linn., a member of the Combretaceae family, stands out for its reported ethnomedicinal uses in the treatment of gastrointestinal disorders, parasitic infections, and inflammation (Devi et al., 2017; Rajkumar et al., 2015). Known as Rangoon Creeper, this tropical woody vine is rich in phytoconstituents such as flavonoids, tannins, saponins, phenolic acids, and alkaloids—all of which have been individually reported to exert anti-diabetic, antioxidant, and hepatoprotective effects (Gupta et al., 2018).

While previous studies have reported general antimicrobial and anthelmintic activities of *Quisqualis indica*, scientific evidence supporting its role in glucose regulation, lipid metabolism, and hepatoprotection remains sparse. In particular, the bark of *Q. indica*—though used traditionally—has not been thoroughly evaluated in animal models of metabolic dysfunction such as cholesterol-induced hyperglycemia, which mimics Type 2 diabetic pathology. Moreover, comprehensive data on its phytochemical composition, toxicity profile, and biochemical impact on key metabolic parameters such as blood glucose, serum cholesterol, liver enzymes (ALT and AST), and total protein are still lacking.

The current study, therefore, aims to (1) evaluate the phytochemical and physicochemical properties of *Q. indica* bark extract, (2) assess its safety via acute oral toxicity testing as per Drugs and Cosmetics Rules (2005), and (3) investigate its therapeutic efficacy in Wistar rats with cholesterol-induced hyperglycemia. The model employed reflects insulin resistance and metabolic syndrome conditions, offering clinically relevant insights. Standardized protocols including spectrophotometric

enzyme assays and glucometer-based glucose monitoring were employed to ensure accurate biochemical analysis. This integrated approach not only validates the traditional claims associated with *Quisqualis indica* but also provides a scientific basis for its potential development as a plant-based anti-diabetic formulation.

2. Collection and Authentication of Crude Drugs

Quisqualis indica stem bark was collected locally and used to prepare a veterinary extract. About 50 g of the powdered bark underwent Soxhlet extraction with 95% ethanol for 8–12 hours. The extract was concentrated via distillation and rotary evaporation below 40°C under reduced pressure. Around 10 g of dried extract was collected and refrigerated. Organoleptic evaluation involved smelling the sample directly or after crushing or heating, and the odor was rated based on intensity.(Kokate et al 2017)

2.1 Preliminary phytochemical screening of extract formulation

a. Test for Fixed Oils

The spot test was performed by pressing a small amount of the extract formulation between filter papers. The appearance of translucent oil stains on the paper indicated the presence of fixed oils in the extract.(Khandelwal et al 2019)

b. Test for Steroids

The presence of steroids in the extract was confirmed using Liebermann-Burchard's and Salkowski's tests. In the Liebermann-Burchard's test, the extract dissolved in a 30:70 hydroalcoholic solution was treated with chloroform, acetic anhydride, and concentrated sulphuric acid. A color change from red to blue and finally bluish-green indicatezazd the presence of steroids. In the Salkowski's test, the hydroalcoholic extract was mixed with chloroform and concentrated sulphuric acid, leading to a bluish-red to cherry-red color in the chloroform layer and green fluorescence in the acid layer, confirming the presence of steroids and sterols.(Harborne et al 1998)

c. Test for Alkaloids

The presence of alkaloids in the extract was confirmed through several classical tests. In Dragendorff's test, an orange-red precipitate appeared upon mixing the extract with Dragendorff's reagent. Mayer's test showed a cream-colored precipitate, while Wagner's test resulted in a reddish-brown precipitate. Lastly, Hager's test produced a yellow precipitate. All these positive outcomes confirmed the presence of alkaloids in the extract.(Trease et al 2009)

d. Test for Flavonoids

Flavonoids in the extract were identified using Shinoda's and Ferric Chloride tests. In Shinoda's test, the addition of magnesium turnings and concentrated hydrochloric acid to the extract produced a pink or red coloration, indicating flavonoids. Similarly, the Ferric Chloride test showed a brown color upon reaction, further confirming their presence.(Harborne et al 1998)

e. Test for Tannins and Phenolic Compounds

Tannins and phenolic compounds were confirmed through multiple tests. The addition of 5% neutral ferric chloride to the extract produced a dark blue color, indicating tannins. When mixed with gelatin solution, a white precipitate formed, confirming the presence of tannins and phenolics. Similarly, the addition of lead tetraacetate resulted in a precipitate, further validating their presence in the extract.(Kokate et al 2017)

f. Test for Carbohydrates

The presence of carbohydrates in the extract was confirmed using several standard tests. In Molisch's test, a purple or reddish-violet ring formed at the junction of α-naphthol and concentrated sulphuric acid, indicating carbohydrates. Fehling's test produced a brick-red precipitate upon heating the extract with Fehling's solutions A and B. Similarly, Benedict's test showed a red precipitate after boiling and cooling the reagent with the extract. In Barfoed's test, the formation of copper oxide upon boiling confirmed the presence of monosaccharides, further supporting the carbohydrate content in the extract.(Khandelwal et al)

g. Test for Proteins and Amino Acids

Proteins and amino acids in the extract were identified using Biuret's, Ninhydrin, and Xanthoproteic tests. In Biuret's test, the addition of 40% sodium hydroxide and 1% copper sulfate produced a violet color, indicating proteins. The Ninhydrin test showed a purple coloration upon heating with the reagent, confirming the presence of proteins and amino acids. In the Xanthoproteic test, a white precipitate formed after adding concentrated nitric acid, further supporting the presence of amino acids.(Kokate et al 2017)

h. Test for Saponins

Saponins in the extract were confirmed through characteristic tests. Shaking the extract with distilled water in a graduated cylinder led to foam formation, indicating saponins. Additionally, the development of a rich violet color upon adding strong sulphuric acid and alcoholic vanillin solution further confirmed their presence.(Khandelwal et al 2019)

i. Test for Glycosides

Glycosides in the extract were identified using multiple confirmatory tests. In Legal's test, a pink to crimson color appeared after adding sodium nitroprusside to the extract dissolved in pyridine, indicating glycosides. Baljet's test produced a yellow to orange hue upon reaction with sodium picrate, further confirming their presence. In Borntrager's test, heating the extract with dilute sulphuric acid, followed by chloroform extraction and ammonia addition, resulted in a red color, indicating anthraquinone glycosides. The Keller-Killiani test showed a reddish-brown color that turned blue at the junction when treated with acetic acid containing ferric chloride, confirming the presence of deoxy sugars in cardiac glycosides.(Trease)

2.2 Physicochemical parameters

The following physicochemical parameters were applied to air-dried powdered plant components.

2.2.1 Moisture content/Loss on drying:

The moisture content of the powdered drug was determined using the oven-drying method. Exactly 10 g of the sample was weighed and placed in a pre-weighed (tared) evaporating dish. The dish was then kept in a hot air oven at 105°C for five hours. After the initial drying, the sample was cooled in a desiccator to avoid moisture absorption and reweighed. This drying and weighing cycle was repeated hourly until a constant weight was achieved, indicating complete moisture removal. The percentage moisture content was calculated using the formula:

$$\textbf{Moisture Content (\%)} = [(W_{initial} - W_{final}) / W_{final}] \times 100,$$

where *Winitial* is the weight before drying and *Wfinal* is the constant weight after drying.

2.2.2 Determination of ash

The total ash content of the air-dried powdered material was determined to assess its inorganic residue. Precisely 2 g of the sample was placed into a pre-ignited and tared silica crucible. The powder was evenly spread and gradually ignited at around 480–600°C until a carbon-free white ash was obtained, indicating complete combustion. The crucible was cooled in a desiccator to avoid moisture uptake and then weighed. If carbon-free ash was not achieved initially, the residue was moistened with 2 mL of water, dried on a water bath, and re-ignited until a constant weight was reached. The total ash content was calculated using the formula:

$$\textbf{Total Ash (\%)} = [(Z - X) / Y] \times 100,$$

where *X* is the weight of the empty crucible, *Y* is the weight of the drug sample, and *Z* is the weight of the crucible with ash.(World Health Organization 2011)

2.2.3 Acid insoluble ash:

The acid-insoluble ash content was determined to evaluate the presence of siliceous impurities like sand and soil in the crude drug. Using the ash obtained from the total ash procedure, a known amount was placed in a crucible and treated with 25 mL of hydrochloric acid. Covered with a watch glass, the mixture was gently boiled for five minutes to dissolve acid-soluble components. The watch glass was rinsed with 5 mL of hot water, and the rinse was added to the crucible to ensure full recovery of soluble material. The mixture was then filtered using ashless filter paper, collecting the insoluble matter. This residue was washed with hot water until the filtrate reached a neutral pH (~7), dried, and transferred back to the crucible. The crucible was ignited until constant weight was achieved, cooled in a desiccator, and weighed. The acid-insoluble ash was calculated using the formula:

$$\textbf{Acid-Insoluble Ash (\%)} = (A / Y) \times 100,$$

where A is the weight of the final residue and Y is the initial weight of the crude drug. .(World Health Organization 2011)

2.2.4 Water soluble ash:

The water-insoluble ash content was determined to assess the presence of non-soluble inorganic matter in the sample. A known quantity of ash from the total ash procedure was placed in a crucible and mixed with 25 mL of water. The mixture was gently boiled for five minutes to dissolve water-soluble components. The contents were then filtered using ashless filter paper, and the residue was thoroughly washed with hot water to remove any remaining soluble matter. The filter paper containing the insoluble residue was transferred back to the crucible and ignited at a temperature not exceeding 450°C for 15 minutes. After cooling in a desiccator for 30 minutes, the crucible was weighed. The remaining residue represented the water-insoluble ash. (World Health Organization 2011)

2.3 Animals

A range of standard protocols was employed to ensure the pharmacological and toxicological evaluations of the test materials in animal models were scientifically valid and ethically compliant. Wistar rats were selected as the experimental species, and all procedures followed the 2003 guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), which govern animal care and use in research. Ethical approval for the study was secured from the Institutional Animal Ethics Committee (IAEC), confirming adherence to regulatory and moral standards. Animals were maintained under controlled environmental conditions—temperature at 23 ± 2°C, relative humidity between 40% and 60%, and a regulated 12-hour light/dark cycle—to minimize stress and ensure physiological stability. Proper animal husbandry was maintained, with

access to species-appropriate feed and water ad libitum. Additionally, food was withdrawn at specific intervals as required by the experimental design to standardize pharmacological or toxicological assessments.

2.4 Experimental protocol

This study assessed the effects of cholesterol and a test extract on blood glucose in Wistar rats across five groups. Group I received saline, Group II received cholesterol (250 mg/kg/day), Group III received a standard antidiabetic drug, and Groups IV and V received the extract at 100 mg/kg/day and 250 mg/kg/day, respectively. Blood glucose was measured weekly via tail vein using a glucometer. Consistent protocols ensured reliable and reproducible results.(Goyal et al 2017)

2.5 Induction of experimental diabetes in rats:

Wistar rats weighing 180–200 g were used as the animal model for diabetes induction. Hyperglycemia was induced by administering cholesterol orally in saline at a dose of 120 mg/kg body weight. Prior to induction, the rats were fasted overnight to stabilize baseline glucose levels. After three days of cholesterol administration, fasting blood glucose levels were measured using a OneTouch Accu-Chek glucometer via tail vein sampling. Rats exhibiting fasting blood glucose levels ≥250 mg/dL were classified as hyperglycemic and selected for further study.(Ghosh et al 2008)

2.6 Biochemical studies

These techniques provide thorough analysis in your study by precisely measuring important biochemical parameters in serum samples from experimental animals.(Burtis et al 2012)

2.6.1 Serum Glucose

Serum glucose was measured using a Crest Biosystems enzymatic kit. Glucose oxidase generated hydrogen peroxide, which reacted with 4-aminophenazone and hydroxybenzoate to form a colored complex. Ten microlitres of serum were mixed with 1 mL of reagent, incubated at 37°C for 10 minutes, and absorbance was read at 505 nm.(Trinder et al 1969)

2.6.2 Serum Protein

Total serum protein was estimated using the Biuret method (Crest Biosystems, India). In this method, cupric ions react with peptide bonds in an alkaline medium to form a colored complex. A mixture of 20 µL serum and 1 mL Biuret reagent was incubated at room temperature for 10 minutes, and the absorbance was measured at 550 nm.(Gornall et al 1949)

2.6.3 Serum Cholesterol

Serum cholesterol was measured using an enzymatic kit (Crest Biosystems, India). Cholesterol esterase hydrolyzed esterified cholesterol, producing hydrogen peroxide, which reacted with phenol and 4-aminoantipyrine to form a colored complex. Ten µL of serum was mixed with 1 mL of reagent, incubated at 37°C for 5 minutes, and absorbance was measured at 560 nm.

2.6.4 ALT (Alanine Transaminase)

Serum alanine transaminase activity was measured using an enzymatic kit (Span Diagnostics Ltd., India). ALT transformed α-ketoglutarate and alanine into pyruvate and glutamate. A brown hydrazone was created when the pyruvate was mixed with 2,4-dinitrophenylhydrazine (DNPH). After 30 minutes of incubating 0.25 ml of buffered substrate with 0.05 ml serum at 37°C, DNPH was added to halt the process. After adding sodium hydroxide, the reaction was monitored at 505 nm.(Reitman et al 1957)

2.6.5 AST (Aspartate Transaminase)

Serum aspartate transaminase activity was measured using a kit from Span Diagnostics Ltd. in India. AST transformed aspartate and α-ketoglutarate into glutamate and oxaloacetate. The hydrazone that was created when DNPH and oxaloacetate mixed together gave the alkaline pH its hue. After 0.25 ml of buffered substrate and 0.05 ml serum were added, the reaction was stopped by DNPH after an hour of incubation at 37°C. Sodium hydroxide was then added to obtain a reading at 505 nm.(Reitman et al 1957)

2.6.6 Acute Toxicity Studies

A uniform suspension of the test substances was prepared using 0.5% (w/v) carboxymethyl cellulose (CMC) as a vehicle, with the aid of a mortar and pestle. Experimental animals, weighing between 200–250 g, were administered varying doses of the plant extracts orally at 250 mg/kg body weight. Following administration, the animals were closely monitored for a period of 72 hours to observe any signs of toxicity, behavioral changes, or mortality, in compliance with OECD Guideline No. 423 (2001).

3. Result

3.1 Physico-Chemical Evaluation of Crude Drugs

Each crude drug was subjected to both physical and chemical evaluations based on various parameters. Physical examination serves as the initial and crucial step in the identification and standardization of crude drugs. It helps verify the authenticity of the material, detect possible adulterants, and provides essential insights into its composition. This process lays the groundwork for further chemical analysis and quality assurance.

3.2 Physical Test of Crude Drugs

The Quisqualis indica bark extract was found to be fibrous, indicating structural plant components. Its color ranged from brownish to dark brown, influenced by pigments and phytochemicals. The extract had an aromatic odor due to volatile compounds, while its taste profile remains unreported, requiring further evaluation.

Table 3.1: "The Organoleptic properties of the plant extract were evaluated for appearance, colour and taste".

Crude drugs	**Physical Test**			
	Nature	**Colour**	**Odour**	**Taste**
Quisqualis indica Bark Extract	slightly fibrous	Brownish to dark brown	Aromatic	Bitter

3.3 Extractive Values

The extractive values of Quisqualis indica bark extract were 15.45% w/w in aqueous solution and 10.62% w/w in ethanol, indicating a higher solubility of constituents in water. This suggests that water is more effective than ethanol in extracting soluble components from the bark. These results are valuable for selecting suitable solvents to optimize the yield of bioactive compounds in future pharmacological or analytical applications. The relatively lower ethanol extractive value suggests a lesser presence or lower extractability of lipophilic compounds in the bark. Understanding such parameters ensures reproducibility in formulation and helps maintain batch-to-batch consistency in herbal products.

Table 3.2: "The plant extract's extractive values for aqueous and ethanolic solutions were assessed."

Crude drugs	**Ethanol % w/w**	**Aqueous % w/w**
Quisqualis indica Bark Extract	10.62%	15.45%

3.4 Moisture content And Foreign Organic Matter(Table 5.3)

Quisqualis indica bark extract showed a moisture content of 8.25% w/w, indicating good stability and quality. The foreign matter was 2.58% w/w, reflecting minor contamination. These parameters are essential for ensuring the extract's purity and compliance with pharmaceutical and herbal standards.

Table 3.3: "Moisture content And Foreign Organic Matter"

Crude drugs	**Moisture content (% w/w)***	**Foreign matter (% w/w)***
Quisqualis indica Bark Extract	8.25 %	2.58%

3.5 Total Ash, Acid Insoluble Ash And Water Soluble Ash Values(TABLE 5.4)

Quisqualis indica bark extract showed a total ash value of 7.52% w/w, with 3.34% w/w water-soluble ash and 4.15% w/w acid-insoluble ash. These values reflect the inorganic content and its solubility, contributing to the extract's physicochemical profile and ensuring its quality for pharmaceutical and herbal applications.

Table 3.4: Total Ash, Acid Insoluble Ash And Water Soluble Ash Values

Crude drugs	**Total ash value* % w/w**	**Water soluble ash* % w/w**	**Acid insoluble ash value* % w/w**
Quisqualis indica Bark Extract	7.52 %	3.34 %	4.15 %

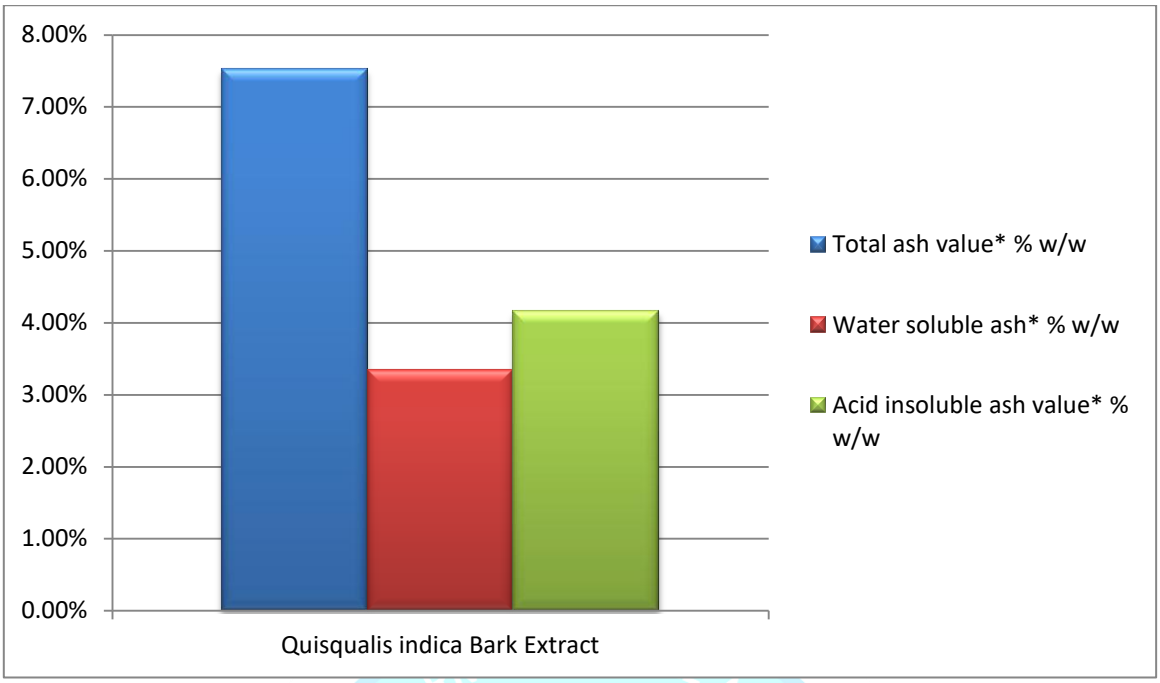

Fig 3.2: Total Ash, Acid Insoluble Ash And Water Soluble Ash Values

3.5 Phytochemical Screening

Phytochemical screening of Quisqualis indica bark extract revealed the presence of several bioactive compounds, including saponins, alkaloids (confirmed by Hager's and Mayer's tests), tannins, phenolic compounds, flavonoids, and proteins. However, triterpenoids, steroids, glycosides, and carbohydrates were absent. The presence of medicinally important constituents like alkaloids and flavonoids highlights the extract's therapeutic potential, warranting further investigation for its use in pharmaceutical applications.

3.6 Collection of Blood and separation of Serum

Using the retro-orbital plexus technique and heart puncture, blood samples were drawn into separate tubes and centrifuged for 20 minutes at 3000 rpm. Before analysis was done, the serum was separated as supernatant and kept at -20°C.

3.7 Acute Toxicity Study

Acute toxicity studies are vital for determining the safety profile of a substance by identifying potentially harmful effects at a high or single dose. In this study, acute oral toxicity of the Quisqualis indica bark extract was evaluated as per the Drugs and Cosmetics Rules (2005). Wistar rats received a single oral dose of 200 mg/kg and were observed for 72 hours for any signs of toxicity, behavioral changes, altered feeding patterns, or mortality. No adverse effects or deaths were recorded, indicating

that the extract at this dose is safe and well-tolerated, supporting its suitability for further pharmacological evaluation.

3.8 Biochemical Studies

Biochemical analysis over a 28-day treatment period revealed notable metabolic differences among the Wistar rat groups. Group 1 (control) showed baseline levels with glucose at 80.21 mg/dL, cholesterol at 91.05 mg/dL, total protein at 4.20 mg/dL, ALT at 34.05 IU/L, and AST at 33.64 IU/L. Group 2 exhibited elevated glucose (90.63 mg/dL), cholesterol (163.07 mg/dL), protein (5.56 mg/dL), and liver enzymes, indicating possible metabolic stress. Group 3, treated with a standard drug, showed improved parameters with reduced glucose (68.15 mg/dL) and cholesterol (79.25 mg/dL), and normalized liver enzymes. Groups 4 and 5, treated with the test extract, showed intermediate values, suggesting a dose-dependent modulation of glucose, lipid metabolism, and liver function. These findings highlight the extract's potential metabolic influence in hyperglycemic conditions.

Table 3.7: Biochemical Studies after 28 days

Groups	**Biochemical Studies after 28 days**				
	Glucose (mg/dl)	**Cholesterol (mg/dl))**	**ALT (IU/L)**	**AST (IU/L)**	**Total Protein (mg/dl)**
Group 1	80.21±2.41	91.05±1.16	34.05±1.17	33.64±2.23	4.20±1.06
Group 2	90.63±2.15	163.07±2.33	39.48±2.18	40.98±2.5	5.56±2.8
Group 3	68.15±1.92	79.25±3.72	33.12±2.56	34.12±3.34	4.14±3.68
Group 4	73.81±2.14	137.06±2.28	37.94±2.24	38.14±3.39	4.60±4.00
Group 5	71.97±1.24	110.42±3.41	35.45±3.77	36.16±3.8	4.25±4.55

Values are presented as mean ± SEM (n=6),$p<0.05$

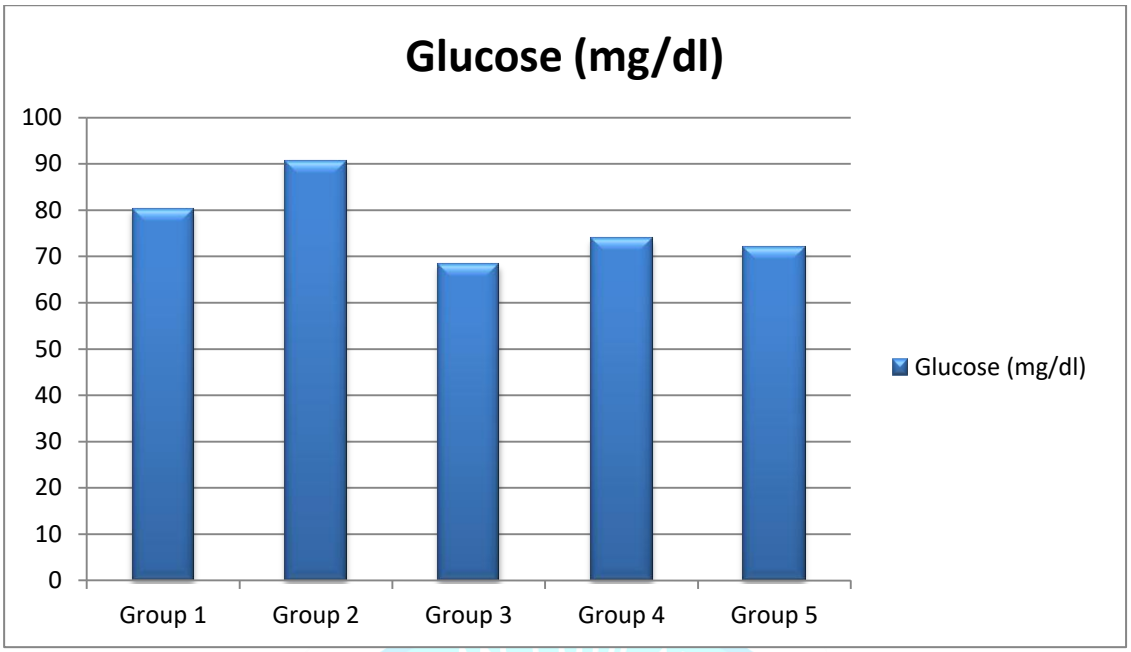

Fig 3.3: Biochemical Studies after 28 days Glucose (mg/dl)

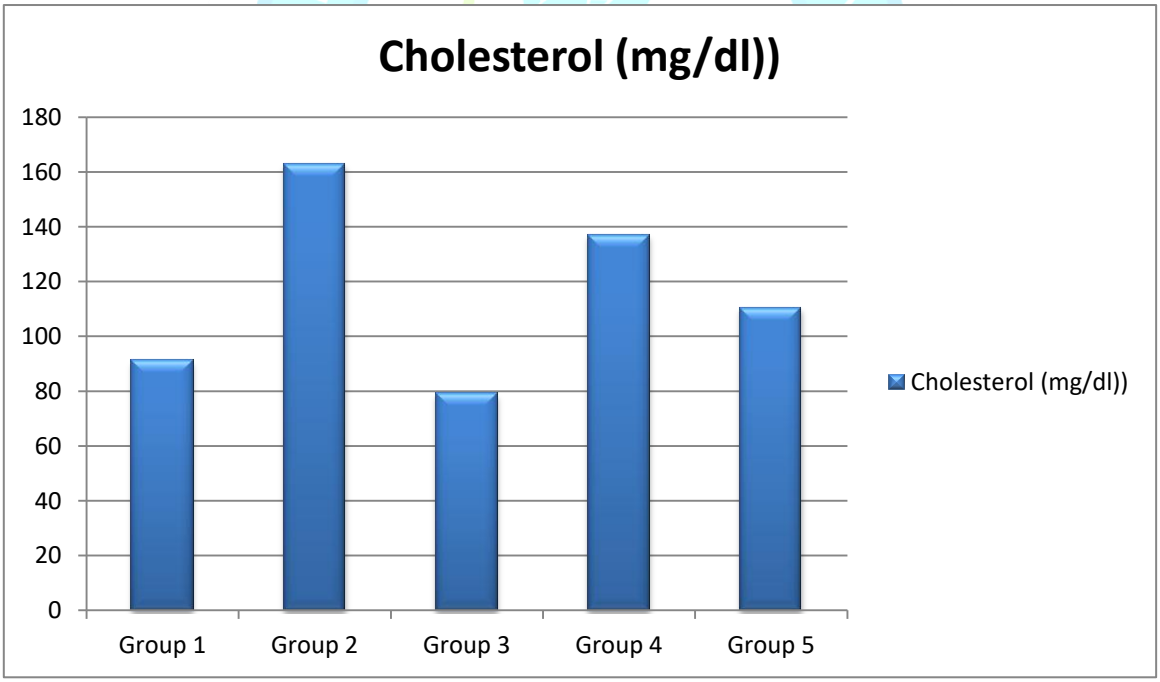

Fig 3.4: Biochemical Studies after 28 days Cholesterol (mg/dl))

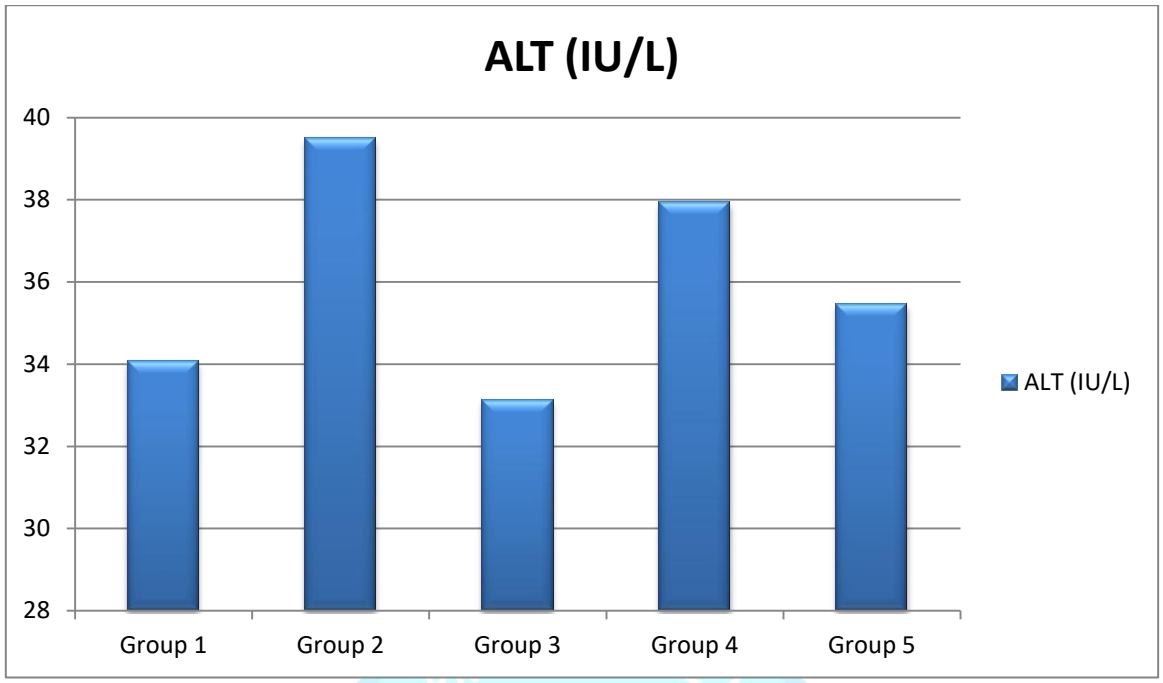

Fig 3.5: Biochemical Studies after 28 days ALT (IU/L)

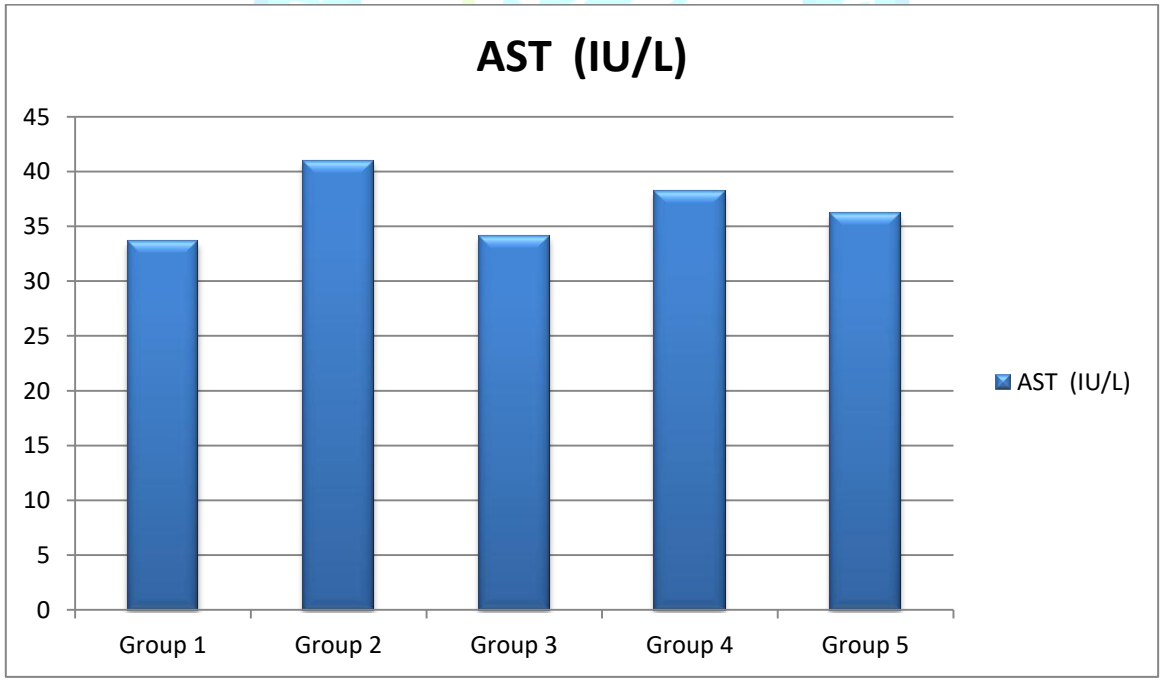

Fig 3.6: Biochemical Studies after 28 days AST (IU/L)

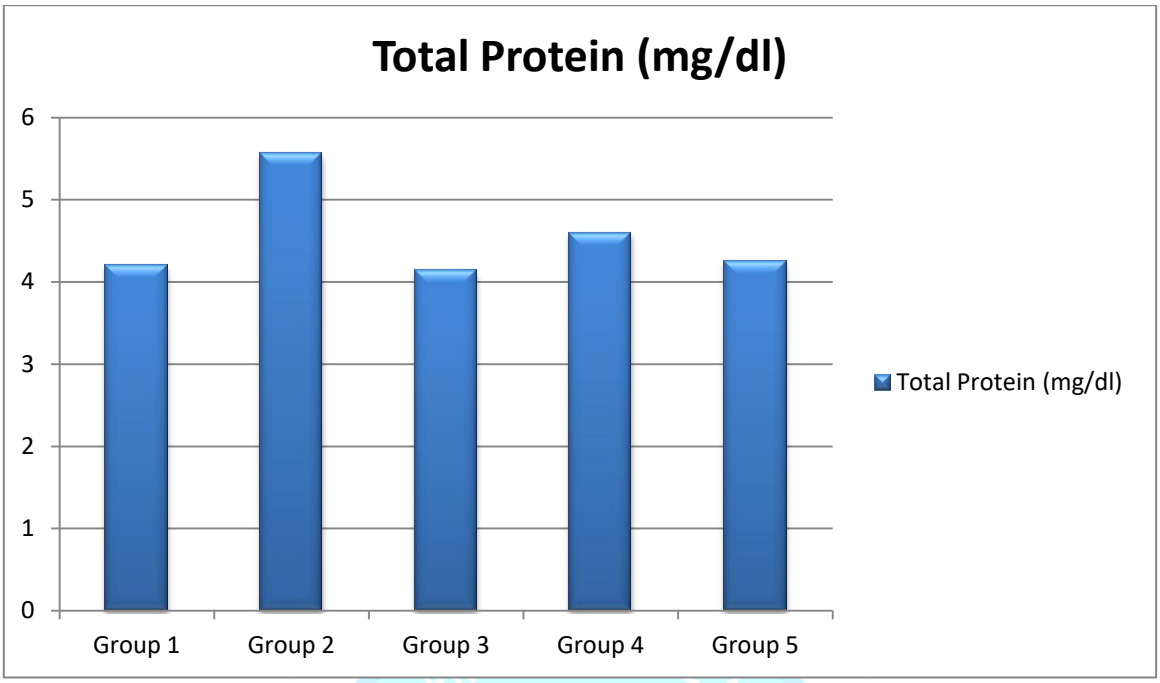

Fig 3.7: Biochemical Studies after 28 days Total Protein (mg/dl)

3.9 Screening of anti-diabetic action of test drugs

Fasting blood glucose levels were monitored over 15 days to assess the anti-diabetic effects of extracts in rats with cholesterol-induced diabetes. On Day 0, Groups 2–5 showed elevated glucose levels (279.60–305.65 mg/dL), confirming successful diabetes induction, while Group 1 remained normal (104.25 mg/dL). Group 3, receiving a standard antidiabetic treatment, showed the most significant glucose reduction, reaching 125.05 mg/dL by Day 15. Groups 4 and 5, treated with the extract, also demonstrated gradual declines in glucose levels, suggesting dose-dependent anti-diabetic activity. Group 1 remained stable, validating experimental consistency. These results support the extract's potential hypoglycemic effect.

Table 3.7: Screening of anti-diabetic activity of extracts on cholestrol-induced diabetic rats

Groups	**Fasting blood glucose (mg/dl)**			
	Day 0	**Day 5th**	**Day 10th**	**Day 15th**
Group 1	104.25±2.5	105.21±4.10	102.27±2.88	101.33±2.92
Group 2	305.65±3.55	315.75±2.9	316.08±1.77	317.05±2.98

Group 3	279.60±2.98	202.45±3.37	165.06±1.62	125.05±1.96
Group 4	290.06±2.44	247.55±3.3	198.37±3.37	155.25±3.37
Group 5	287.34±3.43	235.56±2.49	185.64±3.15	140.25±2.4

Values are presented as mean ± SEM (n=6),p<0.05

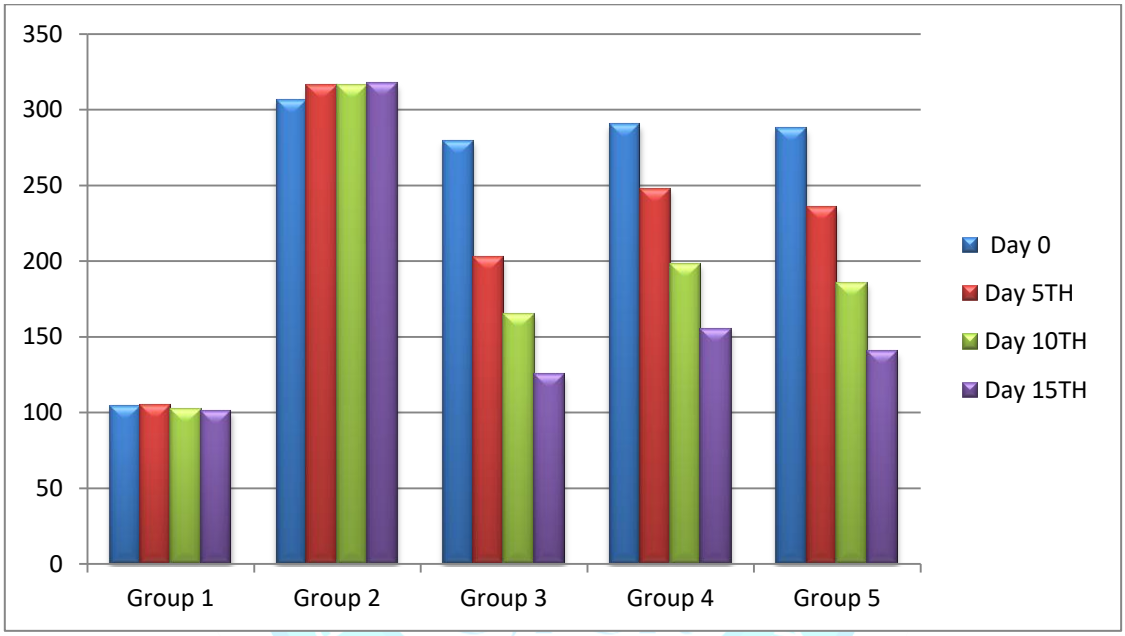

Fig 3.8 Screening of anti-diabetic activity of extracts on cholestrol-induced diabetic rats

3.10 Body weight (g)

Body weight measurements taken over the 15-day treatment period revealed notable changes across the groups, indicating potential physiological effects of the treatments. Group 1 (control) maintained relatively stable weight, showing minor fluctuations around the baseline. Group 2, despite starting at a lower weight, showed gradual gains, suggesting mild recovery. Groups 3, 4, and 5, which received standard drug or extract treatments, exhibited consistent and significant increases in body weight, with Group 3 showing the highest gain from 83.27 g to 95.05 g. These trends suggest that the treatments may have supported overall health and metabolic improvement in diabetic rats.

Table 3.8: The body weight (g) of the animals during 15 d of treatment

Groups	**Body weight (g)**

	Day 0	**Day 5th**	**Day 10th**	**Day 15th**
Group 1	100.25±2.93	103.23±2.81	101.24±2.77	102.27±2.85
Group 2	75.26±3.64	80.25±2.63	81.07±2.18	81.55±1.77
Group 3	83.27±3.57	90.26±3.72	93.24±2.42	95.05±1.62
Group 4	80.65±3.00	90.23±3.3	92.06±2.09	93.45±3.33
Group 5	79.88±3.47	91.05±2.28	93.05±1.67	94.27±3.70

Values are presented as mean ± SEM (n=6),$p<0.05$

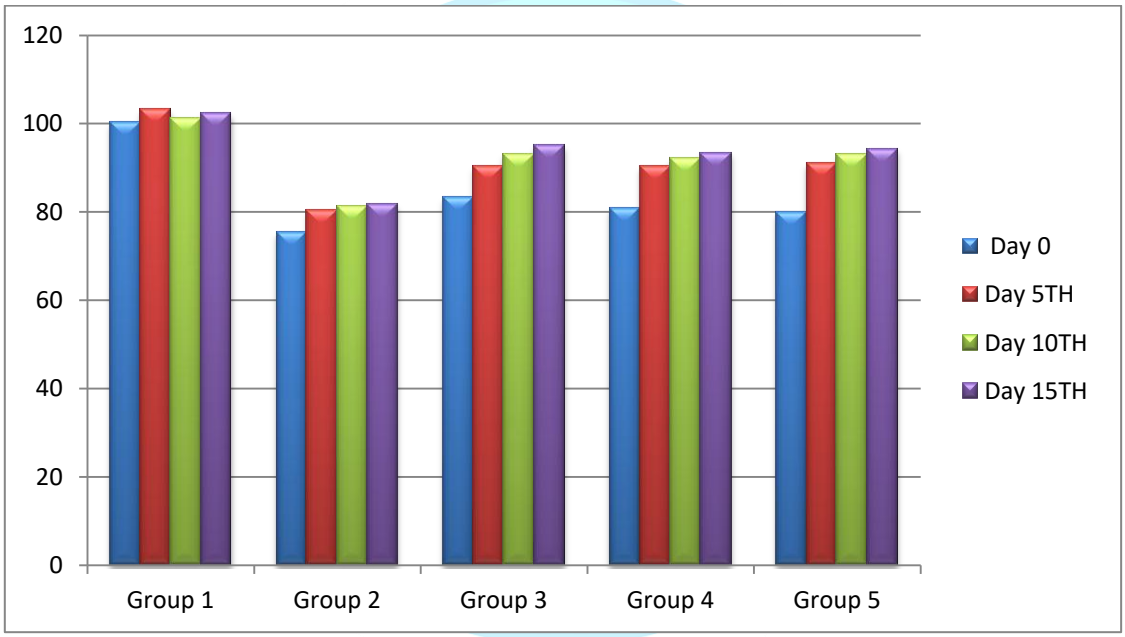

Fig 3.9: Body weight (g) of the animals during 15 d of treatment

3.11 Body temperature (°F)

Body temperature monitoring over 15 days in five groups of Wistar rats revealed varied physiological responses to treatment. Group 3 showed a notable drop from 98.25°F to 95.54°F, while Group 4 experienced a steady rise to 98.77°F, suggesting differing thermoregulatory effects. Groups 1, 2, and 5 exhibited minor fluctuations. These variations indicate potential treatment-induced metabolic or physiological changes, warranting further investigation into their underlying mechanisms and relevance to overall therapeutic impact.

Table 3.9: The Body temperature (°F) of the animals during 15 d of treatment

Groups	Body temperature (°F)			
	Day 0	Day 5th	Day 10th	Day 15th
Group 1	96.06±4.35	96.35±2.85	97.24±2.72	97.88±4.06
Group 2	97.24±5.08	95.98±2.65	96.54±2.14	96.24±2.51
Group 3	98.25±4.38	97.64±3.78	96.54±3.22	95.54±4.41
Group 4	98.24±4.78	98.64±3.5	98.45±3.44	98.77±4.87
Group 5	97.33±3.36	97.25±3.41	97.23±2.8	98.12±3.41

Values are presented as mean ± SEM (n=6),$p<0.05$

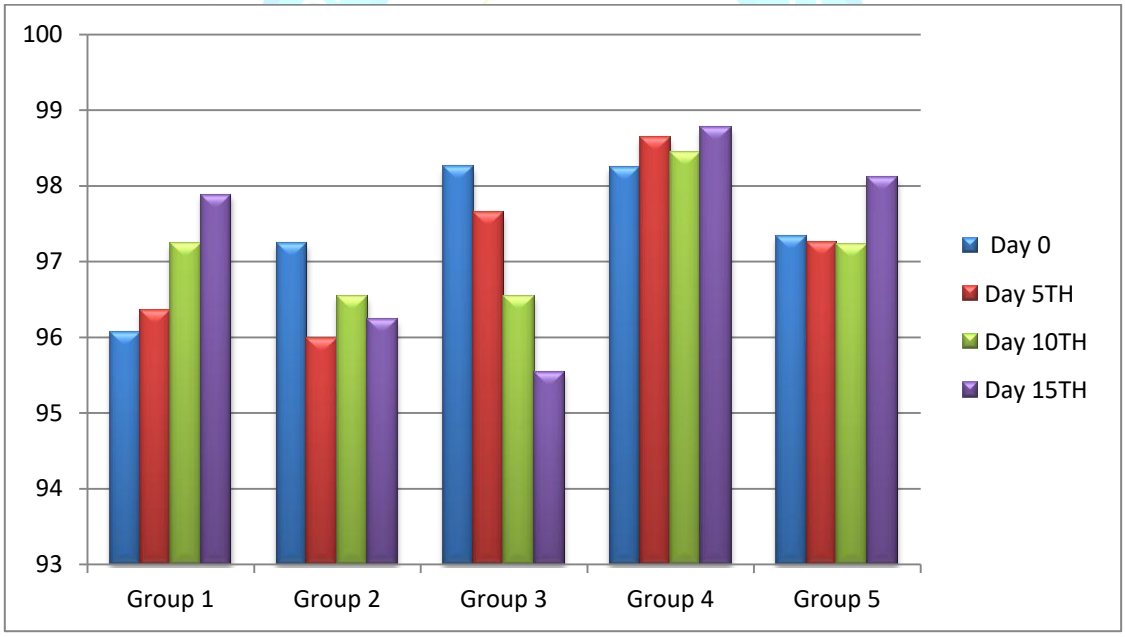

Fig 3.10: Body temperature (°F) of the animals during 15 d of treatment

4. Conclusion:

The findings of this study demonstrate that *Quisqualis indica* bark extract possesses significant anti-diabetic activity, as evidenced by its ability to reduce fasting blood glucose levels and improve biochemical parameters such as serum cholesterol, ALT, AST, and total protein in cholesterol-induced diabetic Wistar rats. Phytochemical analysis confirmed the presence of bioactive constituents including flavonoids, alkaloids, tannins, phenolics, saponins, and proteins, which may contribute to its

therapeutic effects. Physicochemical evaluations confirmed the extract's quality and compliance with pharmacopoeial standards, while acute toxicity studies indicated that the extract is safe at tested doses. Overall, the study supports the traditional use of *Quisqualis indica* and suggests its potential as a safe and effective natural remedy for managing diabetes and related metabolic disorders. Further research is recommended to isolate specific active constituents and explore their mechanisms of action through advanced pharmacological and clinical studies.

5. Conflict of Interest:

The authors declare that there is no conflict of interest

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