



ANTI-HYPERGLYCEMIC ACTIVITY OF ABUTILON INDICUM USING ALLOXAN INDUCED HYPERGLYCAEMIA IN MICE

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ABSTRACT

During past several years, there has been growing interest among the usage of various medicinal plants from traditional system of ailments. The objective of this study was to evaluate the anti-hyperglycemic effect from alcoholic extract derived from the *Abutilon indicum* plant. Oral administration of the extract (200mg/kg body weight) led to a significant reduction in plasma glucose levels in diabetic mice (by inducing alloxan) as compared with untreated mice, and this was at a faster rate than the use of antidiabetic drug Glibenclamide. Phytochemical screening also revealed that the extract contains alkaloids, flavonoids, tannins, glycosides that could account for the observed pharmacological effect.

INTRODUCTION

Diabetes mellitus

Diabetes mellitus (DM) is a group of diseases characterized by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. The term diabetes mellitus describes a metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both [1-5]. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs.

AIM AND OBJECTIVES

Aim

To evaluate the anti-hyperglycemic activity of *Abutilon indicum* using alloxan induced hyperglycemia in albino mice using various parameters.

Objectives

- Collection and extraction of *Abutilon indicum*
- Biological evaluations of plant extract

- To induce the hyperglycemia (increase in blood glucose level) in male albino mice by using single Intraperitoneal administration of Alloxan.
- To investigate the anti-hyperglycemic activity using various parameters as follows:
 - Evaluation of body weight
 - Evaluate the acute toxicity of plant extract
 - Estimation of blood glucose levels using glucometer
 - Estimation of plasma glucose levels by God-Pod Method.

MATERIALS AND METHODS

Plant Profile

Introduction

The *Abutilon indicum* belong to the family Malvaceae [6] is a group of about 120 species of aromatic herbs, under shrubs.

Scientific Name	: <i>Abutilon indicum</i> Linn.
Family	: Malvaceae
Common Name	: Atibala
Kingdom	: Plantae
Order	: Malvales
Genus	: <i>Abutilon</i>
Species	: <i>indicum</i>

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Vernacular Name

Telugu	: Tutturbenda, Botlabenda
English	: Country mallow
Hindi	: Kanghi, Kakhi
Kannada	: Tuhi, Mudragida
Tamil	: Tuti
Marati	: Mudra
Gujarathi	: Khapat, kanski

Abutilon indicum is commonly known as “Atibala” in Sanskrit. ‘Ati’ means very and ‘bala’ means powerful, referring to the properties of this plant as very powerful. The plant is an annual or more often perennial, erect, wood, branched herb and shrubs, distributed mainly in tropical and sub-tropical region of the world. Out of about 120 species known only five species recorded in India they are *Abutilon indicum*, *Abutilon hirtum*, *Abutilon theophrasti*, *Abutilon glaucoma* and *Abutilon asiaticum* [7].

The leaves of *Abutilon indicum* are up to 12 cm long, cordate, ovate, acuminate, toothed rarely subtrilobate, petioles 3.8-7.5 cm long. Stipules 9 mm long linear acute, deflexed pedicels often 2.5-5 cm long auxiliary solitary jointed very near the top. Calyx 12.8 mm long divided to the middle lobes ovate, apiculate. Corolla 2.5 cm in diameter, yellow, opening in the evening. Staminal tube hairy at the base filaments long carpals usually 15-20, longer than the calyx with a distinct small acute point hairy ultimately shining dark brown seeds brown-black densely and minutely scrobiculate. It is a fairly common road side weed, which is grown in hotter parts of India as a weed [8].

Phytochemical Review

The *Abutilon indicum* leaves contain a large amount of mucilage, organic acid, flavonoids, sterols triterpenoids, and glycosides. Flower contains Flavonoids. So far seven flavonoids reported in flowers i.e., luteolin, chrysoeriol, 7-O-beta-glucopyranoside, chrysoeriol 7-O-beta-glucopyranoside, apigenin 7-O-beta-glucopyranoside, were isolated and identified from the flower of *Abutilon indicum* and root contain. Asparagine as major others are non-drying oil consisting of various fatty acid besides β -sitosterol and β -amyrin from unsaponifiable matter and alkaloid is also present. Flavonoids of four malvaceous plants including *Abutilon indicum* flavonoids are quercetin, gossypetin and kaempferol has reported phytochemical investigation of *Abutilon indicum*. Two sesquiterpene lactones from *Abutilon indicum* afforded two sesquiterpene lactones identified as alantolactone and isovalantolactone. This is the first report of the occurrence of these compounds in the genus *Abutilon* and in the family Malvaceae. Galactomannose isolated from the seeds of *Abutilon indicum* containing D-galactose and D-mannose in 2:3

molar ratio. Flowers of *Abutilon indicum* contain Luteolin, chrysoeriol, luteolin 7-O-beta-glucopyranoside, chrysoeriol 7-O-beta-glucopyranoside, apigenin 7-O-beta-glucopyranoside, quercetin 3-O-beta-glucopyranoside, quercetin 3-O-alpha-rhamnopyranosyl(1-6)-beta-glucopyranoside, were isolated and identified from flowers of *Abutilon indicum*. Two new compounds identified as abutlin and (R)-N-(1-methoxycarbonyl-2-phenylethyl)-4-hydroxy benzamide along with 28 known compounds. The structure of two new compounds established by the spectroscopic analysis. Larvicidal activity showed by the different extracts such as crude hexane, ethyl acetate, petroleum ether, acetone and methanol extracts of *Abutilon indicum*, *Aegle marmelos*, *Euphorbia thymifolia*, *Jatropha gossypifolia* and *Solanum torvum*, petroleum ether extract shows the highest larval mortality in *Abutilon indicum* [9].

Traditional Review

According to Ayurveda the bark is slightly bitter in taste and used as febrifuge, anthelmintic, alexeteric, removes “Vatta and tridosha” and roots used in uterine haemorrhagic discharges. According to Unani system bark is used in urinary complaints. The leaves are prescribed for toothache, Lumbago, piles, and all kinds of inflammation. The mucilaginous seeds are tonic; they are good for chest troubles bronchitis, plies and gonorrhoea. The leaves are cooked and eaten for bleeding plies and decoction is used in bronchitis, gonorrhoea and inflammation of the bladder and in fevers. According to Chinese in Hong Kong seeds are employed as an emollient and demulcent, the root is used as diuretic and pulmonary sedative and flowers and leaves are used in ulcers [10]. Entire plant of *Abutilon indicum* is used as demulcent, diuretic, laxative urinary disorder, chronic, dysentery and fever (Rajasab AHS, Isaq M, 2004).

Pharmacological Review

Three compounds (clomiphene citrate, centchroman, embelin) and plant-derived methanolic extracts (*Abutilon indicum* and *Butea monosperma*) on uterotrophic and uterine peroxidase activities in ovariectomized rats were estrogenic/antiestrogenic potential of antifertility substances. Eugenol which was found to possess significant analgesic activity on doses of 10, 30 and 50 mg/kg body weight eugenol exhibited 21, 30, 92, 30 and 92.96% inhibition of acetic acid induced writhing in mice. The liquid extract from fresh leaves of *Abutilon indicum* and *Allium cepa* bulbs effective against on Paracetamol and carbon tetrachloride induced hepatotoxicity. *Abutilon indicum* leaf extract having hypoglycemic action in rats. Alcohol and aqueous extract has shown significant reduction in blood glucose level. Flavonoids are known to regenerate the damaged pancreatic β -cells glycosides stimulant the



secretion of insulin in β -cells of pancreas. The leaf aqueous extracts of *Abutilon indicum* in rats against carbon tetrachloride and paracetamol induced hepatotoxicities, showed interference with free radical formation which may concluded in hepatoprotective action. The plant extract was effective in the wound healing activity.

Atibala is a stronger diuretic and heart tonic. *Abutilon indicum* reported in the Siddha system as a remedy for jaundice, piles, ulcer, leprosy, and blood purifier. Chemically it contains flavonoids (quercetin), saponins, alkaloids, tannins and phenolic compounds [11-15].

Plant material Collection

The Leaves of *Abutilon indicum* plant were collected from RN Reddy (Local area of Hyderabad, Andhra Pradesh, India) wild area during June 2012.

Preparation of extracts

The fresh leaves were air dried and treated with mechanical pulveriser for size reduction. The fine powder was collected and used for preparation of extracts. The powder was successively extracted first with petroleum ether using Soxhlet apparatus for 72 hr.

The petroleum ether extracts were collected by filtration. A green colour residue was obtained. Then that green colour residue was extracted with ethanol and dried. A brown colour residue was formed. These brown coloured residue was confirmed according to our trial and error basis method. This extract was used for anti-hyperglycaemic activity [16].

Procedure for Preliminary phytochemical Screening

The preliminary phytochemical screening on all the extract of *Abutilon indicum* was carried out as per the procedure and test given below and results are discussed in Tabular form [17].

The extracts obtained were subjected to qualitative test for the identification of various chemical constituents.

TEST FOR ALKALOIDS

Mayer's Test

A pinch of extracts were taken and 2ml of dilute hydrochloric acid was added, mixed, filtered, and to the filtrate one or two drops of Mayer's reagent was added. Formation of white precipitate indicates the presence of Alkaloids [18-19].

Dragendroff's Test

A pinch of extracts were taken and treated with 2ml of 2% acetic acid, mixed thoroughly and filtered. To the filtrate, two drops of Dragendroff's reagent was added. Formation of brown precipitate indicates the presence of Alkaloids [20].

Hager's Test

A pinch of aqueous alcoholic extract was taken and a drop of Hager's reagent was added. Formation of yellow coloured precipitate indicates the presence of Alkaloids.

Wagner's Test

A pinch of extracts were taken and a drop of Wagner's reagent was added. Formation of brown precipitate indicates the presence of Alkaloids.

TEST FOR CARBOHYDRATES AND SUGAR:

Molisch's Test

The extracts were treated with 2-3 drop of 1% alcoholic- α - naphthol solution and 2 ml of concentrated sulphuric acid was added along the sides of the test tube. Formation of violet colour ring at the junction of two liquids indicates the presence of Carbohydrates [21-24].

Barford's Test

The extracts were treated with Barford's reagent and heated for few minutes showed a red precipitates of cuprous oxide indicates the presence of Monosaccharides.

Fehling's Test

The extracts were treated with Fehling's reagent A & B and heated for few minutes, showed a brick red precipitates of cuprous oxide indicates the presence of Reducing Sugar.

Benedict's Test

The extracts were treated with Benedict's reagent and heated for few minutes showed a reddish brown precipitates of cuprous oxide indicates the presence of reducing Sugar.

TEST FOR GLYCOSIDES

Borntrager's Test

The extracts were boiled with dilute sulphuric acid. It was filtered while hot and to the cold filtrate, organic solvent like benzene or ether was added. It was shaken well and the organic layer was separated and equal volume of dilute ammonia was added. Formation of rose pink colour of Ammonia layer indicates the presence of Glycosides [25-27].

Legal's Test

The extracts were hydrolyzed for few hours in water bath. The hydrosylate was added with 2ml of sodium nitro prusside solution and was made alkaline with sodium hydroxide solution. The change of colour from yellow to orange indicates the presence of Cardiac Glycosides.



Keller-killiani Test

About 1 gram of extract was boiled with 70% alcohol for 3 minutes and filtered and to the filtrate, 5ml of water, 0.5ml of strong solution of lead acetate is added, shaken well and filtered. The clear filtrate is treated with equal volume of chloroform and chloroform layer is evaporated. The residue is dissolved in 3 ml of Glacial acetic acid and to this, adds two drops of ferric chloride. The contents are transferred to test tube containing 2ml of concentrated sulphuric acid. Reddish brown layer acquiring bluish green colour after standing indicates the presence of Cardiac Glycosides [26-27].

TEST FOR STEROIDS [28]**Salkowski Test**

A little of the extract was warmed gently with tin and thionyl chloride. Appearance of the pink colour shows the presence of Phytosterol.

Liebermann's Test

To a few mg of residue in a test tube, few ml of acetic anhydride was added and gently heated. The contents of the test tube are cooled. Few drops of conc. Sulphuric acid was added from the sides of the test tube. A blue colour indicates the presence of Sterols.

TEST FOR TANNINS [29]

A pinch of the dried extract was dissolved in ethanol, mixed thoroughly and filtered. The filtrate is tested for the presence of tannins by the following tests:

Ferric chloride Test

To the filtrate, dilute Ferric chloride solution was added. The formation of deep blue colour, black, violet (or) greenish blue precipitate indicates the presence of Tannins.

Lead acetate Test

To the filtrate, Lead acetate solution was added (10%). The formation of white colour precipitate shows the presence of Tannins..

Bromine Test

To the filtrate, few drops of Bromine solution were added. The formation of precipitate indicates the presence of Tannins.

TEST FOR PROTEINS

Small quantity of extract was dissolved in a few ml of water and subjected to the following tests.

Millon's Test

Few drops of Millon's reagent was added to the extract. The formation of reddish brown colour shows the presence of Proteins.

Biuret Test

To the extract, few drops of Biuret reagent (1% CuSO₄ and 10% NaOH), 1 drop of Copper sulphate solution and 10 drops of Sodium hydroxide solution were added. The appearance of purple or violet colour shows the presence of Proteins.

TEST FOR AMINOACID [30]**Ninhydrin Test**

To the extract few drops of Ninhydrin reagent was added. The formation of purple colour shows the presence of Proteins.

TEST FOR FLAVONOIDS [31]**Shinoda Test**

A pinch of extract was dissolved in ethanol, mixed thoroughly and filtered. To the filtrate, pieces of magnesium metal and concentrated hydrochloric acid were added and heated. Appearance of magenta colour confirms the presence of Flavonoids.

TEST FOR ANTHOCYANINS

The extracts were treated with sodium hydroxide solution. Formation of blue-violet colour indicates the presence of Anthocyanins. The substance was treated with concentrated sulphuric acid. Formation of yellowish orange colour indicates the presence of Anthocyanins.

TEST FOR QUINONES

To the extract, sodium hydroxide was added. Formation of bluish green or red colour indicates the presence of Quinones.

TEST FOR SAPONINS**Foam Test**

1 ml of the extract was diluted separately with distilled water to 20 ml and shaken in a graduated cylinder for 15 minutes. A 1 cm layer of foam indicates the presence of Saponins.

TEST FOR PHENOLIC COMPOUNDS**Ferric Chloride Test**

The extracts were taken in water and warmed. To this, 2ml of Ferric chloride solution was added. The formation of green and blue colour indicates the presence of Phenolic compounds.

Lead Acetate test

To the extracts (2ml), Lead acetate solution was added. The formation of precipitate shows the presence of Phenolic compounds.

DETECTION OF FIXED OILS AND FATS**Spot Test**

A small quantity of various extracts was



pressed separately between two filter papers. Oil stained on the paper indicates the presence of Fixed oils.

Experimental Animals

Albino mice (male), weighing 25 to 30 g were obtained from The Department of Pharmacology, TKR College of Pharmacy, Hyderabad, A.P, India.

The animals were kept at room temperature for observation. The animals were given free access to a libitum and water. The study protocol was approved by IAEC.

Drugs and Chemicals Used

- Alloxan
- Ethanol
- Petroleum ether
- Glibenclamide
- Normal Saline
- Glucose reagents
- Sodium Citrate

All the drugs and chemicals were obtained from the TKR college of Pharmacy, Department of Pharmacology.

Equipments Used

- Soxhlet apparatus
- Glucometer (Ritecheck, obtained from Medplus, Hyderabad.)
- Micro Centrifuge
- UV-Visible spectroscopy
- Incubator

All the Equipments were provided by the TKR college of Pharmacy, Department of Pharmacology.

Acute oral toxicity studies

This study was performed according to the Organization for Economic Cooperation and Development (OECD) guidelines. Mice weighing between 25-30 gm in groups of five were used (n=5). Then the crude extract was administered orally in dose of 1000 and 2000 mg/kg to different groups of mice and observed for 14 days for physical and behavioural changes.

Preparation of drug solution

Accurately weighed quantities of both the powdered extracts were dissolved in distilled water to prepare the appropriate stock solution of the drug from which the different doses were administered by selecting the appropriate concentration of the stock solution.

Collection of blood sample through the retro orbital route

- The mice must be anesthetized before going to eject through the retro orbital route
- The anesthetized mice on its side on a table or hold

it in hand with its head pointing down

- With first finger and thumb (finger above and thumb below the eye) pull the skin away from the eyeball above and below the eye, so that the eyeball is protruding out of the socket as much as possible.
- Take care not to occlude the trachea with your thumb.
- Insert the capillary tube into the corner of the eye socket underneath the eyeball, directing the tip at a 45-degree angle toward the middle of the eye socket.
- Rotate the capillary tube between your fingers during forward passage, do not move it from side to side or front to back.
- Apply gentle downward pressure and then release until the vein is broken and blood is visualized entering the capillary tube
- When a small amount of blood begins filling the capillary tube, withdraw slightly and allow the capillary to fill. Do not let the capillary come out of the eye socket.
- If the capillary is not withdrawn slightly, it may occlude the vein and blood will not flow freely.
- Cover the open end of the capillary tube with the tip of your finger before removing it from the orbital sinus to prevent blood from spilling out of the tube.
- Bleeding usually stops immediately and completely when the capillary tube is removed.
- It may be necessary to apply gentle pressure on the eyeball for a brief moment by closing the skin above and below the eye using your first finger and thumb.

Procedure for induction of the hyperglycaemia using alloxan in Albino mice

- Induction of hyperglycemia was accomplished by single intraperitoneal injections of alloxan at 48-hour intervals. The mice were fasted for 18 hours before the injection.
- The dosage of alloxan that was administered was 200 mg/kg body weight.

Procedure for Anti-hyperglycaemia

The induction of Hyperglycaemia using alloxan in mice (male) were randomly allocated into three groups (6 mice per group)

Blood samples (60 μ l of each) were collected from the retro orbital route by using capillary tube (on day 5 only, observe plasma glucose percentage reduction at 2h, 4h, 6h, and 8h time intervals) and I.V. route. The animals were weighed on day 0,1,2,3,4,5,6,7,10 and 12 for corrected doses of medication.

Procedure for evaluation of body weight

Mice are weighed before and after injecting the alloxan. Weighing should be done until end of the treatment to know the weight variations.



Procedure for evaluation of blood glucose levels using glucose meter

Prepare the glucose meter and insert the testing strip according to the manufacturer's instructions.

- This usually involves checking that it has been calibrated for the particular batch of testing strips that are being used by ensuring the product code on the display matches the code on the testing strip container.
- Also check the expiry date on the test strips to ensure they are in date. Electrodes having the copper coating are inserted into meter. Yellow colour coating is testing window.
- Insert the test strip into the meter in the direction of the arrow.
- The mice blood collects from the I.V. route by pricking the vein using needle
- From the collected blood sufficient drops are placed on strip which contains yellow colour
- Wait for the meter to provide a digital display of the result

Procedure for evaluation of plasma glucose levels using God-pod Method

- Blood was collected through retro orbital route in a clean dry container. Use of plastic or siliconized container was avoided since it may prolong clotting time.
- For plasma separation, sodium citrate(4:1 ratio) was used as anticoagulant
- It was pipetted into clean dry test tubes labelled as Blank(B), Standard(S), Test(T).

They were mixed well and incubated at 37°C for 10 min. The absorbance of the standard (Abs. of S) and Test Sample(Abs. of T) was measured against Blank, within 60min at 505nm using UV-Visible spectroscopy.

Statistical Analysis

All data were expressed as mean \pm standard error of mean (SEM.) and analyzed by ANOVA. Differences between groups were considered significant levels.

RESULTS

Evaluation of Preliminary Photochemical screening

The qualitative chemical tests of extraction of *Abutilon indicum* was carried out using standard procedures. Methanolic extract of *Abutilon indicum* were subjected to preliminary phytochemical screening for the

detection of various plant constitutions like alkaloids, tannins, glycosides, flavonoids, saponins, proteins are present.

Evaluation of Acute oral toxicity study:

The study was performed according to the acute oral toxic classic method (as per CPCSEA/ OECD guidelines). Swiss Albino mice were used for acute oral toxicity study. The animals were kept fasting for over night providing only water, after which the test drug extract dissolved in administered orally at the dose of 2000mg/kg and observed for 12 days.

Animals were observed individually atleast once during the first 30 min after dosing, periodically during the first 24 hr (with special attention during the first 4 hr) and daily thereafter for a period of 12 days. Once daily cage side observations included changes in skin, fur, eyes, mucous membrane (nasal), respiratory, circulatory (heart rate and blood pressure), autonomic (salivation, lacrimation, perception and defecation) and central nervous system (drowsiness, tremors and convulsion). The extract, at the dose of 2000mg/kg and 1000mg/kg were given to mice, showed no effect on their behaviour after administration. The extract was found to be safe till 1000mg/kg. Hence we selected 200mg/kg dose for pharmacological screening.

Evaluation of Body weights variation

On 2nd day, after administration of alloxan monohydrate, body weights were reduced, after feed was supplied from 2nd day slightly increase in body weights were observed on subsequent days, but not reached to the Day 0 weights. Still we resulted that, with good diet, body weights were controlled during hyperglycaemia.

Evaluation of Blood glucose levels

The blood glucose levels were observed on day 5 after induction of alloxan, we observed that the glucose levels reached to moderate diabetes (185 μ g/dl and above), thereafter we had given distilled water to control group, Glibenclamide (5mg/kg) to the standard group and Extract (200mg/kg) to the test group. After injecting the extract, plasma glucose levels were observed at 2hr, 4 hr, 6 hr and 8 hr time interval using God-pod method, on remaining days, blood glucose levels were observed using Glucometer. From day 5 to day 12 Glibenclamide and Extract were administered regularly. Blood glucose levels were reduced slightly with *Abutilon indicum* extracts, as compared with the Glibenclamide.

Table 1. Acute oral toxicity studies

Group	Dose
I – 5 mice	2000mg/kg
II- 5 mice	1000mg/kg



Table 2. Anti-hyperglycaemic activity

GROUP	TREATMETNT	DOSE
I-6 mice	Distil water (Control group)	-
II-6 mice	Glibenclamide (Standard group)	5mg/kg
III-6 mice	Plant extract (Test group)	200mg/kg

Table 3. Reagents for plasma glucose levels

Addition sequence	B(ml)	S(ml)	T(ml)
Glucose Reagent (L1)	1.0	1.0	1.0
Distilled water	0.01	-	-
Glucose Standard(S)	-	0.01	-
Sample	-	-	0.01

Table 4. Phytochemical Tests results

Chemical tests	Inference
Test for alkaloids	
Mayer's test	+
Dragendroff's test	+
Hager's test	+
Testfor Glycosides	
Borntragers test	+
Keller-kellani test	+
Test For Steroids	
Liebermanns test	-
Salkowski test	-
Test for tannins	
Ferric chloride test	+
Lead acetate	+
Bromine test	+
Potassium Dichromate test	+
Test For Proteins	
Millon's test	+
Biuret test	+
Test for amino acids	
Ninhydrin test	-
Test for flavonoids	
Shinoda test	+
Test for anthocyanins	
Test for quinines	
Test for saponins	
Foam test	+
Test for phenolic compounds	
Ferric chloride test	+
Lead acetate test	+
Detection of fixed oils and fats	
Spot test	-



Figure 1. *Abutilon indicum*



Figure 2. Preparation of extract using soxhlet apparatus

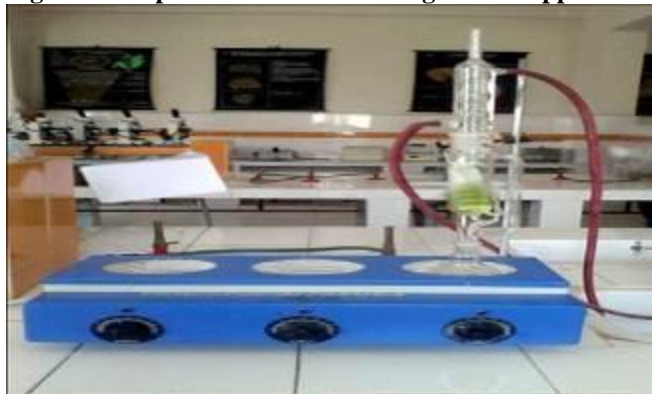


Figure 3. Observation of animals at Room temperature



Figure 4. Alloxan induction of Hyperglycaemia into the mice through I.P. route



Figure 5. Blood glucose levels observation using Glucometer



Figure 6. Blood sample collection from mice orbital sinus

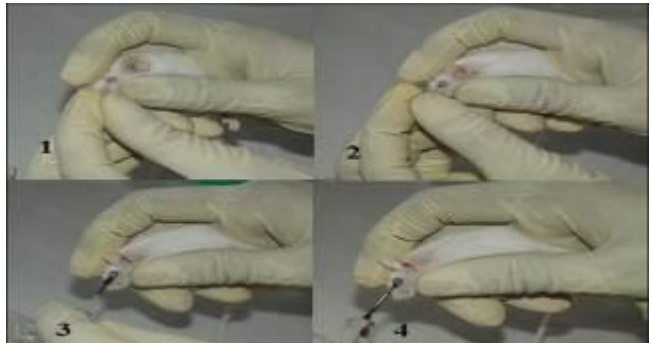


Figure 7. Control group – Body weights



Figure 8. Standard group – Body weights



Figure 9. Test group – Body weights

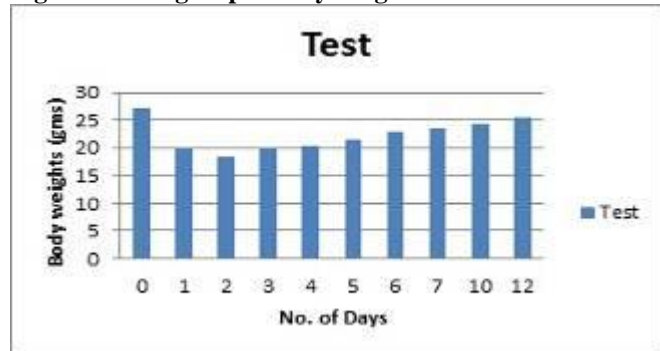


Figure 10. Body weights variations in 3 groups

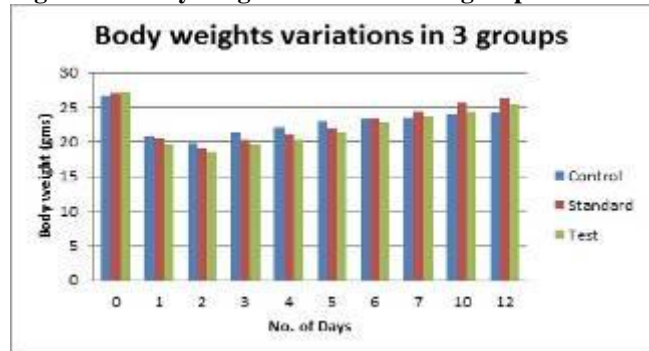


Figure 11. Body weights variations in 3 groups

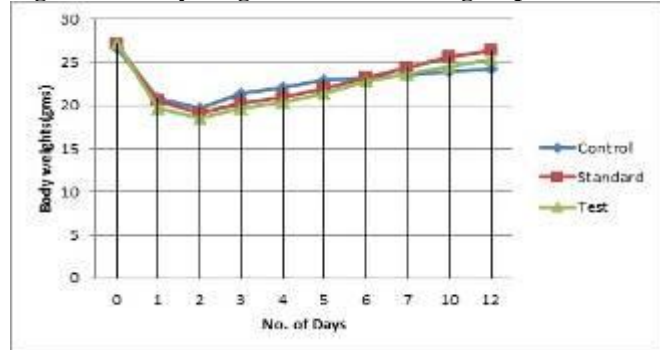


Figure 12. Control group - Blood glucose levels using Glucometer



Figure 13. Standard group–Blood glucose levels using Glucometer

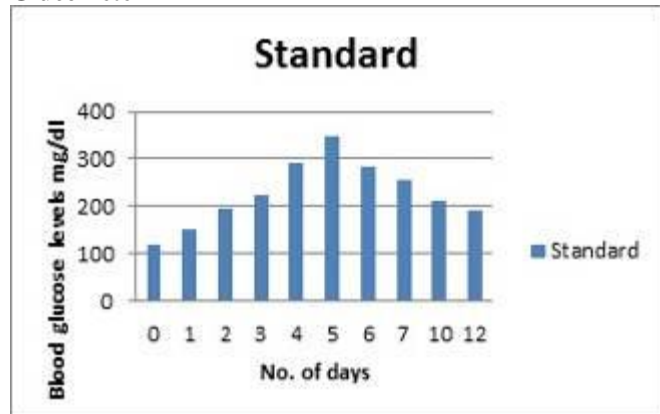


Figure 14. Test group – Blood glucose levels using Glucometer

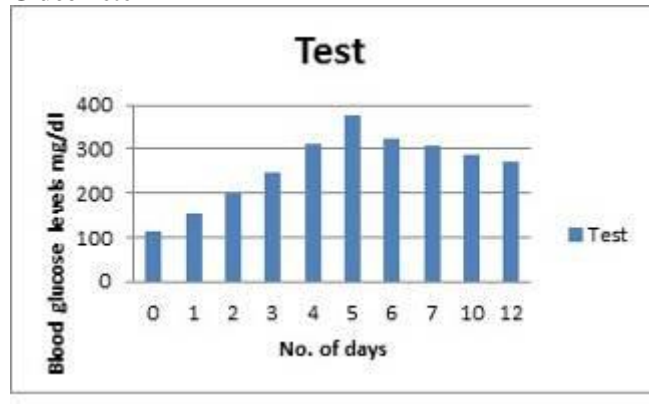


Figure 15. Anti-Hyperglycaemic activity of Abutilon indicum

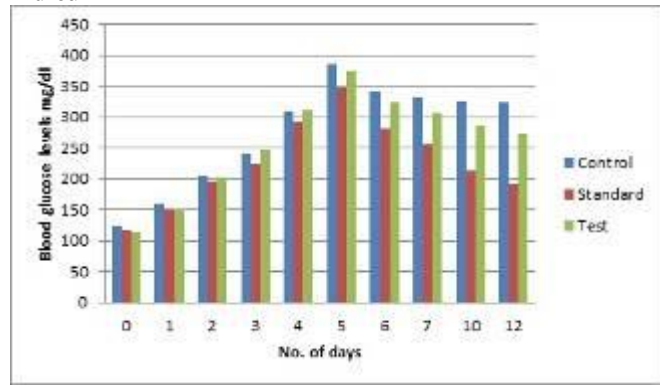


Figure 16. Anti-Hyperglycaemic activity of Abutilon indicum

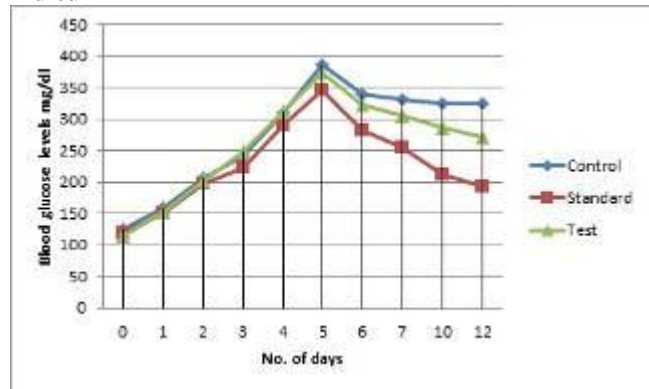
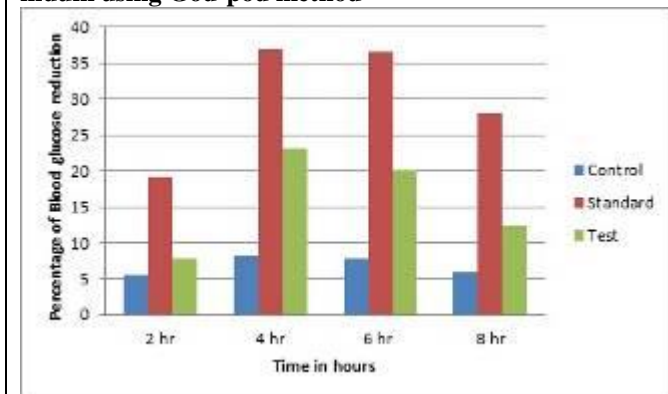
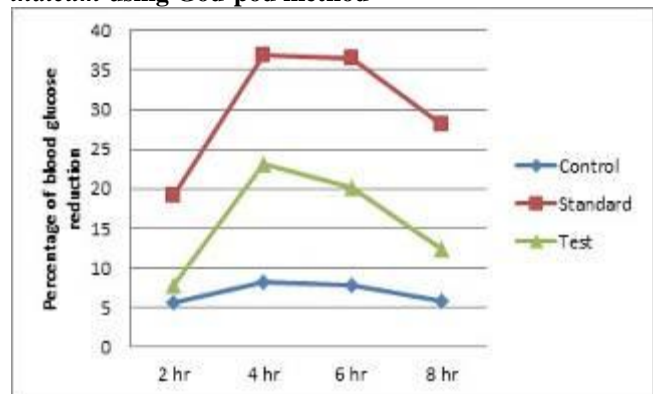


Figure 17. Anti-hyperglycaemic activity of *Abutilon indicum* using God-pod method**Figure 18. Anti-Hyperglycaemic activity of *Abutilon indicum* using God-pod method**

DISCUSSION

Abutilon indicum is growing as a weed in the waste places throughout the tropical parts of India. In the present investigation, preliminary phytochemical analysis of alcoholic extract of aerial parts (leaves) of *Abutilon indicum* (AI) showed the presence of steroids, glycosides, triterpenoids, alkanoids, saponins, flavonoids, carbohydrates and proteins. The earlier scientific studies have revealed that these phytochemicals are mainly responsible for the pharmacological actions and their by suggested worth to explore the traditional claims. Toxicity is one of the most important aspects of any medication to govern the extent of therapeutic utility. Since preliminary phytochemical results gave indication of further pharmacological screening, it becomes mandatory to evaluate the extracts for their toxicity profile to confirm its safety. As per the principles of pharmacology any drug shall not only be pharmacologically effective but also free of toxicity. The acute oral toxicity studies of *Abutilon indicum* extracts were found to be safe up to the dose of 2000mg/kg and from these findings the dose of 200mg/kg was selected for the further studies.

The changes in plasma glucose levels in response to oral alloxan have long been used clinically for the diagnosis of diabetes mellitus and research to evaluate the effectiveness of hyperglycemia. In this oral alloxan induced hyperglycemia animal model study, the whole *Abutilon indicum* plant that was administered to non-diabetic animals showed some anti hyperglycemic activity. However, it was not as strong as lasting as in those animals treated with the glybenclamide. In reference to the ability of glybenclamide in lowering blood glucose mainly by stimulating insulin secretion, the observed hyperglycemic activity of *Abutilon indicum* extract appears to slightly involve the mechanism of insulin secretion are only during the first phase of the secretion. The increased activity of insulin secretion during the first phase was clearly observed in moderately diabetic mice after the extract has produced a

marked reduction in plasma glucose levels after alloxan administration, which was faster than that of Glibenclamide. The above results indicate that the anti hyperglycemic activity of the extract could be related to the reduce in glucose levels and enhancement of insulin secretion. Thus, this extract may possess benefits especially in reducing plasma glucose level. Hyperglycemia places an important role in both micro-vascular and macro-vascular complications of diabetes. The reducing effects of *Abutilon indicum* on glucose may be able to greatly decrease the risk of developing type-2 diabetes in patients with impaired glucose tolerance.

Although the major components that possess anti-hyperglycemic activity in the *Abutilon indicum* extract were identified in this study, the phytochemical analysis of *Abutilon indicum* extract revealed the presence of alkaloids, flavonoids, and tannins. The results from other researchers have shown that this plant also contains saponins and glycosides. Most of the plants with anti-hyperglycemic properties have been found to contain metabolites such as glycosides, alkaloids and flavonoids. Another research has also reported that saponins and alkaloids could inhibit glucose uptake, whereas flavonoids could protect various cell types from oxidative stress-mediated cell injury. Glycosides could stimulate insulin secretion as well. These chemical substances may be responsible for the anti-hyperglycemic effect of the extract observed in this study.

CONCLUSION

Plenty of medicinal plants are used from traditional system of medicine for the treatment of varied ailments. Many herbs belonging to the species *Abutilon* are documented for their various medicinal benefits also, and the plants of *Abutilon indicum* belonging to the family *Malvaceae* were taken for our study to screen and give a report on the treatment of hyperglycemic disorder.



Furthermore, phytochemical investigation of the plant extracts is an important tool for the determination of the phytochemicals, which are responsible for specific pharmacological activity the plant for this, gives the valuable information about the plant for the future workers.

On the basis of the results of this study, it is possible to conclude that all the effects observed as anti-hyperglycemic effect. the alcoholic extract after oral administration of 200mg/kg exhibits significant reduction in the blood glucose levels from the 6th day to the 12 th day. These results compared to that obtained with Glibinclamide, indicate that the above extract

possess a weak activity. Since flavonoids are known to regenerate the damaged pancreatic B-cells and glycosides of stimulate the secretion of insulin in B-cells of pancreas. The presence of both in the active extract may be responsible for their activity. It seems safe, however to conclude that these plant parts do possess biological activity following oral administration.

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