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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Antimicrobial and Antidiabetic Activity of Extract of G. Marantia Roots

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ABSTRACT:

Globba marantia, a broadly practiced plantspecies in India, has tremendous nutritional value as it has vital food ingredient shaving therapeutic potential to combat rheumatism, snake bites, and disorders caused due to microbial infection. In current investigation , we studiedthe antidiabetic potential of extracts of roots of *G. marantia*in streptozotocin (STZ)-stimulateddiabetic albino rats. Phytochemical screening revealed the presence of various metabolites.The succession of diabetes was tremendously decreased after administration of plant extracts. In rats administrated with plant dose , there was note worthy decrease in serum glucose and nitric oxide, with simultaneous enhance in serum insulin and protein concentrations. Antibacterial activity was carried out using the extract. Thus we assumed that *G. marantia* possessed tremendous antidiabetic and antibacterial potential and some phytochemical may be isolated for analysis in future clinical trials.

Keywords: Antidiabetic; histopathology; *Globamarantia*

INTRODUCTION:

The use of medicinal plants for drug delivery has been intertwined with human civilization for centuries.These plants, often employed as herbs in various culinary traditions, are rich in bioactive compounds that can serve as powerful remedies against infectious diseases. Their importance is especially highlighted in tropical climates, where the prevalence of pathogens makes their application essential. Common weeds found in agricultural fields—such as nettle, dandelion, and chickweed—harbor numerous beneficial compounds. Archaeological evidence indicates that our ancestors relied heavily on medicinal plants as far back as 63,000 years ago during the Paleolithic era. Over time, various species of plants have played significant roles in human health, with Sumerians documenting around 5,000 years ago the properties of 100 medicinal plants, as inscribed on clay tablets including references to Myrrh and Opium. Similarly, about 3,600 years ago, ancient Egyptians compiled the Ebers Papyrus, which detailed knowledge of 1,000 plant species with medicinal value, such as Cannabis, castor bean, garlic, aloe, juniper, and mandrake.

In India, the roots of herbal drug formulations trace back approximately 4,000 years, particularly those steeped in Ayurvedic practices. Historical texts, including the Rig Veda, written around 3,600 years ago, provide some of the earliest insights into medicinal plants that form the foundation of Ayurvedic therapies. Prominent ancient scholars like Charaka and Sushruta further expanded upon these traditions in the first millennium BC. The Sushruta Samhita, attributed to Sushruta in the 6th century BC, catalogs 750 medicinal plants, highlighting that 64 were derived from mineral sources and 57 from animal origins.

MATERIAL AND METHODS

DRYING AND POWDERING OF *GLOBBA MARANTIA ROOTS*

The Plant material was collected and the dust particles of plant material were removed by washing the *Globba marantia* with water and shade dried for one week. The roots of *Globba marantia* were cut into small pieces. Thus, the chopped plant material was pulverized by a mechanical grinder, and then it is sieved through 40 mesh and stored in an air tight and light resistant container for further use.

GLOBBA MARANTIA EXTRACT PREPARATION

Globba marantia solution were prepared by, adding the powder of roots of *Globba marantia* in the water at the concentration of 1 mg/ml. The stock solution is prepared for 100 ml for the further experimental uses. 10 g of *Globba marantia* powder is weighed and then dissolved in 100 ml of distilled water in a conical flask. The solutions is then stirred with help of the magnetic stirrer to make it as a homogeneous solution. The flask is covered with aluminium foil.

PHYTOCONSTITUENTS EXTRACTION

The finely powdered roots of *Globba marantia* is subjected to a soxhlet extraction. For the soxhlet extraction water is used as solvent due to its non-toxicity nature.

EXTRACTION PROCESS

The extraction process was carried out with the help of Soxhlet apparatus with heating mantle. The prepared solution of the *Globba marantia* were taken in round bottom flask of Soxhlet apparatus for solvent extraction. The round bottom flask containing *Globba marantia* solution is placed on the heating mantle. The temperature is set for 100°C and the process is continued, the vapours from the solution passes through the distillation chamber where cold water is keep on poured in tubes through funnel for condensation of vapors from the solution. The condensed extract is then simultaneously collected on the round bottom flask. The extract were stored in conical flask for further experimental uses.

PHYTOCHEMICAL ANALYSIS

Various biochemical compounds that play a vital role in maintenance of human health and diet which also present in the fruits of the trees or plants. The biochemical compounds, especially secondary metabolites that found and isolated

from several plants have shown that these compounds have anticancer, antihaemolytic, antimicrobial, analgesic, antitumor, antinuclear, and anti-inflammatory. These phytochemical compounds including Phenol test, Reducing sugar test, Saponin test, Flavonoid test, Phyto steroid test, Ninhydrin test, Steroid test, Tannin test, Glycoside test. Phytochemical compounds shall be effectively obtained on the solvent extraction from plants. The phytochemical study was performed on the extract standard and the results were observed.

PHYTOCHEMICAL SCREENING

The crude fractions of the selected herbs were checked for the presence of Phenol test, Reducing sugar test, Saponin test, Flavonoid test, Phyto steroid test, Ninhydrin test, Steroid test, Tannin test, Glycoside test. The results are expressed as (+) for the presence and (-) for the absence of phytochemicals. The qualitative phytochemical study was performed on the extracts by using below standard tests.

a. Test for Alkaloids (Wagner's test)

Add few ml of plant extract was treated with 4-5 drops of Wagner's reagent.The Formation of Reddish-Brown precipitate confirms the presence of Alkaloids.

b. Test for Phenol (Ferric chloride test)

About 2ml of the extract was treated with 10% ferric chloride solution and observed for the formation of Deep Blue / Black color.

c. Test for reducing sugars (Fehling's Test)

To 1ml of the extract added few drops of Fehling's reagent and the mixture was boiled in a boiling water bath for 10minutes and observed for the appearance of blue color.

d. Test for Saponin (Foam test)

To 2 ml of the plant extract added 6ml of water in a test tube. The mixture was shaken. vigorously and observed for the formation of persistent foam for few seconds. The presence of foam confirms the presence of Saponin.

ISOLATION, IDENTIFICATION AND QUANTIFICATION OF SECONDARY METABOLITES

Flavonoids Extraction

Various plant parts (roots) of selected plants were dehydrated in shade and grinded, discretely. They were macerated with 80% methanol on heating mantle for 1 day. The layer which were dissolved in methanol were extracted out, diluted *in vacuo* and water soluble compounds were purified by chronological drawing out with petroleum ether (Fr1), diethyl ether (FrII) and ethyl acetate (FrIII) consecutively. Every process followed 3 times for complete isolation, first fraction was redundant in every process as it was heavily interfered with fatty compounds, while as fraction II and fraction III were isolated differently and processed further for analysis of flavonoids.

Fractions of ethyl acetate were acidified by treating with 7% H_2SO_4 ($10mLg^{-1}$ sample for 2 h), filtered and remains 3 times treated with ethyl acetate. All fractionated layer of ethyl acetate pooled fraction were collected discretely, pH was adjusted by distilled water during frequent reactions and dehydrated *in vacuo.* Both fraction II and III were collect in minute quantity and dissolved in ethanol (2-5mL) prior chromatographic analysis.

Antimicrobial Activity

Antimicrobial efficacy of isolated flavonoids has been carried out against various clinical important strains. Various microbial strains have been collected for pursuing the activity.

Antibacterial Assay

Antidiabetic Activity

The methodology were conducted to analyze the hypoglycemic effects of extracts of roots of selected plants administered orally to adult mice *(Rattus norvegicus)* Colony bred, adult, male albino rats of is tar strain (200±30 g) were kept in cages made of polypropylene and kept in ideal environment

around recommended heat (25±3°C) at time interval of photoperiod of 12 h light and dark including 40-65% relative humidity. Animals were fed with standard rats feed in form of pellets purchased from Hindustan Unilever Ltd, Mumbai and water were given ad libitum. Only strong rats used for research methodology. Whole methodology was carried out in late winters and initial spring so that there is no effect of any particular abiotic conditions, if any.

Sample Preparation

Leaves of *L. macrophylla* and *G. marantia* and bulb of *C.candelabrum* were washed, dehydrated, grinded and mixed. Dried powder (3 kg, 1.25 kg *L. macrrophylla*, *G. marantia* and 0.5 kg of *C.candelabrum*) macerated with methanol at 37^0C for 2 days, with continuous shaking in whole experiment. The soluble formulation was pooled out, concentrated and dehydrated *in vacuo* (25.7 g w/w) for final treatment dose.

RESULTS AND DISCUSSIONS:

Physico-chemical screening of various metabolites (carbohydrates, proteins flavonoids and alkaloids) in different plant parts from selected medicinal plants were analyzed (Table). On sequential extraction, all the plant parts and exhibited a similar response for all the major groups of metabolites tested. It showed that the biosynthetic potentialities for all types of metabolites in general are retained.

PHYTOCHEMICAL ANALYSIS

The qualitative phytochemical study was performed on the *Catharanthus roseus* extracts by using the standard tests. The result reviews that medically active compounds were present in the *c. roseus* extract.

The formation of reddish-brown precipitate confirms the presence of Alkaloids. The formation of deep blue / black color indicates the presence of phenol. Presence of reducing sugars observed by the appearance of blue color. Formation of persistent foam for few seconds confirms the presence of saponins. The formation of green or blue color indicates the presence of flavonoids. Formation of red color precipitate indicates the presence of steroids. The presence of tannin is confirmed by the formation of dark green or blue color. The results are expressed as (+) for the presence and (-) for the absence of phytochemicals in the table given below (Table-4) (k Kabesh *et al*., 2015). Plant *extract of C. roseus* studied for antimicrobial activity against pathogenic bacteria (clinical isolate) by using standard zone of inhibition (ZOI) microbiology assay, with a well size of 5 mm diameter and 50 µL of samples. Chloromphenical of 10 mg/mL concentration was used as a control antimicrobial agent. The zinc nanoparticles synthesized showed inhibition zone against all the studied bacteria. Maximum zone of inhibition was found to be 11 mm in *Bacillus cereus* minimum of 6 mm in all studied bacteria Antibacterial Activities (Mukunthan *et al*.,2011).

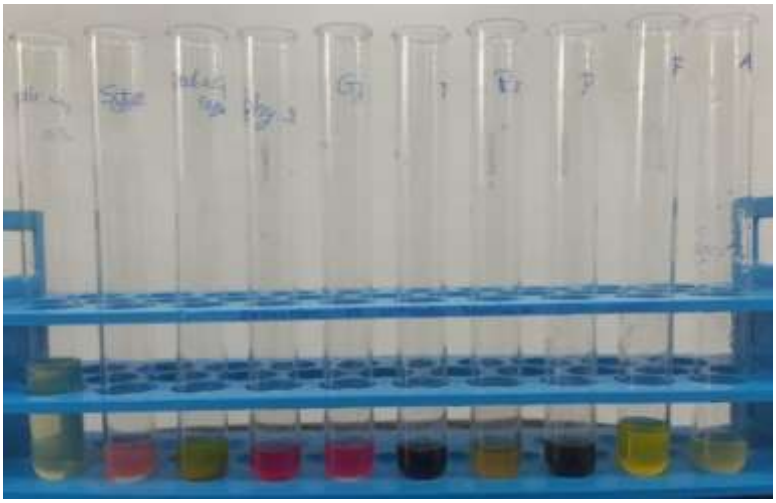
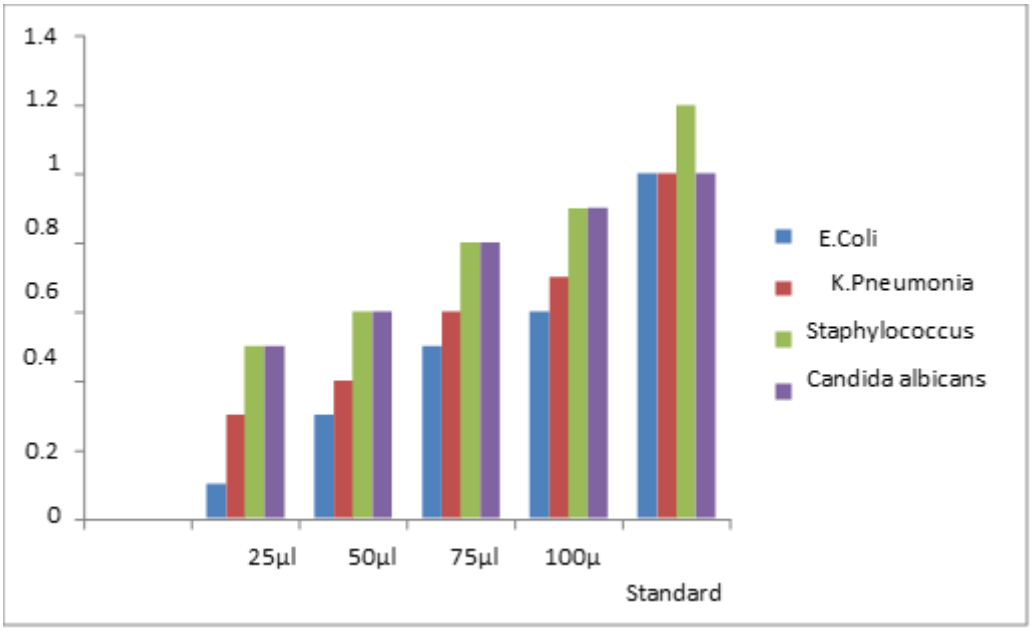


FIG: Phytochemical Analysis- *C. roseus*



Antidiabetic effect of *selected plant extract* on Swiss Albino Rats

Effect of administration of extract on biochemical parameters

The amount of Protein, SOD and GSH reduced tremendously (37.29, 54.49 and 36.23%) while the level of LPO elevated (277.17%) in kidneys of rats administrated with streptozotocin in contrast to control (Table-). Injection of dose of pooled plant extract 300 mg/kg b. wt/day for 3 weeks results in increase of level of protein, GSH and SOD (38.46, 45.56 and 59.35%) while level of LPO reduced at rapid rate (44.34%, 42.34% and 48/89% respectively). Similar outcomes were noted in glibenclamide (0.3 mg/kg b. wt/day) treated rats wherein, protein, SOD and GSH (33.71,81.60&70.95%, respectively) enhanced and LPO (53.21, 54.23 and 57.34 %) reduced tremendousely in contrast to control. When analysed with antidiabetic drug administration using glibenclamide, the levels of GSH and LPO were at par with that of the methanolic extracts *in* treated rats.

In streptozotocin stimulated animal (Gr II), both level of serum urea and sugar concentration levels enhanced (60.23 & 218.49% respectively) at rapid rate in contrast to control (Table). In Mice treated with plants extract at 300 mg/kg b. wt /day dose for 3 weeks the concentration of urea was decreased (27.03,31.25 and 37.76%) simultaneously with sugar (38.00, 39.71 and 41.23 % respectively).

Mice treated with glibenclamide (0.3 mg/kg b. wt/day) showed major decrease in both serum urea and sugar (36.07 & 46.52%, respectively), which improvement in scarce amount in contrast to plant extract treated animal model.

In mice treated with streptozotocin results in tremendous increase ($p \leq 0.001$) in serum creatinine (411.52%), Serum Glutamic Oxaloacetic Transaminase (SGOT/ AST; 165.74%) and Serum Glutamate Pyruvate Transaminase (SGPT/ALT;78.20%) while reduction ($p \leq 0.001$) in serum protein and albumin (44.88 & 40.22%, respectively) in contrast with animal treated with streptozotocin. Dose of methanolic extracts of selected plants (Gr. III) for 3 weeks results in tremendous decrease in serum creatinine, SGOT (34, 38 and 41 %) and SGPT (34, 32.45 and 37 % respectively) and increase in protein and albumin levels ($p \leq 0.01$; 35.19 & 30.48%, respectively). In mice treated with Glibenclamide (0.3 mg/kg b. wt/day dose) reduction in AST and ALT was observed (58.33 & 41.68%, respectively) while increase in protein and albumin level (45.12 & 48.36%, respectively; Table -) in contrast to diabetic rats. The concentration of SGPT in mice treated with commercial drug was almost at equivalence

Kidney histopathology

Histopathological studies of sections from kidney of control, diabetic, extracts of selected plant extract as well as glibenclamide treated rats are shown in. Kidney histoarchitecture of control rat was found normal with well developed renal corpuscles. Streptozotocin treated diabetic rats caused abnormal kidneys with degenerated glomerulus as well as enlarged capsular space. Proximal and distal convoluted tubules were found disintegrated. *MOMtE* Methanolic extracts of all the plant sample along with glibenclamide oral dose to diabetic rats showed well developed proximal and distal convoluted tubules with glomerulus and Bowman‘s capsule .

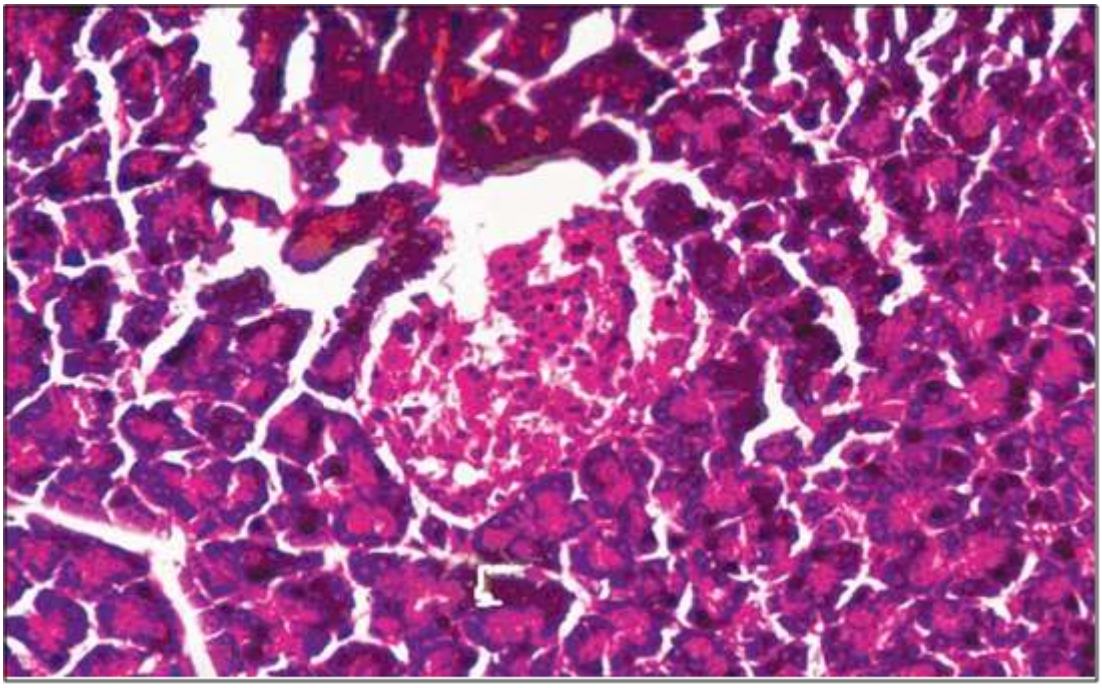


Fig.: *Control* - Rat pancreas section (21 days) showing normal histoarchitecture with prominent cytoplasm, islet cells in pancreatic islet with centroacinar cells containing serous acini (X 400)

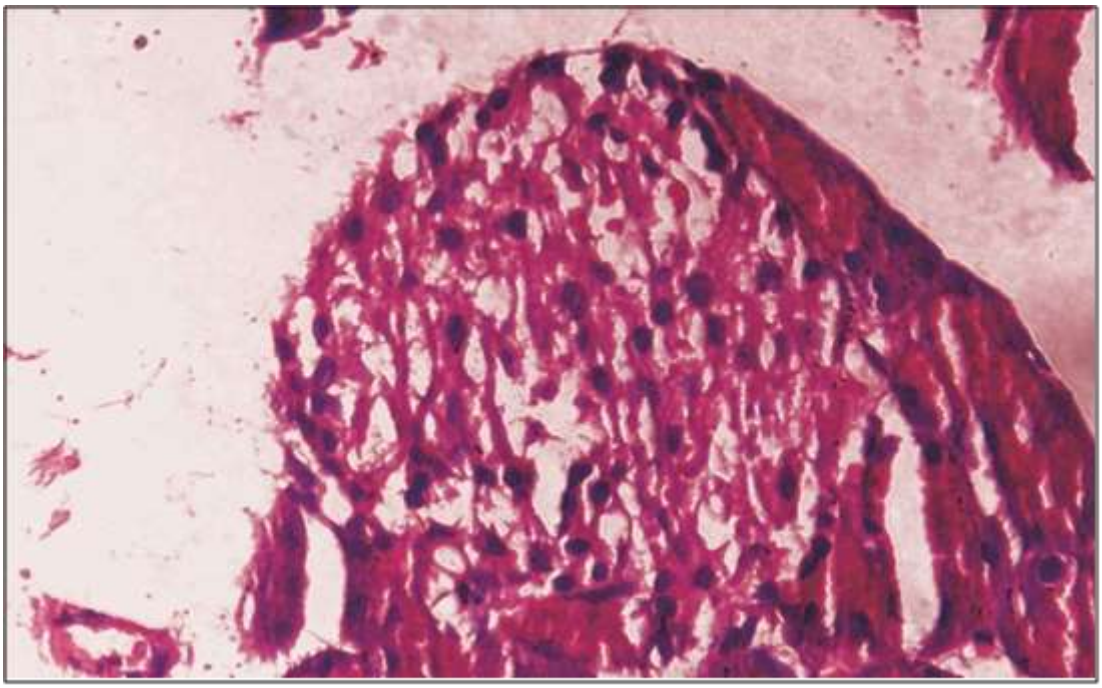


Fig.: *Diabetic Controllor Streptozotocin Treated*-Rat pancreas section(21 days) showing ruptured pancreatic islet with degenerated pancreatic cells. Disintegrated centroacinar cells contain increased intercellular space and cellular debris (X 400).

CONCLUSION

The present research work was carried out on medicinal plant *G.marantia*and to establish its bioefficacy.Physico-chemical evaluation through sequential extraction using different solvents in various plant parts exhibited similar responses for all the major groups of the metabolites tested showing that the biosynthetic potentialities for all types of metabolites in general are greatly retained by their tissue culture. present study reveals that extracts the presence of phytochemical constituents like alkaloids, flavonoids, glycosides, proteins, saponins, tannins, in different solvent extracts. Antibacterial activity of *extract* was seen against several bacteria namely *Escherichia Coli, Klebsella pneumonia , Staphylococcus aureus and Candida albicans,* They often have pharmacological effects and are used as medications and recreational drugs. In the present investigation, streptozotocin (STZ)-induced type1 diabetes in

rats unceasingly administrated with methanolic extracts of selected plants showed the functional and histological alterations of kidney, liver and pancreas. It was observed that these extracts reduces serum glucose in diabetic rats. Further these extracts showed tremendous decrease ($P < 0.05$) of blood glucose level, total protein excreted, serum protein and urea in diabetic rats. The concentration Serum albumin level of diabetic rats was found to be decreased. Administration of these plant extracts to diabetic rats induced tremendous decrease in free radicals revealing normalization of antioxidant enzymes and lipid peroxidation. Further they have prominent hypoglycemic as well as ant in ephropathic and renal protective effects on streptozotocin induced diabetes.

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