WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 11, 1012-1019. Research Article ISSN 2277–7105

# ANTIDIABETIC ACTIVITY OF HERBAL DRUG

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Article Received on
04 April 2025,

Revised on 24 April 2025,
Accepted on 14 May 2025

DOI: 10.20959/wjpr202511-36788

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## ABSTRACT

Diabetes mellitus is a chronic disease characterized by elevated blood glucose levels, disturbances in the carbohydrate, fat and protein metabolism. Diabetes mellitus is considered to be a serious issue in many countries and traditional methods using medicinal plants to control diabetes is gaining momentum. The synthetic hypoglycemic agent/s does produce serious side effects and whereas drug derived from medicinal plants are frequently consider being safe & cost effective. Herbal preparations are used to treat diabetes, as an alternative therapy but their reported hypoglycemic effects are multifarious. Hence there is a need to search for safer hypoglycemic agent/s from plant origin. The present study was conducted on plant *jasminum sambac* to evaluate its antidiabetic activity. The herbal preparations were made with aqueous and organic solvents. Ethanolic and water extract prepared and monitored the effects on oral administration of different doses (250 mg/kg) and (500 mg/kg) of each extract in Streptozotocine induced diabetic Sprague dawley adult male rats. Glibenclamide (0.25 mg/kg) were used as positive control drug. results indicate that the root of *jasminum sambac* have anti-diabetic activity.

**KEYWORDS:** Diabetes mellitus, Hypoglycemia, Streptozotocine, Histopathology, Hyperglycemia.

## INTRODUCTION

Diabetes is the world's largest endocrine disease involving metabolic disorders of carbohydrate, fat and protein. According to WHO projections, the prevalence of diabetes is likely to increase by 35%. Currently there are over 150 million diabetics worldwide and this is likely to increase to 300 million or more by the year 2020. Statistical projection about India suggests that the number of diabetics will rise from 15 million in 1995 to 57 million in the

year 2025 making it the country with the highest number of diabetics in the world. Therefore, it is necessary to look for new solutions to manage this health problem. Although, many drugs and interventions are available to manage diabetes, in most instances these are expensive (Like insulin, thiazolidinediones) for a developing country like India and have adverse effects (Like hypoglycemia). India is a country with a vast reserve of natural resources and a rich history of traditional medicine.

Diabetes mellitus is a chronic disease characterized by elevated blood glucose levels, disturbances in the carbohydrate, fat and protein metabolism. Diabetes mellitus is considered to be a serious issue in many countries and traditional methods using medicinal plants to control diabetes is gaining momentum. The synthetic hypoglycemic agent/s does produce serious side effects and whereas drug derived from medicinal plants are frequently consider being safe & cost effective. Herbal preparations are used to treat diabetes, as an alternative therapy but their reported hypoglycemic effects are multifarious. Hence there is a need to search for safer hypoglycemic agent/s from plant origin. The present study was conducted on plant jasminum sambac to evaluate its antidiabetic activity by using invitro techniques. The herbal preparations were made with aqueous and organic solvents and were used to screen the antidiabetic potential by using Invitro evaluations.

The most common substances inducing diabetes in the rat are streptozocin (streptozotocin, STZ). STZ is taken up by pancreatic b-cells via glucose transporter GLUT2. The main cause of STZ-induced b-cell death is alkylation of DNA by the nitrosourea moiety of this compound. However, production of NO and reactive oxygen species may also be involved in DNA fragmentation and other deleterious effects of STZ.

Medicinal plants use has turned out to be an alternative method for treatment of disease such as diabetes mellitus. Literature reports more than 800 plants have been utilized as empirical treatment for diabetes. One tenth of them have been characterized as hypoglycemic plants with active compounds such as mucilage gum, glycans, flavonoids, triterpenes and alkaloids Currently several hundred plants have been reported to have beneficial effect in treatment of diabetes.

*Jasminum sambac* (L.) Aiton; Family: Oleaceae; Synonym: *Nyctanthessambac*L., *Nyctanthesundulata*L.). It is also known as Mogra (Hindi and Marathi), Sampaguita (Spanish), JuhiMahli (Oriya), Mallepuvvu (Telugu). It is native to southwestern, southern and

southeastern Asia especially in India and Myanmar. It is also distributed and cultivated more or less throughout Srilanka, Pakistan, Nepal, Malaysia, China, Indonesia, France, Spain, Hawaii and tropical Australia.

The traditional use of this plant suggests analgesic, antidepressant, anti-inflammatory, antiseptic, aphrodisiac, sedative, expectorant, anti-spasmodic, galactagogue and tonic (uterine) effects. Leaves and flowers are used as antipyretic and decongestant; roots as analgesic. In India, it is traditionally used for skin disorders. The root is used in China to treat headaches, insomnia, and pain due to dislocated joints and broken bones; it is reported to have anaesthetic properties as well. Since no detail scientific data is available regarding the anti-diabetic activity of *Jasminum sambac* (L.) Aiton, therefore the present study was carried out to evaluate anti-diabetic activity.

## MATERIALS AND METHODS

### Collection of plants

The plant was collected from Botanical garden and authenticated by Botanical survey of India, Pune. (Voucher specimen No.-331)

### Preparation of plant extract

Plants were shade dried, milled, and ground into coarse powder with the help of a mixer. The powdered material was extracted with ethyl alcohol and water at temperature (65-75 $^{o}$C) using direct soxhlet method The solvents were evaporated under reduced pressure at 40 $^{o}$C using a rotary evaporator.

### Preliminary phytochemical studies

Preliminary qualitative phytochemical screening for the identification of the phytoconstituents of the Aqueous and ethanolic extract of *Jasminum sambac* has been carried out.

### Experimental animals

Sprague Dawley male adult rats weighing 150-200 g obtained from National Bioscience Pune. Animals were housed in plastic cages and were maintained under conventional laboratory conditions of temperature (25 ± 2 ºC), with a regular 12 h light/12 h dark cycle throughout the study. They were fed standard pellet chow and were allowed water *ad libitum*. All experimental procedures were conducted in accordance with ethical procedures

**Induction of diabetes**

Rats were fasted overnight before inducing diabetes with streptozotocin. The rats were given an intraperitoneal injection of streptozotocin (40 mg/kg) freshly prepared in 0.1 M sodium citrate buffer. The diabetic state was confirmed 48 h after streptozotocin injection. Threshold value of fasting blood glucose was taken as > 300 mg/dl.

Control and diabetic rats were weighed matched for body weight and divided into following group consisting six animals each.

Group I – Normal control

Group II – Diabetic Control

Group III –Diabetic rats administered with Glibenclamide at dose of (0.25 mg/kg)

Group IV –Diabetic rats administered with ethanolic extract of *jasminum sambac* in dose of 250 mg/kg

Group V – Diabetic rats administered with ethanolic extract of *jasminum sambac* in dose of 500 mg/kg

Group VI – Diabetic rats administered with aqueous extract of *jasminum sambac* in dose of 250 mg/kg

Group VII – Diabetic rats administered with aqueous extract of *jasminum sambac* in dose of 500 mg/kg

The study involved treatment of Glibenclamide and *Jasminum sambac* extract for 21 days and blood glucose levels were estimated on 0,7,14, and 21days.

**Sample Collection and Evaluation**

**Blood glucose estimation**

Blood samples were obtained through retro orbital puncture and collected blood samples were analyzed by auto analyzer.

Blood glucose levels were expressed in terms of mg/dl.

**Triglyceride level determination**

Blood samples were obtained through retro orbital puncture and collected blood samples were analyzed by auto analyzer.

**Body weight determination**

Weight of rats was recorded during the study period of 21 days.

Percentage (%) change in body weight was calculated.

**Histopathological study**

On the last day of study animals were sacrificed by overdose of carbon dioxide.

Pancreas were excised after scarification for histopathology.

## RESULTS AND DISCUSSION

Phytochemical screening *J. sambac* is the reservoir for many potentially active chemical compounds which acts as drugs. Phytochemical screening of both aqueous and ethanolic extract showed the presence of

**Table I**

| Test | Aqueous extract | Ethanolic extract |
|---|---|---|
| Alkaloid | +ve | +ve |
| Carbohydrate | -ve | -ve |
| Flavonoid | +ve | +ve |
| Tannin | -ve | -ve |
| Proteins | -ve | -ve |
| Mucilage | +ve | -ve |
| Steroids | -ve | +ve |
| Glycoside | +ve | +ve |
| Saponins | +ve | -ve |
| Fatty acids | +ve | +ve |
| Triterpene | +ve | +ve |

*+ve indicates presence of constituents

*-ve indicate absence of constituents

Effect of both Aqueous and ethanolic extract on serum concentration of blood glucose, total triglyceride and body weight

Blood glucose: Percent (%) reduction in blood glucose compared to disease control

**Table II**

| Group | % reduction in blood glucose | | |
|---|---|---|---|
| | $7^{th}$ day | $14^{th}$ day | $21^{st}$ day |
| Glibenclamide (0.25mg/kg) daily | 15 | 37 | 70 |
| JS Aqueous extract (250 mg/kg) daily (dose 1) | 6 | 43.46 | 70 |
| JS Aqueous extract (500 mg/kg) daily (dose 2) | 13 | 31.78 | 69.52 |
| JS Ethanolic extract (250 mg/kg) daily (dose 3) | 4 | 24.47 | 61.09 |
| JS Ethanolic extract (500 mg/kg) daily (dose 4) | 10 | 33.89 | 64 |

**Effect of *Jasminum sambac* extract on triglyceride level and body weight**

**Table III**

| Group | % reduction in triglyceride level | | |
|---|---|---|---|
| | 7th day | 14th day | 21st day |
| Glibenclamide (0.25 mg/kg) Daily | 11 | 35.33 | 64.2 |
| JS Aqueous extract (250 mg/kg) daily (dose 1) | 7 | 30.46 | 62.5 |
| JS Aqueous extract (500 mg/kg) daily (dose 2) | 9.2 | 31.78 | 65.3 |
| JS Ethanolic extract (250 mg/kg) daily (dose 3) | 4 | 24.47 | 60.33 |
| JS Ethanolic extract (500 mg/kg) daily (dose 4) | 6.2 | 29.89 | 62.2 |

**Effect of *Jasminum sambac* extract on body weight**

**Table IV**

| Group | % reduction in Body weight | | |
|---|---|---|---|
| | 7th day | 14th day | 21st day |
| Glibenclamide (0.25 mg/kg) daily | 4 | 5.9 | 5 |
| JS Aqueous extract (250 mg/kg) daily (dose 1) | 7 | 9.3 | 8 |
| JS Aqueous extract (500 mg/kg) daily (dose 2) | 7.2 | 8.2 | 6 |
| JS Ethanolic extract (250 mg/kg) daily (dose 3) | 7.3 | 12 | 9 |
| S Ethanolic extract (500 mg/kg) daily (dose 4) | 6.2 | 7.2 | 7.5 |

STZ- induced diabetic rats exhibiting persistent hyperglycemia (Blood Glucose>300 mg/dl) were selected for assessing the effect of Root extract of *Jasminum sambac.* Table I shows the blood glucose level at seven days intervals to observe effect of four different doses of *Jasminum sambac* extract. Data showed significant difference in blood glucose of all the treatments compared to diabetic control. Glibenclamide showed highest % decrease (70%) followed by JS Aqueous Extract (500 mg/kg) (69.52 %). JS Aqueous extract (250 mg/kg) showed (61.78 %), JS Ethanolic Extract showed (64 %) reduction at (500 mg/kg) dose, JSE (250 mg/kg) showed lowest % decrease (61.09 %) in blood glucose level. It is clear from the data that JS Aqueous extract (500 mg/kg) showed more hypoglycemic activity than JS ethanolic extract (250 mg/kg).

Aqueous extract found to be more active than Ethanolic extract at higher doses.

Table II. showed that Aqueous extract more active compared to ethanolic extract. JS aqueous extract (500 mg/kg) showed (65.3 %) reduction in TG level compared to disease control.

Table 3 shows the % change in body weight of rats during the study. The % change in body weight of all the treatments was calculated. Glibenclamide, JS Aqueous extract (500 mg/kg), (250 mg/kg), Ethanolic extract (500 mg/kg), (250 mg/kg) showed 6,8,7.5,9 decrease in body weight respectively. All the treatments showed more % decrease in body weight than non-

diabetic control. JS Aaueous extract (500 mg/kg) showed less % deacrese effect on body weight.

So *Jasminum sambac* extract not only showed significant hypoglycemic activity but also effective in preventing the weight loss due to diabetes.

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