WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 6, 1417-1423. Research Article ISSN 2277– 7105

ANTI-DIABETIC ACTIVITY OF *SALACIA CHINENSIS* STEM EXTRACT

Dr. Shahira Banu D. A.[1]*, Dr. Karpagam S.[2] and Dr. Amudha P.[3]

[1]Department of Plant Biology and Plant Biotechnology, J.B.A.S. College for Women, Chennai-600 018, Tamil Nadu, India.

[2]Dept. of Botany, Queen Mary's College, Chennai -600 004, Tamil Nadu, India.

[3]Dept. of Pharmacognosy, C.L. Baid Metha College of Pharmacy, Thoraipakkam, Chennai – 600 097, Tamil Nadu, India.

Article Received on
19 March 2019,

Revised on 09 April 2019,
Accepted on 29 April 2019,

DOI: 10.20959/wjpr20196-14930

***Corresponding Author**
Dr. Shahira Banu D. A.
Department of Plant Biology and Plant Biotechnology, J.B.A.S. College for Women, Chennai-600 018, Tamil Nadu, India.

ABSTRACT

Plants have been used for pain relieving and health care needs from earlier times. The objective of the present study was to evaluate the anti-diabetic activity of *Salacia chinensis* specimen stem collected from Karikan location, Karnataka, India. The aqueous stem extract of *Salacia chinensis* were evaluated for *in -vivo* anti-diabetic activity in animal rat model. Young adult male albino rats(Sprague-Dawley strain) were used. Experimental diabetes was induced in rats by intraperitoneal administration of streptozotocin. The animals were divided in to five groups each constituting six rats. One group of diabetic rats were treated with standard drug Glibenclamide 5mg/kg/b.w./p.o and other two groups were treated with low and high dose of *Salacia chinensis* aqueous extract. The above mentioned treatment scheduele was followed for the respective group of animals for 28 days. Blood samples were collected from tail vein in overnight fasted animals on 0^{th}, 7^{th}, 21^{st} and 28^{th} day to estimate blood glucose levels using a commercial glucometer and glucose – oxidase strips. (One touch glucometer). The aqueous stem extract of the *Salacia chinensis* with low and high dose showed significant, anti-diabetic efficiency in Streptozotocin (STZ) induced diabetics in experimental model rats and the results were Comparable with the standard drug Glibenclamide.

KEYWORDS: *Salacia chinensis*, Streptozotocin, Glibenclamide, One touch glucometer.

INTRODUCTION

Diabetes Mellitus is a chronic disorder of carbohydrate, fat and protein metabolism, leads to relative or absolute deficiency of insulin secretion and impaired carbohydrate (glucose) utility into hyperglycemia and glucose intolerance, causing multiple life threatening complications like cardiovascular diseases, renal diseases, cerebrovascular disorders, hypertension, neuropathy etc. The strict control over the blood sugar level possibly by changing our life style and food habits, along with the rational use of cost effective and easily available herbal supplement is the essential time of need.

Herbal medicines has become a topic of global importance, making an impact on both world health and international trade. Evaluation of plant products to treat diabetes mellitus is of growing interest as they contain many bioactive substances with therapeutic potential. one such herbal plant is *Salacia chinensis*. This wonderful plant has anti-diabetic and anti-obesic healing properties (Ramakrishna et al., 2015).[1] *Salacia chinensis* is a versatile plant used in treating variety of diseases like respiratory disorder, chronic fever, cold, cough, malaria, dysentery, diarrohoea, arthritis, skin diseases, trauma, convolusions, diabetes treatment of internal organs, hepatic vessel and immunologic disorders (Nadkarni and Nadkarni 1976).[2] According to Sumalatha *et al*., (2012)[3] aqueous root extract of *Salacia chinensis* can boost the immune system.

MATERIALS AND METHODS

Sample collection

The plants of *Salacia chinensis* were collected from karikan location of Karnataka. These plants were identified in Queen Mary's College, Chennai-600 004 and authenticated by Dr. P.Jayaraman, Plant Anatomy and Research Centre, Chennai-600 045.

Extract Preparation

The collected plant materials were cleaned thoroughly in water and the stem is cut in to small pieces and shade dried. The dried material were coarsely powdered. The powdered plant material (200 gm) was macerated in 1 litre of distilled water and boiled in hot water bath for 15 minutes, al1low it to cool overnight and then filtered using whatman filter paper and concentrated in vacuum at 40^{o}C using rotary evaporator.

Anti-diabetic activity

Young adult male albino rats (Sprague-Dawley strain) weighing 70-180g were used. The aqueous extracts of *S.chinensis* was suspended in 0.05% w/v carboxymethyl cellulose and used for toxicological and pharmacological evaluations. These evaluations were carried out with the Institutional Animal Ethical Committee clearance (Ref: IAEC approval No-IAEC/L/12/CLBMCP/2017) at C.L.Baid Metha College of Pharmacy, Thoraipakkam, Chennai-600 097. in accordance with the guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) as the institute has CPCSEA registration. The animals were housed in polypropylene cages in standard environmental conditions, 12 h light and 12 h dark cycle at 25 ± 2 ºC. Before and during the experiments, the rats were fed with standard laboratory pellet diet and water *ad libitum*.

Induction of Experimental diabetes (Mustafa Aslan *et al.*, 2007)[4]

The experimental animals were administered with Streptozotocin i.p.(55mg/kg, in 0.1 M Citrate buffer, pH 4.5) to induce diabetes. After 72 h of Streptozotocin injection, blood glucose levels were analysed. Animals with more than 250mg/dl was considered as diabetic, selected and divided in to groups.

Experimental design (Gupta *et al.*, 2004)[5]

The animals were divided into 5 groups each constituting 6 rats. Group I were normal rats, Group II were STZ (55 mg /kg b.w., i.p.) induced diabetic rats. Group III STZ (55 mg /kg b.w., i.p) induced diabetic rats were treated with Glibenclamide 5 mg/kg b.w/p. o, Group IV STZ (55 mg/ kg b.w., p.o) induced diabetic rats were treated with *Salacia chinensis* 200mg/kg b.w p.o Group V STZ (55 mg / kg b.w., i.p) treated with *Salacia chinensis* 400mg/kg b.w p.o treated for 28 days.

Estimation of blood glucose levels (Sasaki, Masty and Sona, 1972)[6]

The above mentioned treatment scheduele was followed for the respective group of animals for 28 days. Blood samples were collected from tail vein in overnight fasted animals on 0^{th}, 7^{th}, 21^{st} and 28^{th} day to estimate blood glucose levels using a commercial glucometer and glucose – oxidase strips. (One touch glucometer).

RESULTS AND DISCUSSION

Hyperglycemia was induced by single intraperitoneal injection of Streptozotocin in group II, III, IV, V After 48 h of injection increase in blood glucose level noticed in all rats induced

with single injection of STZ. The standard drug glibenclamide of 5 mg/kg and extract at two different doses of 200 and 400 mg/kg were administered to diabetic rats for a period of 28 days. In the present study, significant (P<0.01) increase or decrease in blood glucose level was noticed and presented in table 1.

Glibenclamide at the dose of 5 mg/kg showed significant (P<0.01) increase in blood glucose level on Day 07 of the drug treatment, whereas *S.chinensis* at the dose levels of 200 and 400 mg/kg body weight also showed significant (P<0.01) increase in blood glucose levels in STZ induced diabetic rats compared with diabetic control (Fig.1b).

Glibenclamide at the dose of 5 mg/kg showed significant (P<0.01) increase in blood glucose level on Day 21 of the drug treatment, whereas *S.chinensis* at the dose levels of 200 and 400 mg/kg body weight also showed significant (P<0.01) increase in blood glucose levels in STZ induced diabetic rats compared with diabetic control (Fig.1c).

Glibenclamide at the dose of 5 mg/kg showed significant (P<0.01) decrease in blood glucose level on Day 28 of the drug treatment, whereas *S.chinensis* at the dose levels of 200 and 400 mg/kg body weight also showed significant (P<0.01) decrease in blood glucose levels in STZ induced diabetic rats compared with diabetic control (Fig.1d).

The major symptoms of diabetes are hyperglycemia. Hyperglycemia increases oxidative stress through the abnormal production of reactive oxygen species, which result in an imbalance between free radicals and the antioxidant defence system. In the present study, the diabetes rats were treated with plant extracts of *Salacia chinensis*. The aqueous extract was administered in the range of 200 mg/kg and 400 mg/kg body weight. Glibenclamide was administered as standard diabetic drug. After 28 days of treatment, STZ induced rats showed increase in blood glucose level. *S.chinensis* treatment for 28 days has lowered the blood glucose level.

The findings were also supported by Yoshikawa *et al*., (2003)[7], the anti-diabetigenic activity of methanolic extract from the stem of *Salacia chinensis* showed its potent anti-hyperglycemic result in oral sucrose loaded rats. These *in vivo* findings are in concordance with Khadija Ghanam *et al*.,(2016)[8] report of *Salacia chinensis* extract, recorded decrease in insulin levels when compared to the control groups.

Table 1: Effect of *Salacia chinensis* extract in Blood Glucose level.

GROUPS		DAY 0	DAY 7	DAY 21	DAY 28
Group I	Control	96.83±1.19	89.83±1.62	92±0.93	95.83±1.3
Group II	STZ	103.83±2.84^{a***}	165.66±1.8^{a***}	172.5±1.97^{a***}	192.5±3.72^{a***}
Group III	STZ+Glibenclamide 5mg/kg/p.o	102.83±3.63^{a***b***}	198.66±2.5^{a***b***}	177.83±2.6^{a***b***}	163.66±1.25^{a***b***}
Group IV	STZ+200mg/kg/p.o	94.33±1.87^{a*b*}	195.83±1.92^{a*b*}	186±2.3^{a*b*}	182.83±2.3^{a*b*}
Group V	STZ+400mg/kg/p.o	94±1.69^{a**b**}	199.66±2.27^{a**b**}	187±1.61^{a**b**}	176.66±2.09^{a**b**}

Values are represented in Mean ± SEM, n=6.

Comparison: a- Group I vs Group II, III, IV, V b- Group II vs Group III, IV, V Statistical significance test for comparison was done by one way ANOVA followed by Dunnet's't' test.

ns - Non-significant *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001.

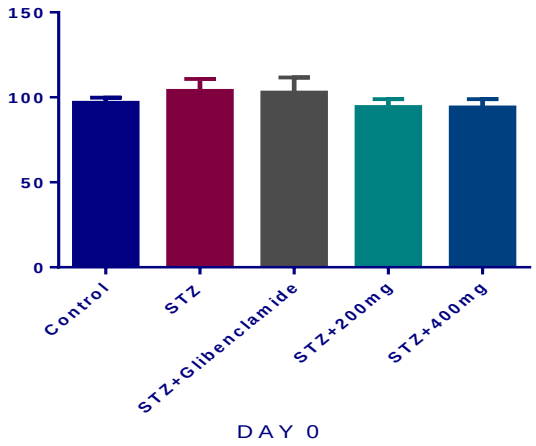

Fig – 1a: Effect of *Salacia chinensis* extract in blood Glucose level on Day 0.

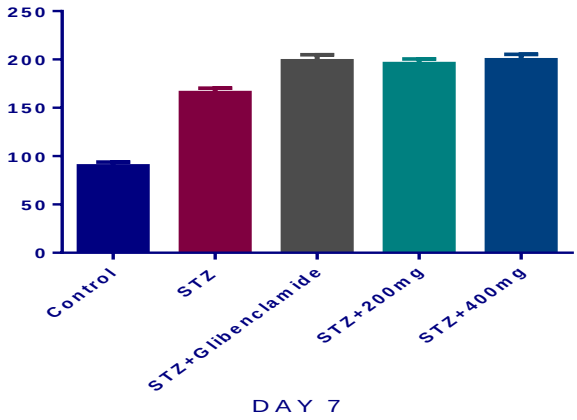

Fig 1b: Effect of *Salacia chinensis* extract in Blood Glucose level on Day 7.

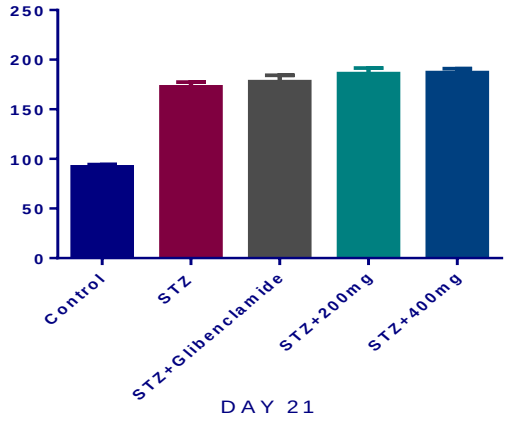

Fig 1c: Effect of *Salacia chinensis* extract in Blood Glucose level on Day 21.

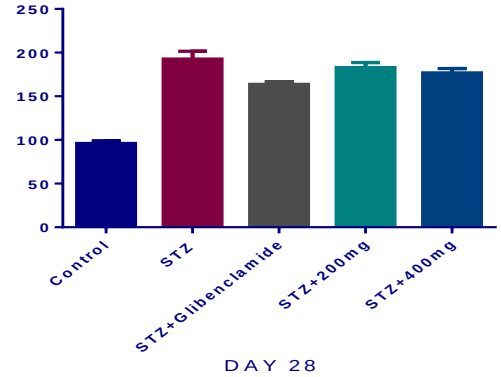

Fig 1d: Effect of *Salacia chinensis* extract in Blood Glucose level on Day 28.

CONCLUSION

From this study it was concluded that the aqueous stem extract of the *Salacia chinensis*(Karikan location) with low and high dose showed significant, anti-diabetic efficiency in Streptozotocin (STZ) induced diabetics in experimental model rats and the results were comparable with standard drug Glibenclamide. The protective effect of *Salacia chinensis* extract could be due to its direct influence on the endocrine pancreatic function in diabetic rats or may act on the stimulation of glucose intake in to cells and thus lowering of blood glucose is encountered. Thus treatment with the extract could maintain the blood glucose homeostasis, which in turn prevents the auto oxidation of glucose by insulin secreted from pancreatic beta cells. The aqueous stem extract possess a very good anti-diabetic property.

REFERENCES

1. Ramakrishna D, Shashank A.T, Shinomol George K, Kiran S and Ravishankar G.A. 2015. *Salacia sps*-A potent source of Herbal Drug for Antidiabetic and Antiobestic Ailments: A detailed Treatise. *International Journal of Pharmacognosy and Phytochemical Research*, 7(2): 374-382.
2. Nadkarni AK., Nadkarni KM. 1976. Indian Materia Medica. Popular prakashan Bombay, 263-269.
3. Sumalatha, Rama Bhat P, Shwetha R, Ballal and Sadananda Achayra. 2012. Studies on immunomodulatory effects of *Salacia chinensis* on albino rats. *Journal of Applied Pharmaceutical Science*, 2(09): 098-107.
4. Mustafa Aslan, Disdem Delporman, Orhan, 2007. *In-vivo* antidiabetic and antioxidant potential of *Helichrysum plicatum* spp. *Plicatum capitulums* in streptozotocin induced – diabetic rates. *Journal of ethnopharmocology*, 109: 54- 59.
5. Gupta S, Kataria M, Murganandan S. 2004. Protective role of extracts of neem seeds in diabetes caused by streptozotocin rats. *Journal of Ethnopharmacology*, 90: 185 – 189.
6. Sasaki T, Masty S and Sonae A. 1972. Effect of acetic acid concentration on the colour reaction in the O'toluidine boric acid method for blood glucose estimation. Rinshbo kagaku, 346 – 353.
7. Yoshikawa M., Pongpiriyadacha Y, Kishi A, Kageura T, Wang T, Morikawa T and Matsuda H. 2003. Biological activities of *Salacia chinensis* originating in Thailand, The quality evaluation guided by α-glucosidase inhibitory activity. Yakugaku. Zasshi, 123: 871-880.
8. Khadijah Ghanam., Vandita Srivastava., Jayant Deshpande., and Vijaya Julturu. 2016. *Salacia chinensis* Extract (SCE) Modulates carbohydrates and lipid Metabolism: *in- vitro* and *in- vivo* models. *Endocrinology and Metabolism International Journal*, 3(6): 00071.