IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)
e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 11, Issue 3 Ver. I (May.- Jun.2016), PP 61-65
www.iosrjournals.org

Hypoglycemic activity and Phyto-chemical screening on *Coccinia grandis* leaf and fruit

J.V.C. Sharma [1], P.Swapna [2], B.Shiva Prasad [2], A.Ashok [2], J.L.K Soundarya [2], G. Mounika [2], B.Parshuram [2]

[1](*Department of Pharmacognosy, Joginpally B.R. Pharmacy College / JNTUH, India)*
[2](*Department of Pharmacognosy, Joginpally B.R. Pharmacy College / JNTUH, India)*

Abstract: *Many plant drugs are studied for effecting in the treatment of Diabetes mellitus. In the present study methanolic extract of herb of Coccinia grandis leaf and fruit was evaluated for hypoglycemic effect in Alloxan induced diabetic rats using oral glucose tolerance test. A comparison was made between the actions of methanolic extract Coccinia grandis leaf and fruit and known antidiabetic drug Glibenclamide (5 mg/kg, p.o). The methanolic extract of Coccinia grandis leaf and fruit was administered at doses to normal and diabetic rats. The methanolic extract at 400 mg/kg body weight dose level exhibited significant hypoglycemic activity (P < 0.01 and P < 0.001). Phytochemical screening of methanolic extract revealed the presence of alkaloids, saponins and steroids, flavonoids etc. It is concluded that methanolic extract of herb of Coccinia grandis leaf and fruit posses anti hyperglycemic activity.*

Keywords: *Alloxan induced Diabetes, Coccinia grandis, Hypoglycemic activity, Oral glucose tolerance test.*

I. Introduction

Medicinal plants have been identified and used throughout human history. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions, and to defend against attack from predators such as insects, fungi and herbivorous mammals. At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total1, 2. From previous studies done on Coccinia grandis and due to the presence of effective phytochemical constituents, methanolic extract of the plant leaves and fruits were selected for evaluating hypoglycemic activity. Various drugs available in the market for hypoglycemic activity and none of the drug are not up to mark for showing its efficacy. From literature survey it was found that Coccinia grandis effective in treatment of anti-bacterial, anti-hepatotoxicity, antiulcer, anti-tussive, anti-oxidant, anthelmintic activity etc3-18. The study period is 4 days. Animals used are male wistar rats. Before performing the hypoglycemic activity of methanolic extract of the plant leaves and fruits, phytochemical evaluation was done. Oral Glucose Tolerance Test was carried out to determine hypoglycemic activity of plant leaf and fruits extract.

II. Materials and Methods

A. *Plant Material Collection*

The plant was collected during the month of Jan 2016; Leaves and fruits of *Coccinia grandis* were collected from Tirupati. The plant authentication was done by Department of Botany, Sri Venkateswara University, Tirupathi dist. Chittoor, Andhra Pradesh. Leaves and fruits of *Coccinia grandis* were dried at room temperature for 2-3 days. The dried leaves and fruits of *Coccinia grandis* powdered in a mixture. The extraction was done by using the process of maceration. 150 grams of fine powder was suspended in 200 mL methanol for 72 hours at room temperature. After 72 hours the extract was taken and residue was dried[19].

B. *Experimental Animals*

Male wistar rats of 150-200 grams weighed were used for present study. The animals were housed in polypropylene cage (6 animals per cage), the standard conditions were maintained (12 hours light and 12 hours dark cycle, 23 ± 5° C and 40-60% humidity). The standard rat diet, water was provided ad libitum. All the animals were collected from the central animal house Joginpally B.R. Pharmacy College, Amdapur X Road, Yenkapally, Moinabad, Hyderabad, Telangana and all experiments were conducted according to the ethical norms approved by CPCSEA, Ethical Committee IAEC reg.no.**769/2011/CPCSEA)**.

C. *Preliminary Phytochemical Screening*

The methanolic extract of leaves and fruits of *Coccinia grandis* were found large percentage of Alkaloids, glycosides, triterpenoids, flavonoids Phytosterols and tannins[20-21].

D. *Induction of Diabetes by Alloxan*[22-24]

Fasting blood glucose was determined after depriving food for 16 h with free access of drinking water. Hyperglycemia was induced by a single i.p. injection of 120 mg/kg of alloxan monohydrate (Avra synthesis. Ltd., Hyderabad, India) prepared in sterile saline. After 3 days of alloxan injection, the hyperglycemic rats (glucose level > 200mg/dl) were separated and divided into different groups comprising of 6 rats each for the hypoglycemic study.

E. *Preparation of Test Drug*

The test drugs were prepared by 2% tween 80. Both standard and test drugs were given by oral gavage i.e. per oral route at a dose of 0.4 ml/kg body weight. All drugs were prepared freshly before administration.

F. *Experimental Procedure*

Oral glucose tolerance test on Diabetic rats (OGTT)-Hypoglycemic activity:

The overnight fasted rats of all the groups were loaded with glucose (2gm/kg p.o) 30 minutes after drug administration. Blood samples were collected from the tail vein puncture method prior to drug administration and at 30, 60, 120 minute after glucose loading. Serum glucose levels were measured immediately. The glucose level was estimated using digital glucometer[25]

Six fasted animals were used in each group.

Rats were divided into following groups.

Group- I – Received Vehicle- Distilled water (Control –ve)-Normal Rats

Group-II – Received 2 gm /kg glucose p.o. (control +ve)-Diabetic Control

Group III - Received standard drug glibenclamide (10mg/kg), p.o.

Group IV – Received methanolic extract of leaves of Coccinia grandis, dose 400mg/kg, p.o.

Group V – Received methanolic extract of fruits of Coccinia grandis, dose 400mg/kg, p.o.

II-IV group rats are diabetic induced by alloxan injection.

III. Statistical Analysis

The obtained results were expressed as Mean ± SEM. Comparison between control and treatment groups were performed by one way analysis of variance (ANOVA) followed by Dunnets test. The statistical significance criterion was $p< 0.05$ (95% level). $P<0.05$ is considered as significant[24].

IV. Results

Methanolic extract of Coccinia grandis leaf and fruit (400 mg/kg) significantly decreased blood glucose level in glucose fed rats at 120 minutes when compared with the control group. It also decreased the elevated blood glucose at 60 minutes after the glucose administration. The control group showed significant increase in blood glucose level when compared with the normal group.

Glibenclamide showed its potent anti-diabetic activity at 120 minutes. Also the reduction in elevated blood glucose level at 30 and 60 minutes after the administration of glucose was significant when compared to the control group.

These data suggested that treatment with Methanolic extract of Coccinia grandis leaf and fruit showed better tolerance to exogenously administered glucose.

V. Discussion

OGTT referred to as the glucose tolerance test, measures the body's ability to metabolize glucose, or clear it out of the blood stream. The test reveals how quickly glucose is metabolized from the blood stream for use by cells as an energy source. The methanolic extract of the leaf and fruit part of plant of Coccinia grandis produced hypoglycemia and improved glucose tolerance in diabetic rat's inspite of counter regulatory factors avoiding reduction in blood glucose levels.

Therefore, hypoglycemic activity of MCG could be mediated by stimulation of surviving beta cells to release more insulin and may be through extra-pancreatic mechanisms. The MCG (400mg/kg) dose showed promising results.

Like the plant extract, Glibenclamide also produced a significant reduction in the blood glucose level of diabetic rats. Glibenclamide exert its action mainly by increasing the secretion of insulin. They only work in diabetics with some remaining beta cells. They bind to the ATP-inhibited K+channels in the beta cell membranes and inhibit channel activity, depolarizing the beta cell membrane and increasing Ca2+ influx and hence insulin release [26].

The comparable effect of the plant extract with Glibenclamide in this study may suggest similar mechanism of action. These findings appear to be in consonance with the earlier suggestion of Jackson and Bressler(1981)

that sulfonylureas such as Glibenclamide have extra-pancreatic hypoglycaemic mechanism of action secondary to their causing insulin secretion and the attendant glucose uptake into and utilization by the tissues.
Therefore, it can be confirmed that, in present investigation significant hypoglycemic potential of Coccinia grandis shrub may be due to flavonoids, alkaloids, tannins, phenols, phytosterols content, which were confirmed by preliminary phytochemical screening.

VI. Conclusion

The extracts showed increase in the glucose tolerance of the rats and decrease in the fasting blood glucose level of diabetic rats, showing the hypoglycaemic activity of the plant which is most pronounced in methanolic extract.

Result from the phytochemical analysis of Coccinia grandis revealed the presence of alkaloids, tannins, saponins, terpenoids, flavonoids, phenolics and glycosides as the possible biologically active principles, which have also been isolated from the other plants and found to possess hypoglycemic and antidiabetic activity.
In nutshell the extracts of Coccinia grandis possesses significant hypoglycaemic activity, which is the first claim in this respect.

References

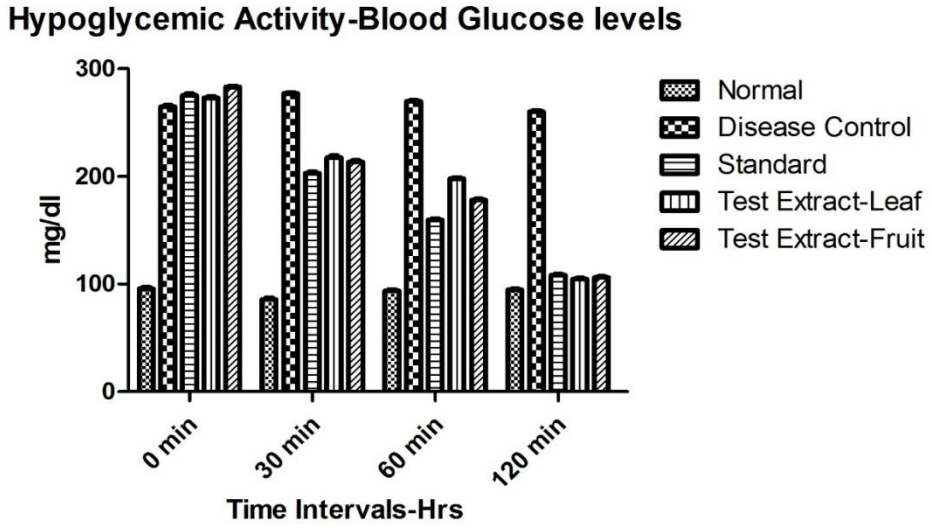
[1]. Tapsell LC, Hemphill I, Cobiac L, et al. (August 2006). "Health benefits of herbs and spices: the past, the present, the future". Med J Aust. 2006 Aug 21; 185(4 Suppl):14-24.
[2]. Lai PK, Roy J (June 2004). "Antimicrobial and chemopreventive properties of herbs and spices". Curr. Med. Chem. 2004 Jun; 11(11):1451-60.
[3]. Syed Z, Krishna B, Kandukuri V, Singara C. Antimicrobial activityof the fruit extracts of Coccinia indica. Afr J Biotechnol 2009; 8(24):7073-7076.
[4]. Shyam KB, Gnanasekaran D, Jaishree V, Channabasavaraj KP. Hepatoprotective activity of Coccinia indica leaves extract. Int J Pharm Biomed Res 2010; 1(4): 154-156.
[5]. Vadivu R, Krithika A, Biplab C, Dedeepya P, Shoeb N, Lakshmi KS. Evaluation of hepatoprotective activity of the fruits ofCoccinia grandis Linn. Int J Health Res 2008; 1(3): 163-168.
[6]. Vinothkumar P, Sivaraj A, Elumalai EK, Senthilkumar B. Carbon tetrachloride-induced hepatotoxicity in rats-protective role of aqueous leaf extracts of Coccinia grandis. Int J Pharm Tech Res2009; 1(4): 1612-1615.
[7]. Sunilson JAJ, Muthappan M, Das A, Suraj R, Varatharajan R, Promwichit P. Hepatoprotective activity of Coccinia grandis leaves against carbon tetrachloride induced hepatic injury in rats. Int J Pharmacol 2009; 5: 222-227.
[8]. Papiya MM, Sasmal D, Arivudi NR. Antiulcerogenic andantioxidant effects of Coccinia grandis (Linn). Voigt leaves on aspirin-induced gastric ulcer in rats. Nat Prod Radiance 2008; 7(1): 15-18.
[9]. Preeth M, Shobana J, Upendarrao G, Thangathirupathi A. Anti-ulcer effect of Coccinia grandis (Linn.) on pylorus ligated (albino)rats. Int J Pharm Res Dev 2010; 2(5).
[10]. Shakti PP, Priyashree S. In vivo antitussive activity of C. grandis against irritant aerosol and sulfur dioxide-induced cough model in rodents. Bangladesh J Pharmacol 2009; 4: 84-87.
[11]. Shyam KB, Gnanasekaran D, Jaishree V, Channabasavaraj KP.Hepatoprotective activity of Coccinia indica leaves extract. Int J Pharm Biomed Res 2010; 1(4): 154-156
[12]. Ajay SS. Hypoglycemic activity of Coccinia indica (Cucurbitaceae)leaves. Int J Pharm Tech Res 2009; 1(3): 892-893.
[13]. Yogesh S, Prashant S, Priya S, Sonal D, Sourabh SB. Evaluation of anthelmintic activity of Coccinia indica (fruits). J Chem Pharm Res 2011; 3(1): 488-491.
[14]. Singh G, Gupta P, Rawat P, Puri A, Bhatia G, Maurya R.Antidyslipidemic activity of polyprenol from Coccinia grandis in high fat diet fed hamster model. Phytomedicine 2007; 14(12): 792-798.
[15]. Bhatia G, Rizvi F, Saxena R, Puri A, Khanna AK, Chander R, et al. In vivo model for dyslipidemia with diabetes mellitus in hamster. Indian J Exp Biol 2003; 41: 1456-1459.
[16]. Niazi J, Singh P, Bansal Y, Goel RK. Anti-inflammatory, analgesicand antipyretic activity of aqueous extract of fresh leaves ofCoccinia indica. Inflamm Pharmacol 2009; 17(4): 239-244.
[17]. Vareerat J, Jaruntorn B, Suwansri S, Puntarika R, Chanida H. Alpha amylase inhibition and roasting time of local vegetables and herbs prepared for diabetes risk reduction chili paste. Asian J Food Agro-Ind 2010; 3(1): 1-12.
[18]. Sudha P, Zinjarde SS, Bhargava SY, Kumar AR. Potent -amylase inhibitory activity of Indian Ayurvedic medicinal plants. BMC Complement Altern Med 2011; 11: 5.Singh B., Gambhir S.S.,et al. J. Ethnopharmacol 25: 189-199 (1989).
[19]. Kokate CK, Handbook of Practical Pharmacognosy, 4th ed.New Delhi, India: Vallabh Prakashan, 1994.
[20]. Umamaheswari M, Chatterjee TK. In vitro antioxidant activities of the fractions of Coccinia grandis leaf extract. Afr J Tradit Complement Altern Med 2008; 5(1): 61-73.
[21]. Syed Z, Krishna B, Kandukuri V, Singara C. Antimicrobial activityof the fruit extracts of Coccinia indica. Afr J Biotechnol 2009; 8(24) 7073-7076.
[22]. Rotimi, S., O., Omotosho, O. E., and Roimi, O. A., (2011). Persistence of acidosis in alloxan induced diabetic rats treated with the juice of Asystasia gangetica leaves. Phcog. Mag., 7:25-30.
[23]. Suryawanshi, N. P., Bhutey, A. K., Nagdeote, A. N., Jadhav, A. A., and Manoorkar, G. S., (2006). Study of lipid peroxide and lipid profile in diabetes mellitus. Indian Journal of Clin.Biochemistry. (1):126-130. 85 Claudia, E. N. M., Julius, E.O., Dagobert, T., and Etienne, D., (2006).
[24]. Antidiabetic and hypolipidemic effects of Laportea ovalifolia (Urticaceae) in alloxan-induced diabetic rats. Afr.J. Trad. Complementary and Alternative Med., 3 (1):36-43.
[25]. Bodole S, Patel N, Bodhankar S, Jan B, Bhardwaj S. Antihyperglycemic activity of aqueous extract of leaves of Cocculus hirsutus (L.) Diels in alloxan induced diabetic mice. Indian J Pharmacol. 2006; 38: 49-53
[26]. Lukacinova, A., Mojzis, J., Benacka, R., Keller, J., Maguth, T., Kurila, P., Vasko, L., Rczo, O., and Nistiar, F., (2008). Preventive effects of flavonoids on alloxan induced diabetes mellitus in rats. Acta veterinaria, 77, 175-182.

Table No 1: Preliminary phytochemical screening of 70% MCG

Phytochemical constituents	**70%Methanolic extract**	**70%Methanolic extract**
Alkaloids	+++	+++
Glycosides	++	++
Carbohydrates	-	-
Flavonoids	+++	+++
Saponins	-	-
Tannins	++	++
Steroids	+++	+++
Proteins & Amino acids	_	_
Phytosterols	++	++
Phenols	+++	+++
Triterpenoids	+++	+++

Table No 2: Effect of Methanolic extracts of Coccinia grandis on oral glucose tolerance test in Diabetic rats

GROUPS	**Blood glucose level mg/dl**			
	0 min	30 min	60 min	120 min
Normal	95.69 ± 1.51	85.95 ± 1.37	93.83 ± 0.94	94.51 ± 0.99
Control (ALX 120mg/kg)	264.84 ± 1.26[a]	277.01 ± 1.19[a]	269.86 ± 1.01[a]	260.18 ± 1.12[a]
Standard (GLB 10mg/kg)	275.45 ± 1.52	203.01 ± 1.39[***]	159.72 ± 1.05[***]	108.39 ± 1.04[***]
Coccinia grandis leaf (400mg/kg)	273.02 ± 1.43	217.67 ± 1.60[***]	197.94 ± 1.22[***]	104.64 ± 0.89[***]
Coccinia grandis fruit (400 mg/kg)	283.03 ± 1.21	213.49 ± 1.34[***]	178.02 ± 1.18[***]	106.15 ± 1.03[***]



Graph No 1 Effect of Methanolic extracts of Coccinia grandis on oral glucose tolerance test in Diabetic rats