Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2015; 4(1): 68-71
Received: 07-02-2015
Accepted: 16-04-2015

Raveendra Reddy J
Division of Pharmacognosy, Raghavendra Institute of Pharmaceutical Education and Research, Krishnam Reddy Palli cross, Chiyyedu, Anantapuramu-515721, Andhra Pradesh, India.

Sanjeeva Kumar A
Division of Pharmacognosy, Raghavendra Institute of Pharmaceutical Education and Research, Krishnam Reddy Palli cross, Chiyyedu, Anantapuramu-515721, Andhra Pradesh, India.

Rama Mohan Gupta V
Pulla Reddy Institute of Pharmacy, Near Dundigal Air force Academy, Annaram Village, Jinnaram Mandal, Medak District- 502313, Telangana, India.

Correspondence:
Sanjeeva Kumar A
Division of Pharmacognosy, Raghavendra Institute of Pharmaceutical Education and Research, Krishnam Reddy Palli Cross, Chiyyedu, Anantapuramu -515721, Andhra Pradesh, India.

Anti-diabetic activity of *Ipomoea quamoclit* in Streptozotocin Induced diabetic rats

Raveendra Reddy J, Sanjeeva Kumar A, Rama Mohan Gupta V

Abstract
Present study was undertaken to screen the antidiabetic activity of *Ipomoea quamoclit* whole plant belongs to *Convolvulaceae* family. Extraction and preliminary phytochemical screening were conducted by standard methods. Antidiabetic activity was evaluated by streptozotocin induced diabetic rats where the hydroalcoholic extract of whole plant was administered orally at a dose of 250 and 500 mg/kg for 30 days. Blood glucose levels were estimated at 1st, 10th, 20th and 30th day of study. Lipid profile was studied 30th day of study and body weight of the animals was measured at day 1 and 30. Thirty days administration of hydroalcoholic extract of *Ipomoea quamoclit* whole plant showed a significant ($p<0.001$) reduction in blood glucose levels at both dose levels under study that is 250 and 500 mg/kg body weight in comparison with diabetic control group. Standard drug also exhibited a significant ($p<0.001$) reduction in blood glucose levels of the animals in comparison with diabetic control. In biochemical parameters, significant ($p<0.05$) effect on triglycerides at its lower dose, significant ($p<0.05$) on total cholesterol levels and HDL, LDL and VLDL levels and also significant ($p<0.01$ and $p<0.001$) at its high dose that is 500 mg/kg body weight and a good control ($p<0.01$) over the body weight of the animals in comparison with diabetic control group. Present study gives a scientific evidence for the folklore claim of the plant under study for its use in diabetes.

Keywords: *Ipomoea quamoclit*, Folklore, Streptozotocin, Diabetes, Lipid profile and Body weight

1. Introduction
Ipomoea quamoclit also called as *Quamoclit pinnata* belongs to *Convolvulaceae* family is one of the most important herb in ayurveda and folk medicine. In English it is called as Cypress Vine, Indian Pink and Cupid's Flower [1]. In Philippines, the leaves are used as poultices for bleeding haemorrhoids. The crushed leaves are used for carbuncles. The seeds are used as a laxative. In India, the powdered roots were given as sternutatory (substance that tends to cause sneezing) where as in Spain, the crushed leaves are used for ulcers and chest pain [2]. Plant found its significant use in Siddha Medicine also where the decoction of leaves and stems is used to treat fever, is also used in diabetes [3] and in Thailand, is used for snake bites and as snuff, as a laxative and for haemorrhoids and in bloody cough [4]. Leaves and stems contain small amounts of alkaloids and cyanogenetic glycosides. Seeds have been reported to contain the resin glycosides, quamoclins I-IV and Jalapin. Pyrrolizidine alkaloids like mono and diesters of platynecine and minalobines like minalobine O and R, ipangulines like ipangualine B_2 and D_{11} [5, 6] and ergoline alkaloids [7] and Anthocyanins [8] were identified from the plant. Total alkaloid in seeds was found 0.012% [9]. The present study deals with pharmacological screening of anti-diabetic activity of *Ipomoea quamoclit Linn* in a streptozotocin induced diabetic rats with a view to justify its use for diabetes in folk medicine.

2. Materials & Methods
2.1. Collection of Plant Material
For the present study, whole plant of *Ipomoea quamoclit* was collected from the forest area near to the Madanapalli of Chittoor district of Andhra Pradesh, India and the plant was botanically identified and authenticated by Dr. K. Madhava Chetty, Assistant Professor, Department of Botany, Sri Venkateshwara University, Tirupati, A.P., India and a voucher specimen (RIPER/ASK/002) was preserved in division of Pharmacognosy, RIPER, Anantapuramu for further reference.

2.2. Extraction
For the present study, 1000 gm of the powdered *Ipomoea quamoclit* was extracted by cold maceration method with ethanol: water (3:2) mixture as solvent. The maceration was

continued for 72 hours with occasionally agitation after which, the contents were filtered and concentrated by rota evaporator [10, 11]. A resinous greenish extract was obtained which was calculated for the yield, designated with HAIQ and stored in desiccator till further study.

2.3. Phytochemical Screening
Hydroalcoholic extract of *Ipomoea quamoclit* whole plant was subjected to standard battery of preliminary phytochemical screening [10, 11].

2.4 Animals
Adult Swiss albino mice of either sex for acute toxicity studies (20–30 gm) and Wistar rats (150-200 gm), of either sex for pharmacological screening at about 6–8 weeks of age were used in the study. The animals were maintained with free access to food and water and kept at 25 ± 2 ^{0}C under a controlled 12 h light/dark cycle. Twelve hours before each experiment animals received only water, in order to avoid food interference with substances absorption [12]. The care and maintenance of the animals were carried out as per the approved guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), New Delhi [12, 13]. The research protocols were approved by the Institutional Animal Ethical Committee (IAEC) of Raghavendra Institute of Pharmaceutical Education and Research, Krishnam Reddy Palli cross, Chiyyedu, Anantapuramu-515721, Andhra Pradesh, India.

2.5 Gross behavioural and toxicity studies
The hydro alcoholic extract of whole plant of *Ipomoea quamoclit* was screened for the gross behavioural and toxicity studies in selected Swiss albino mice. Groups of mice comprising six animals each were treated with 100, 200, 400,800, 1000, 2000 and 3000 mg/kg of the extract suspended in 0.5% w/v sodium carboxy methyl cellulose were administered orally, via a gastric catheter. The animals were then observed continuously for first four hours for any behavioural changes and for mortality if any at the end of 72 h. However, no mortality was observed in the animals [12, 13]. Hence HAIQ was selected to screen for its anti-diabetic activity in streptozotocin induced diabetic rats at dose level of 250 mg/kg and 500 mg/kg body weight.

2.6 Induction of diabetes
Rats were made diabetic by single intraperitoneal administration of streptozotocin at a dose of 55 mg/kg dissolved in 0.1 M citrate buffer, pH 4.5. Forty-eight hours later, blood samples were collected and glucose levels were determined to confirm the development of diabetes. Only those animals which showed hyperglycemia (blood glucose levels >180 mg/dl) were used in the experiment [14].

2.7 Experimental design: Studies on Streptozotocin-induced diabetic rats
The rats were divided into six groups comprising of six animals each (n=6).
Group 1: Normal control; normal rats received 1% w/v CMC, orally for 30 days,
Group 2: Diabetic control; diabetic rats received 1% w/v CMC, orally for 30 days,
Group 3: Standard; diabetic rats treated with Glibenclamide (10 mg/kg, orally) in aqueous solution for 30 days,
Group 4: Test I; diabetic rats treated with HAIQ (250 mg/kg, orally) suspended in 1% w/v CMC solution for 30 days.
Group 4: Test II; diabetic rats treated with HAIQ (500 mg/kg, orally) suspended in 1% w/v CMC solution for 30 days.

2.8 Collection of blood samples
Blood samples (1.5 ml) were collected on 1st, 10th, 20th and 30th day of study by retro orbital plexus under mild anaesthesia and allowed to clot and were centrifuged at 3000 rpm for 15 min. The serum was separated and used for the estimation of blood glucose levels by glucometer [15, 16].

2.9 Biochemical estimations and body weight
The lipid profile in STZ induced diabetic model were evaluated on 30th day after withdrawal of blood for estimation of blood glucose levels. Serum lipid profile, including total cholesterol (CHOD/PAP method), triglycerides (GPO/PAP method), HDL cholesterol (PEG Precipitation method), LDL cholesterol and VLDL cholesterol were estimated. A change in body weight was determined by weighing the animals on day 1 and 30 [17, 18].

2.10 Statistical significance
All the results are expressed as the mean ± S.E.M. The data were analyzed for statistical significance by one-way analysis of variance (ANOVA) followed by Bonferroni's test using computerized Graph Pad Prism, version 4.5 software (Graph Pad Software Inc). Statistical significance was set accordingly.

3. Results
3.1 Extraction
A thick green viscous matter about 36.4 gm was obtained from 1000 gm of *Ipomoea quamoclit* whole plant by maceration and the percentage was found to be 3.64% w/w.

3.2 Preliminary phytochemical analysis
Preliminary phytochemical analysis of whole plant of *Ipomoea quamoclit* was carried out and it showed the presence of alkaloids, carbohydrates, saponins, phytosterols, phenolic compounds, tannins, flavonoids, proteins, amino acids, terpenoids, gums and mucilages.

3.3 Antidiabetic activity
3.3.1 Effect on blood glucose levels
The initial administration of streptozotocin at 55mg/kg caused marked elevation in blood glucose levels of the animals under study. Thirty days administration of hydroalcoholic extract of *Ipomoea quamoclit* whole plant showed a significant ($p<0.001$) reduction in blood glucose levels at both dose levels under study that is 250 and 500 mg/kg body weight in comparison with diabetic control group (figure 1). Standard drug also exhibited a significant ($p<0.001$) reduction in blood glucose levels of the animals in comparison with diabetic control. The results were shown in table number 1.

3.3.2 Effect on lipid profile
In biochemical parameters, thirty days administration of hydroalcoholic extract of *Ipomoea quamoclit* whole plant showed a significant ($p<0.05$) effect on triglycerides at its lower dose, significant ($p<0.05$) on total cholesterol levels and HDL, LDL and VLDL levels and also significant ($p<0.01$ and $p<0.001$) at its high dose that is 500 mg/kg body weight (figure 2). The results were shown in table number 2.

3.3.3 Body weight

Administration of hydroalcoholic extract of *Ipomoea quamoclit* whole plant exhibited a good control ($p<0.01$) over the body weight of the animals in comparison with diabetic control group (figure 3). The results were shown in table number 3.

Table 1: Effect of *Ipomoea quamoclit* whole plant on blood glucose levels of STZ induced diabetic rats

Group	Mean Blood glucose conc. (mg/dl.)			
	1st Day	10th Day	20th Day	30st Day
Normal control	89.16±0.08	88.48±0.22	89.1±0.11	88.4±0.12
Diabetic control	195.24±0.29	203.5±0.15	216.5±0.08	239.5±0.16
Glibenclamide 10mg/kg	189.7±0.39[a]	154.2±0.23[b]	141.3±0.14[b]	130.1±0.24[c]
HAIQ 250 mg/kg	185.97±1.03[a]	181.07±0.34[b]	170.70±0.32[b]	162.20±1.28[c]
HAIQ 500 mg/kg	191.47±0.66[b]	173.47±0.20[b]	165.46±0.46[c]	155.58±0.81[c]

All values were expresses as Mean± SEM, one way ANOVA followed by Bonferroni's test, a: $p<0.05$, b: $p<0.01$ and c: $p<0.001$ when compared to diabetic control group; HAIQ- Hydroalcoholic extract of *Ipomoea quamoclit* whole plant

Table 2: Effect of *Ipomoea quamoclit* whole plant on lipid profile of STZ induced diabetic rats

Group	Mean Lipid profile (mg/dL)				
	Triglycerides	Total cholesterol	HDL	LDL	VLDL
Normal control	67.58±0.49	74.25±0.32	32.08±0.18	38.50± 0.20	12.21± 0.11
Diabetic control	157.32±1.38	143.16±0.39	14.37±0.12	93.70±0.27	43.58±0.19
Glibenclamide 10mg/kg	68.00 ±0.06[a]	78.96±0.32[a]	31.16±0.13[b]	38.62±0.23[b]	14.98±0.12[c]
HAIQ 250 mg/kg	63.44±0.23[a]	84.44±0.24	25.20±0.12[a]	42.02±0.54[b]	14.33±0.22[a]
HAIQ 500 mg/kg	65.40±0.24	72.15±0.31[a]	30.82±0.12[b]	41.23±0.30	14.58±0.17[c]

All values were expresses as Mean± SEM, one way ANOVA followed by Bonferroni's test, a: $p<0.05$, b: $p<0.01$ and c: $p<0.001$ when compared to diabetic control group; HAIQ- Hydroalcoholic extract of *Ipomoea quamoclit* whole plant

Table 3: Effect of *Ipomoea quamoclit* whole plant on body weight of STZ induced diabetic rats

Group	Mean Body weight (gm)	
	1st day	30th day
Normal control	165.39±0.39	179.79±0.76
Diabetic control	167.5±0.42	106.85±0.62
Glibenclamide 10mg/kg	168.66±0.62[a]	188.34±0.38[a]
HAIQ 250 mg/kg	174.37±0.30	178.76±0.82
HAIQ 500 mg/kg	176.71±0.34[a]	180.92±0.22[a]

All values were expresses as Mean± SEM, one way ANOVA followed by Bonferroni's test, a: $p<0.01$ when compared to diabetic control group; HAIQ- Hydroalcoholic extract of *Ipomoea quamoclit* whole plant

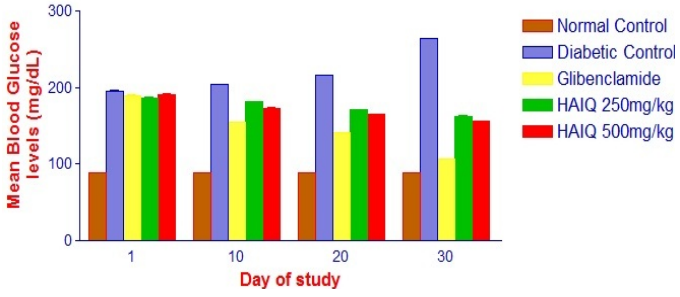

Fig 1: Effect of *Ipomoea quamoclit* whole plant on blood glucose levels of STZ induced diabetic rats

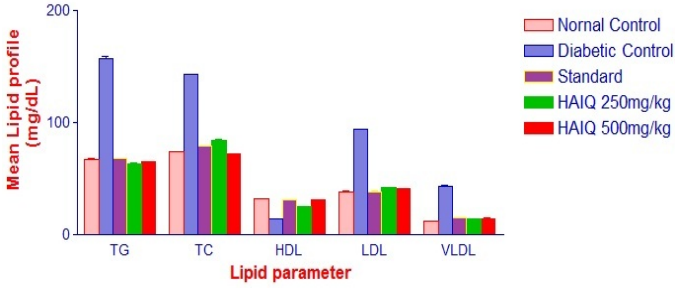

Fig 2: Effect of *Ipomoea quamoclit* whole plant on lipid profile of STZ induced diabetic rats

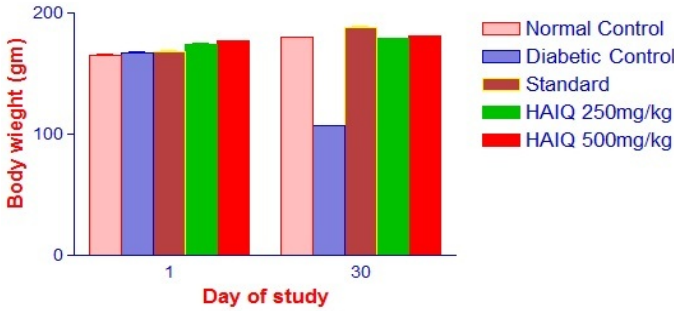

Fig 3: Effect of *Ipomoea quamoclit* whole plant on body weight of STZ induced diabetic rats

4. Conclusion

From the above findings, it can be concluded that thirty days administration of hydroalcoholic extract of *Ipomoea quamoclit* whole plant exhibited a significant reduction in the blood glucose levels of the streptozotocin induced diabetic rats. This may be probably due to the presence of different phytoconstituents like alkaloids, saponins, phytosterols, phenolic compounds, flavonoids [16]. Further studies are under progress to isolate and identify the pure phytoconstituents that are responsible for the anti-diabetic activity. Present study supports the folklore claim of the whole plant of *Ipomoea quamoclit* in the treatment of diabetes.

5. Acknowledgement

Authors express their sincere thanks to the principal and management of Raghavendra Institute of Pharmaceutical Education and Research, Krishnam Reddy Palli cross, Chiyyedu, Anantapuramu-515721, Andhra Pradesh, India for their constant encouragement and support for carrying out this research work. The authors also extend their thanks to Dr. K. Madhava Chetty, Assistant professor, Department of Botany, S.V. University, Tirupati, A.P., India for identification and authentication of the plant material.

6. References

1. Chetty KM, Sivaji K, Rao KT. Flowering plants of Chittoor district, Andhra Pradesh, India. 1st Ed, Student offset printers, Tirupati (India), 2008.
2. Pullaiah T, Chennaiah E. Flora of Andhra Pradesh. 1st Ed, Scientific Publishers, Jodhpur (India), 1997, 1.
3. Hasan SMR, Hossain MM, Raushanara A, Mariam J, Mazumder HEM, Rahman S. DPPH free radical scavenging activity of some Bangladeshi medicinal plants. Journal of Medicinal Plant Research 2009; 3(11):875-879.
4. Khare CP. Indian Medicinal Plants. 1st Ed, Spinger, New Delhi (India), 2007.
5. Kristina JS, Sonja CO, Thomas S, Karsten S, Frank M, Monika H. Ipangulines and minalobines, chemotaxonomic markers of the infrageneric *Ipomoea* taxon subgenus Quamoclit, section Mina. Phytochemistry 2005; 66:223-231.
6. Mahabir PG, Ludger W, Hartmann T. Pyrrolizidine alkaloids from *Ipomoea hederifolia* and related species. Phytochemistry 1998; 47(8):1551-1560.
7. Diego AP, Harborne JB. New sources of ergoline alkaloids within the genus *Ipomoea*. Biochemical Systamic Ecology 1993; 21(4):455-461.
8. A Survey of the Anthocyanins of some Tropical Plants. Proc. Royal Society of London, 1954, 549-564.
9. Rastogi RP, Mehrotra BN. Compendium of Indian medicinal plants- an illustrated dictionary. 2nd Ed, Directorate of information, Council for Scientific and Industrial Research (CSIR), Delhi (India), 2007, 3.
10. Kokate CK. Practical Pharmacognosy. 4th Ed, Nirali Prakashan Publishers, Delhi, 2003, 108-111.
11. Khandelwal KR. Practical Pharmacognosy: Techniques and Experiments. 13th Ed, Nirali Prakashan, Pune, 2005, 147-156.
12. Organization for Economic Cooperation and Development. OECD guidelines for testing of chemicals. Guideline 423, Acute oral toxicity - acute toxic class method. Adopted March, 22, 1996.
13. Srinivas K Reddy, Sanjeeva A Kumar, Vinay D Kumar, Ganapaty S. "Anti-inflammatory and analgesic efficacies of *Amorphophallus bulbifer (Roxb.) Kunth* whole plant''. Tropical Journal of Pharmaceutical Research 2012; 12(6):971-976.
14. Bhaskar AB, Vidhya VG, Ramya M. Hypoglycemic effect of *Mucuna pruriens* seed extract on normal and streptozotocin-diabetic rats. Fitoterapia 2008, 79:539-543.
15. Gagandeep K, Pradeep K, Kalia AN. Antidiabetic and anti-hyper cholesterolemic effects of aerial parts of *Sida cordifolia* Linn on Streptozotocin-induced diabetic rats. Indian Journal of Natural Products and Research 2011; 2:428-434.
16. Nabi AS, Babu KR, Swapna S, Krishna T, Venkateshwarulu M, Jyothi K *et al.* Antidiabetic and anti hyperlipidemic activity of *Piper longum* root aqueous extract in STZ induced diabetic rats. BMC Complementary and Alternative Medicine 2013, 13:1-9.
17. Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge, Clinical Chemistry 1972; 18:499-502.
18. Rajendran RP, Vijaya C, Parasuraman S. Antidiabetic Activity of Polyherbal Formulation in Streptozotocin – Nicotinamide Induced Diabetic Wistar Rats. Journal of Traditional and Complementary Medicine 2014; 4:108-117.