Asian Journal of Pharmacodynamics and Pharmacokinetics
Copyright by Hong Kong Medical Publisher
ISSN 1608-2281 2006 6(4): 327-329

Paper ID 1608-2281-2006-06040327-03
Received April 24, 2006
Accepted July 10, 2006

Anithyperglycemic activity of *Momordica dioica* fruits in alloxan-induced diabetic rats

G. Thirupathi Reddy, B. Ravi Kumar, G. Krishna Mohan and Mullangi Ramesh*
University College of Pharmaceutical Sciences, Kakatiya Univesity,Warangal 506 009, A.P, India

Abstract **Aim** The objective of this study was to verify the claim and evaluate the antidiabetic activity of the fruits of *M. dioica* by preparing the various organic extracts and the resultant extracts screening for the antidiabetic activity to track the activity. **Methods** The chloroform, ethyl acetate and alcohol extracts of *M. dioica* fruits were made and subjected for phytochemical screening and tested for their anti-diabetic activity in alloxan-induced diabetic rats. **Results** Phytochemical screening showed positive test for steroids and/or triterpenoids ($CHCl_3$ extract), steroids and/or triterpenoids and their glycosides (EtoAc extract), steroids and/or triterpenoids and their glycosides (EtOH extract). The ethyl acetate and ethanol have shown significant anti-diabetic activity at a dose of 200 mg/kg, p.o. **Conclusions** The study results suggested that *M. dioica* fruits possess potential anti-diabetic activity.

Key words *Momordica dioica*; fruits; rats; alloxan-induced diabetes; anti-hyperglycemic activity

Introduction

Momordica dioica Roxb. Ex. Wild. (Cucurbitaceae) is a perennial, dioiceous climber with tuberous roots found throughout India from Himalayas to Ceylon, up to an altitude of 1,500 m. The plant is sometimes found growing wild and is common in hedges. It is often cultivated for its fruits, which are used as vegetable [1]. The whole plant is used for treatment of eye diseases, poisoning and fever [2]. Juice of root is stimulant, astringent and antiseptic; tubers are used in cases of bleeding piles and similar affections. Plant is claimed to be expectorant, analgesic and soothing agent. Root is also used to stop bleeding from piles, as an expectorant and also in urinary and bowel complaints [3]. Fruits, leaves and tuberous roots used in India as a folk remedy for diabetes [4]. The aqueous extract of the root has spermicidal activity and anthelmintic activity [5]. The roots are reported to possess moderate antimicrobial activity and poor antifungal activity [4] and postcoital antifertility activity [6]. Phytochemical investigations have revealed the presence of traces of alkaloids and ascorbic acid in fruits. Lectins, β-sitosterol, saponin glycosides, triterpenes of ursolic acid, hederagenin, oleanolic acid, α-spiranosterol, stearic acid, gypsogenin, momodicaursenol, two novel aliphatic constituents [4, 7-9].

To the best of our knowledge no report is available on the antidiabetic activity of *M. dioica* fruits. The present study was undertaken to verify the claim and evaluate the antidiabetic activity of the fruits of *M. dioica* by preparing the various organic extracts and the resultant extracts screening for the antidiabetic activity to track the activity.

Materials and Methods

Plant material

Fresh fruits of *M. dioica* were collected locally, during July-August, 2004 and identified by Prof. V.S. Raju, Department of Botany, Kakatiya University, Warangal, Andhra Pradesh. An authenticated voucher specimen was deposited in the herbarium of University College of Pharmaceutical Sciences, Kakatiya University, Warangal (MD/Fr/2004).

Extraction and isolation

Fresh fruits of *M. dioica* (3 kg) were chopped, crushed and extracted successively with chloroform, ethyl acetate and alcohol in a Soxhlet extractor and yield was 0.22, 0.85 and 0.45%, respectively, on dried weight basis.

*Corresponding author. Present address: Discovery Research, Dr. Reddy's Laboratories Ltd., Miyapur, Hyderabad-500 049, India. Tel: 91-40-23045439; E-mail: Mullangiramesh@drreddys.com

Phytochemical screening of organic extracts

Freshly prepared organic extracts were tested for the presence of alkaloids, steroid and/or triterpenoids and their glycosides, tannins, flavonoids and their glycosides, carbohydrates and cardiac glycosides using standard procedure [10].

Test animals

Male Wistar rats weighing 190-210 g were used in the experiment. They were maintained in standard environmental conditions of temperature (25 ± 2 ^{0}C), relative humidity (55 ± 10%) and 12 h dark/light cycle were used. They were fed with standard diet (Hindustan Lever, India) and water *ad libitum*.

Antidiabetic activity

Anti-diabetic activity of various organic extracts was studied in alloxan-induced diabetic rats. Hyperglycemia was induced by a single *intraperitoneal* injection of 120 mg·kg^{-1} of alloxan monohydrate in sterile saline [11]. After 5 days of alloxan injection, the diabetic rats (glucose level >350 mg·dl^{-1}) were separated and divided into five groups of six animals each (Table 1). Group I served as diabetic control and was given distilled water. Groups II-IV were treated orally with chloroform ($CHCl_3$), ethyl acetate (EtoAc) and alcohol (EtOH) extracts at a dose of 200 mg·kg^{-1} suspended in carboxy methylcellulose (0.25%). The standard anti-diabetic drug, metformin was administered orally at a dose of 50 mg·kg^{-1} to Group-V animals. Blood samples were colleted from the tail vein at designated time points after extracts and standard drug administration. Plasma was harvested and blood glucose levels were measured immediately by glucose oxidase method [12].

Table 1. Test design for activity

Group	Treatment	Rat number
I	Diabetic rats – Untreated	6
II	Diabetic rats treated with 200 mg·kg^{-1} of chloroform extract	6
III	Diabetic rats treated with 200 mg·kg^{-1} of ethyl acetate extract	6
IV	Diabetic rats treated with 200 mg·kg^{-1} of alcohol extract	6
V	Diabetic rats treated with 50 mg·kg^{-1} of metformin	6

Results and Discussion

Phytochemical screening gave positive test for steroids and/or triterpenoids ($CHCl_3$ extract), steroids and/or triterpenoids and their glycosides (EtoAc extract), steroids and/or triterpenoids and their glycosides (EtOH extract). The $CHCl_3$ extract of *M. dioica* fruits did not show any antihyperglycemic activity. On the contrary, the EtoAc extract after oral administration of 200 mg·kg^{-1} exhibits significant reduction in blood glucose levels. Similarly, the EtOH extract has produced significant reduction in blood glucose levels at 200 mg·kg^{-1}. As shown in Table 2, the effect of EtoAc and EtOH could be comparable to that of well-known hypoglycemic compound, metformin (50 mg·kg^{-1}).

Table 2. Effect of *M. dioica* fruits extracts on fasting blood glucose levels in diabetic rats

Group	0 h	2 h	4 h	6 h
I	390.10 ± 7.65	385.78 ± 8.12	376.21 ± 8.85	380.12 ± 7.84
II	386.13 ± 7.71	401.62 ± 7.59	381.33 ± 8.97 (1.24)	374.80 ± 9.21 (2.93)
III	382.08 ± 7.94	348.33 ± 8.03** (8.83)	268.31 ± 7.40*** (29.77)	287.12 ± 7.37*** (24.85)
IV	407.00 ± 6.08	400.66 ± 18.69 (1.55)	361.46 ± 18.60** (11.19)	271.00 ± 4.90*** (33.41)
V	439.33 ± 9.80	344.33 ± 15.40*** (21.62)	218.00 ± 4.00*** (50.37)	195.66 ± 3.44*** (55.46)

Values (mg 100 ml^{-1}) are mean ± S.E (n = 6), determined at different time (h) after treatment.

*p < 0.05; ** p < 0.01; ***p < 0.001 vs 0 h; Student's t-test. Figures in parenthesis indicate the percentage of reduction.

Thus the claim made by the traditional Indian system of medicine regarding the use of fruits of this plant in the treatment of diabetes stands confirms. As far as the mechanism of action is concerned, we can speculate that antihyperglycemic activity of *M. dioica* could be due to an enhancement of peripheral

metabolism of glucose, even if an increase of insulin release cannot be excluded. Present efforts are directed to isolate the active constituents from EtoAc and EtOH extracts of *M. dioica* fruits and elucidation of mechanism of action.

References

1. Sastri BN. *The Wealth of India - Raw Materials*, CSIR, New Delhi, 1962; p. 408.
2. Satyavati GV, Gupta AK, Tandon N. *Medicinal Plants of India*, Vol. 2, ICMR, New Delhi, 1987; p. 267.
3. Kirthikar KR, Basu BD, An ICS. *Indian Medicinal Plants*, Vol. 2, 2nd edition, Lalit Mohan Basu, Allahabad, India, 1981; pp. 411-2.
4. Sadyojatha AM, Vaidya VP. Chemical constituents of the roots of *Momordica dioica* Roxb. *Ind Drugs* 1996; 330: 473-5.
5. Satyavati GV, Raina MK, Sharma M. *Medicinal Plants of India*, Vol. 1, ICMR, New Delhi, 1987; p. 317.
6. Shreedhar CS, Pai KSR, Vaidya VP. Post coital antifertility acitivity of the root of *Momordica dioica* Roxb. *Ind J Pharm Sci* 2001; 63(6): 528-31.
7. Ghosh PN, Dasgupta B, Sircar PK. Purification of lectin from a tropical plant *Momordica dioica* Roxb. *Ind J Exp Biol* 1981; 19(3): 253-5.
8. Ali M, Srivastava V. Characterization of phytoconstituents of the fruits of *Momordica dioica*. *Ind J of Pharm Sci* 1998; 60(5): 287-9.
9. Luo L, Li Z, Zhang Y, Huang R. Triterpenes and steroidal compounds from *Momordica dioica*. *Yaoxue Xuebao* 1998; 33(11): 839-42.
10. Farnsworth NR. Biological and phytochemical screening of plants. *J Pharm Sci* 1966; 55(3): 225-76.
11. Joy KL, Kuttan R. Anti-diabetic activity of *Picrorrhiza kurroa* extract. *J Ethnopharmacol* 1999; 67(2): 143-8.
12. Trinder P. Determination of glucose using glucose oxidase with an alternative oxygen receptor. *Ann Clin Biochem* 1969; 6(1): 24-7.

Introduction to New Journal

Chinese Medicine

ISSN 1749-8546 (on-line) 1991-0150 (print) http://www.cmjournal.org

Chinese Medicine (CM) is an international interdisciplinary, peer-reviewed, scientific and open access journal for critical evaluation of research in Chinese Medicine. It is published on-line by BioMed Central (BMC) as the official journal of the International Society for Chinese Medicine (ISCM), funded by Macao Foundation. CM aims to give evidence-led FORCES for the modernization and internationalization of Chinese medicines research.

Objectives CM is a major channel for Chinese medicine information and knowledge that is evidence –led, scientifically justified and ethical. To this end, CM aims to (1) Promote evidence-led Chinese Medicine (ELCM) and Chinese medicine based health care, including research, education and practices; (2) provide an international forum on ELCM research approaches and methodologies; (3) review trends of development, recent advances and current topics of wide and international interests in Chinese medicine; (4) publish guidelines, expert consensus, methodologies, protocols, standards for Chinese medicine research community and other interested parties; and (5) publish high quality original research and review articles.

Scope CM publishes papers on all aspects of research in Chinese medicine system including: basic research, clinical research, methodologies, guidelines, protocols, reference standards, theories, diagnosis, herbal medicines, health food, clinical nutrition, acupuncture, Tu-na, prevention, treatment, rehabilitation, Qi-gong, Taichi-quan, Life style, mind-body, education, management, internationalization, cultural exchange, technical translation, provided that the material, methods, results and conclusions are evidence-based, scientifically justified and ethical.

Free and Open Access CM (on-line) is published by BMC, an open access journal publisher, which ensures the journal to meet international standards, You should submit your next manuscript to CM because it is: Free of charge: all fees waived; Open access: international readership without subscription; Recognized: indexed by Pubmed and evaluated by SCI; Citation-friendly: increasing the speed and number of citations; Efficient: on-line submission, peer-review and publication; and Serious: rigorously reviewed by expects.

Editor-in-Chief: Professor Hin Wing Yeung Professor Yeung was born in Macao where he recieived his primary and secondary education. He then moved to Hong Kong to attend the Chinese University of Hong Kong where he obtained BSc degrees in Chemistry and Biology. Subsequently, he obtained MSc and PhD degrees both in Chemistry from the Hong Kong University and the University of Toronto, Canada, respectively. Professor Yeung had extensive research experience in number of renowned universities/institutes, including the Guangzhou University of Traditional Chinese Medicine, China; McMaster University, Canada; Oxford University, UK; the University of California, San Francisco, USA; and the Weizmann Institute of Science, Israel. From 1973 to 1997, he was a faculty member of Biochemistry Department at the Chinese University of Hong Kong. He is one of the founders and the former Director of the Chinese Medicinal Material Research Centre at the Chinese University of Hong Kong (1989-1991), and the founding Director of the Institute for the advancement of Chinese Medicine at Hong Kong Baptist University (1997-2001), From 2002-to 2003, he was a visiting professor in the School of Medicine, University of California, Los Angeles, USA. Among his research achievements, his contribution to the research in Ginseng and Tian-hua-fen was the most significant. His extensive research on Tian-hua-fen and related Chinese herbs has led to the discovery of several new trichosanthin-like protein drugs as well as their novel pharmacological properties. He is one of the co-inventors of the novel anti-HIV activities of trichosanthin and related proteins, for which he holds to patents. For 30 years, he has been working tirelessly for the advancement of Chinese medicine through extensive research and publications, collaborations with other academics, and training of professionals. Professor Yueng has published more than 230 scientific papers in Chinese medicine.