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Antidiabetic potential of a novel hypoglycemic active principle from bittergourd (*Momordica charantia*) seeds in alloxan-induced diabetic rats.

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Abstract-The present study evaluates antidiabetic potential of fractionated bittergourd (*Momordica charantia*) seed extracts in alloxan-induced diabetic rats. A novel hypoglycemic active principle (MCK3P8) obtained from a fraction of the ethanolic extract (MCK3) of bittergourd (*Momordica charantia*) seeds, given by intraperitoneal injection to alloxan-induced diabetic rats at a dose of 15 mg/kg b.wt., showed a significant hypoglycemic activity. Loss in hypoglycemic activity of the MCK3P8 upon proteinase-K treatment indicates the proteinaceous nature of the novel hypoglycemic active principle.

Keywords: Bittergourd (*Momordica charantia*), Antidiabetic potential, Hypoglycemic activity, alloxan-induced diabetic rats.

INTRODUCTION

1. Use in traditional medicine

Momordica charantia L. commonly known as bittergourd, is one of the most used plants for the treatment of diabetes and some of its late complex abnormalities including nephropathy, neuropathy and retinopathy etc. Bittergourd whole fruit, fruit pulp, seeds in diabetes mellitus[1-5], roots as an abortifacient[6] and the leaves for hypoglycemic activity in diabetic animals[7].

2. Previously isolated constituents

Sterols, charantin, momordicine[8-10], cardenolides[11], and polypeptide-P.[12]

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MATERIAL AND METHODS

1. Plant Material

Momordica charantia L. (Cucurbitaceae), seeds purchased from sales counter of Indian Agriculture Research Institute (IARI), Pusa Road, New Delhi in August 2010, in large quantity to maintain the consistency of the stock for extract preparation and was authenticated by the Taxonomist of University Department of Botany, Patna University, Patna, Bihar, India. A voucher specimen is deposited in the Department of Biochemistry of the Patna University, Patna, Bihar, India.

2. Chemical

All the chemicals were of analytical grade and were procured from Sigma Aldrich Chemical Co., USA, or Boehringer - Mannhiem, Germany, unless otherwise stated.

Protamine Zinc Insulin was procured from Boots Pharmaceuticals Ltd., India.

3. Animal

Random bred male wistar rats, 175-200 g (12-14 weeks), were housed in standard laboratory conditions, in the small animal facility of Department of Biochemistry of the Patna University, Patna, Bihar, India. The animals were provided with rat feed (Hindustan Liver Ltd, India) and water ad libitum.

4. Induction of Diabetes

The male wistar rats were made diabetic by using alloxan. Briefly, alloxan was administered i.e. after starving the animals for 36 hrs at a dose of 150 mg/kg b.wt. Animals were stabilized for 3 days by insulin administration, 1-2 units per day for 2 days. Only those animals having blood glucose level more than 300 mg/100 mL blood were selected for further analysis.

5. Tested Material

From decorticated bittergourd (*Momordica charantia*) seeds, fraction MCK3 was obtained from ice cold ethanol extract (75% C_2H_5OH, 1 mM PMSF, 0.2 N HCI), centrifuged and concentrated in speed vac at 4°C. The supernatant was neutralized with $(NH_4)_2CO_3$ to pH 7.2 and centrifuged with liquid ammonia. The supernatant, fraction MCK3 was further subjected to differential precipitation with $(NH_4)_2SO_4$ containing 0.25% TCA which resulted in precipitation of all protein.

The hypoglycemic MCK3P8 was obtained from the fraction MCK3 (14 ml containing 196 mg of proteins) by gel filtration CC with Sephacryl S100 eluting with 0.2 M NH_4HCO_3 (pH 7.2-7.4). Bioactivity of the fractions was measured at each step of purification.

6. Statistical Analysis

All the results were analyzed statistically using student's paired t-test for paired data of different levels of significance. All the results were expressed as mean S.E. P values less than 0.05 were considered significant. N represents number of experimental animals.

RESULTS & DISCUSSION

The present study reports purification of a hypoglycemic active principle from bittergourd (*Momordica charantia* seeds). Hypoglycemic activities studied in control, insulin, fraction MCK3, MCK3P8, Proteinase-K plus MCK3P8 treated alloxan - induced diabetic rat by measuring the blood glucose level enzymatically.[13] by drawing blood from the tale vein during the study period. Results are reported in Table 1.

The hypoglycemic active principle (MCK3P8) was able to bring down the blood glucose level significantly by 3 hours after administration. The hypoglycemic activity brought about by the MCK3P8 was comparable to that observed with insulin treatment of the diabetic rats.

Table 1- Hypoglycemic activity of fraction MCK3, hypoglycemic active principle (MCK3P8) and Proteinase-K treated MCK3P8 of bittergourd (*Momordica charantia*) seeds

Treatment i.p.	Blood glucose level (mg/dL)	
	0 h	3 h
Normal control + saline (0.5 ml)	90 10.0	85 9.1
Control Diabetic + saline (0.5 ml)	347 44.92	355.4 28.20
Diabetic + insulin (5 U/kg b.wt.)	351 18.0	205 16.0 □
Diabetic + fraction K3 (15 mg/kg b.wt.)	399.7 38.5	344.76 43.88
Diabetic + MCK3P8 (15 mg/kg b.wt.)	385.04 47.86	252.9 20.24 □
Diabetic + Proteinase-K treated MCK3P8	414.3 92.4	378.16 46.95

Values are mean S.E., N=5. C" P 0.001 (Student's t-test) vs control diabetic + saline (0.5 ml).

Based on the results of this study, we conclude that the novel hypoglycemic active principle (MCK3P8) of bittergourd (*Momordica charantia*) seed, given intraperitoneally at a dose 15mg/kg b.wt., possesses significant hypoglycemic activity in alloxan-induced diabetic rats, and it is proteinaceous in nature.

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REFERENCES

1. **Ansari Z & Nehal M. 2003.** The hypoglycemic effect of *Momordica charantia* seeds is medicated by extra-pancreatic action. *J.Sci Pharm.* **4(2):**65 - 70
2. **Ansari Z, Zafar E & Nehal M. 2003.** Effect of Bittermelon (*Momordica charantia*) on serum levels of key hepatic enzymes and proteins in alloxan diabetic rats. *J.Sci Pharm.* **4(3):**109 - 114
3. **Kedar P & Chakrabarti CH. 1996.** Effect of bittergourd (Momordica charantia) seed and glibenclamide in STZ induced diabetes mellitus. *Ind.J. Exp.Biol*. **20(3):**232 - 235
4. **Sarkar S. Pranava M & Rosalind NA. 1996.** Demonstration of the hypoglycemic action of *Momordica charantia* in a validated animal model of diabetes. *Pharm Res*. **33(1):**1 - 4
5. **Singh N., Gupta M., Sirohi P & Varsha. 2008.** Effect of alcoholic extract of *Momordica charantia* (Linn.) whole fruit powder on the pancreatic islets of alloxan diabetic albino rats. *J. Env Biol*. **29(1):**101 - 106
6. **Chopra RN., Chopra IC., Handa KI & Kapur LD. 1982.** Chopra's indigenous drug of India. (Academic Publication, Calcutta)
7. **Vimla Devi M., Vankateshwarlu M & Krishna Rao RV. 1977**. Hypoglycemic activity of the leaves of *Momordica charantia*. *Indian J. Pharm* **39:167** - 169
8. **Guevara AP., Lim - Sylianco CY, Dayrit FM & Finch P. 1989.** Acyl glucosyl sterols from *Momordica charantia. Phytochemistry*. **28(6):**1721
9. **Lolitkar MM & Rao MRR. 1996.** Pharmacology of a hypoglycemic principle isolated from the fruits of *Momordica charantia* Linn. *Indian J. Pharmacol.* **28:**129 - 133
10. **Rivera G.1941.** Preliminary chemical and pharmacological studies on "Cundea Mor" and "Charantia L*", Am J. Pharmacol Part II.* **113(7):** 281 - 297
11. **Smith JHC & Benitez A. 1955.** Modern methods of plant analysis, edited by Paech K & Tracey MV, Vol.**4:**142
12. **Khanna P., Jain SC., Panagariya A & Dixit VP. 1981.** Hypoglycemic activity of polypeptide-P from a plant source*, J. Nat Prod.* **44(6):** 648 - 655
13. **Bergmeyer HU., Bernt E., Schmidth F & Strake H. 1974.** Glucose determination with hexokinase and glucose - 6 - phosphate dehydrogenase, edited by Bergmeyer HU. Methods of enzymatic analysis Vol. **3** (Academic Press, New York):1196

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