

Preliminary Antimicrobial and Antihyperglycemic Activities of *Mariscus sumatrensis*

Jamiuddin Ahmed¹, Md. Nur Alam², Nazia Hoque², Md. Sohel Rana², Moynul Hasan³ and Md. Hossain Sohrab⁴

¹Department of Pharmacy, Noakhali University of Science and Technology, Noakhali, Bangladesh

²Department of Pharmacy, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh

³Department of Pharmacy, Dhaka International University, Banani, Dhaka, Bangladesh

⁴Analytical Research Division, Bangladesh Council of Scientific and Industrial Research
Dr. Qudrut-E-Khuda Road, Dhaka-1205, Bangladesh

Abstract

Mariscus sumatrensis (Retzius) is one of the rare plants in the world, which has not been subjected to any phytopharmacological studies. The traditional healers of the Chittagong hill tracts of Bangladesh use tincture of the aerial parts of the plant topically for treating infections and prescribe that tincture to swallow for treatment of diabetes. The objective of the study was to explore the uses of the uninvestigated plant. Disc diffusion assay was used for antimicrobial screening and blood sugar lowering effect was assessed in alloxan induced diabetic rats. The methanol extract of the plant exhibited weak antimicrobial effect against the tested microorganisms. On the other hand, the antihyperglycemic activity of the methanol extract was found to be insignificant. Further extensive study is required to evaluate the traditional uses of the plant.

Key words: *Mariscus sumatrensis*, Antimicrobial, Antihyperglycemic.

Introduction

Plants are the important sources of a diverse range of chemical compounds. Some of these compounds possessing a wide range of pharmacological activities are either impossible or too difficult to synthesize in the laboratory. Only about 6% of the plants of the entire world have been screened for biologic activity, and a reported 15% have been evaluated phytochemically (Verpoorte, 2000). Chemical diversity of secondary plant metabolites that results from plant evolution may be equal or superior to that found in synthetic combinatorial chemical libraries.

Mariscus sumatrensis (Retzius) is one of four available species of Cyperaceae family in Bangladesh. It is a perennial herb, stoloniferous in some cases with very short woody rhizome clothed with brown fibers. In traditional medicines, the root juice of the plant is used in case of cough and fever (Manandhar, 1990; Heywood, 1993), ground rhizomes are applied to skin disorders (Abbiw, 1990) and infusion of nutlets is used for toothache (Altschul, 1973; Millar and Morris, 1988). Remirol and a mixture of the benzofuran remirol plus benzopyran isoevodionol, isolated from the rhizomes of *Mariscus pedunculatus*, were examined for anti-inflammatory activity and was found to show a dose-

dependent (100 and 200 mg/kg, p. o.) capacity to inhibit neutrophil and eosinophil accumulation in the mouse pleural cavity (Siani *et al.*, 2011). Literature survey revealed that so far there is no report on pharmacological investigation of *M. sumatrensis*. Thus, an attempt has been taken to screen out the plant extract for antimicrobial and antidiabetic activities for the first time and we, here in, report the results of our preliminary investigation.

Materials and Methods

Collection of the plant: The whole plant was collected from Savar, Dhaka, Bangladesh during March 2008. It was identified by Mrs. Boshra Khan, Senior Scientific Officer, Bangladesh National Herbarium, Dhaka, where a voucher specimen has been deposited (Accession no. DACB 32,762) for the collection.

Extraction: The powdered plant material (300 g) was extracted to exhaustion in a Soxhlet extractor at elevated temperature with petroleum ether, dichloromethane and methanol successively. The whole mixture was then filtered through filter paper and the filtrate was evaporated under reduced pressure at 40 °C using a Buchii rotary evaporator to have a gummy concentrate of the crude extract. From the hot extraction process the yield of

petroleum ether extract, dichloromethane extract and methanol extract was found to 4.5 g, 3.8 g and 2.3 g respectively. The yields of the extracts were very low due to the grass like nature and the higher content of fiber in the plant.

Test organisms: The bacterial and fungal strains used for the experiment were collected as pure cultures from the Institute of Nutrition and Food Science (INFS), University of Dhaka. Among the bacterial species five are Gram-positive (*Bacillus cereus*, *Bacillus megaterium*, *Bacillus subtilis*, *Sarcina lutea* and *Staphylococcus aureus*) and seven are Gram-negative (*Escherichia coli*, *Salmonella paratyphi*, *Salmonella typhi*, *Shigella boydii*, *Shigella dysenteriae*, *Vibrio mimicus* and *Vibrio parahemolyticus*). The fungal species are *Aspergillus niger*, *Candida albicans* and *Saccharomyces cerevisiae*.

Screening for antimicrobial activity: The *in vitro* sensitivity of the extracts against microorganisms was determined by disc diffusion method (Bauer *et al.*, 1966). The test samples MET, PET and DCM were prepared by dissolving in 50 mg each of the dried methanol, petroleum ether and dichloromethane extract, respectively in 2 ml of respective solvents to give a concentration of 25 µg/µl. Sample discs were prepared by allowing each sterile disc (6 mm in diameter) of filter paper to absorb 20 µl of a test solution in aseptic condition. The discs were allowed to dry until complete evaporation of the solvent. Dried and sterilized filter paper discs, each containing a test sample of 500 µg of the test agent were placed on nutrient agar medium uniformly seeded with the test microorganisms. Kanamycin (30 µg/disc) and blank disc were used as the positive and negative control. The plates were kept at 4 °C for 24 h to allow maximum diffusion of the test materials to the surrounding medium. The plates were incubated at 37 °C for 24 h for optimum growth of the organisms. The antimicrobial activity of the extracts was determined by measuring the diameter of zone of inhibition expressed in millimeter.

Drugs and chemicals: Kanamycin disc (CT 00268) was purchased from OXOID, UK. Metformin was obtained as a generous gift sample from Eskayef Pharmaceuticals Ltd., Dhaka, Bangladesh. Alloxan was purchased from Sisco Research Laboratories Pvt. Ltd., Mumbai, India.

Animals: The study was conducted as Long Evan's rats weighting about 110-120 g that were purchased from International Center for Diarrheal Disease Research Bangladesh (ICDDRDB). Rats were housed in colony cages (six rats per cages) at an ambient temperature of 25-27 °C with 12 h light and dark cycles having proper ventilation in the room and fed with normal diets purchased commercially from the vendors and water *ad libitum*. The animals were allowed to acclimatize to the laboratory environment for one week and then randomly divided into 4 groups (each contains 6 rats) for experiment.

Induction of diabetes: Animals were allowed to fast for 12 h and were administered with freshly prepared alloxan (120 mg/kg body weight i.p.) in saline water. The alloxan treated animals were supplied with food and water overnight to overcome drug-induced hypoglycemia. The rats were kept undisturbed for 48-72 h for development and aggravation of diabetes, and rats with moderate diabetes having persistent glycosuria and hyperglycemia were used for further experimentation.

Antidiabetic study: Antihyperglycemic activity was determined according to the method described by Kasiviswanath *et al.* (2005). The animals were divided into four groups, Group I animals were served as normal control, Group II animals were untreated diabetic control, Group III diabetic rats treated with Metformin hydrochloride (150 mg/kg) whereas Group IV diabetic rats were given methanolic extract of *M. sumatrensis* (200 mg/kg). After intraperitoneal administration of drug and plant extracts, blood samples were collected by pricking the tail vein at different time intervals (at 0, 4, 8 and 24 hours) for checking blood glucose level by strip method (Clever check Glucometer, Germany).

Data analysis: All the results were expressed as mean ± SD (n = 6). Hypothesis test was performed by one-way analysis of variance (ANOVA) followed by least significant difference test. *p*-values of less than 0.05 were considered statistically significant.

Results and Discussion

Antimicrobial activity: The petroleum ether, dichloromethane and crude methanol extracts of *M. sumatrensis* exhibited weak antimicrobial activity against most of the test organisms with zone of inhibition of 7-10 mm at 500 µg/disc.

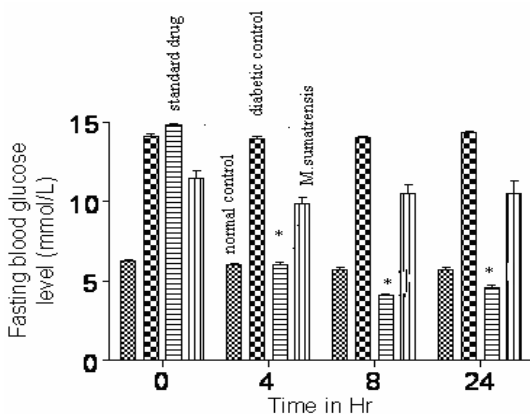


Figure 1. Effect of drug of *Mariscus sumatrensis* on fasting blood glucose level in normal control and alloxan induced diabetic rats compared to standard metformin drug. (* Indicates significant antidiabetic activity)

Antidiabetic study: The mean blood glucose level in normal control (6.11 mmol/L) and alloxan treated group (14.86 mmol/L) indicated the induction of diabetes in the treated group. The mean blood glucose level of control-untreated, metformin-treated and methanolic extract of *Mariscus sumatrensis*-treated animals were estimated after 0, 4, 8 and 24 hours respectively. Metformin reduced blood glucose level (in alloxan induced diabetic rats) by 59.42%, 72.4% and 69.31% after 4, 8 and 24 hours, respectively. On the other hand, methanol extract of *M. sumatrensis* reduced blood glucose level by 14.4%, 8.69% and 8.43% after 4, 8 and 24 hours, respectively during observing antihyperglycemic effect. Antidiabetic activity of the methanol extract of the plant was found but weak when compared to control (Figure 1). Before claiming the absence of hypoglycemic constituents in *M. sumatrensis* further investigation is required to show the antidiabetic activity of the non polar extracts of the plant.

Conclusion

Extensive literature study provides very little information about *M. sumatrensis* and its pharmacological

activity. Weak antimicrobial and antidiabetic activities of its crude methanol extract justify the uses the plant by the people and traditional healers of chittagong hill tracts. Further investigation is required to evaluate the antimicrobial as well as antihyperglycemic activities of *M. sumatrensis*.

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