ISSN 0975-6299 Vol 3/Issue 2/April – June 2012

International Journal of Pharma and Bio Sciences

RESEARCH ARTICLE MICROBIOLOGY

MOMORDICA CHARANTIA L-AN ETHNOBOTANICAL DRUG

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ABSTRACT

Leaves of *Momordica charantia* L or bitter melon or bitter gourd (Cucurbitaceae) an active ingredient of many ayurvedic preparations mainly against diabetes was studied for its pharmacognisical characters. The trace elements and the mineral content of the leaves were also evaluated. Ethanolic extracts of the leaves reported *in vitro* antibacterial activities against gram negative bacteria such as *Salmonella typhi, Pseudomonas fluorescens, Pseudomonas aeruginosa and Escherichia coli.* The pathogens were tested by disc diffusion assay method and a minimum inhibitory concentration was evaluated. An attempt was made to compare the activity of the extract with a standard antibiotic ciprofloxin. The pharmacognisical and the phytochemical constituents help in proving the authencity of the drug. In addition it proves the efficacy of the plant as an antibacterial agent.

KEY WORDS

bitter gourd, Momordica, antibacterial, trace element, minerals

INTRODUCTION

The genus Momordica (Momordi, from mordeo, meaning to bite (for the seeds appear to have been bitten), belongs to the order Campanulales, family Cucurbitaceae or "gourd family." They are herbaceous, climbing or prostate vines, with simple or forked tendrils and dioecious or monoecious, mostly yellow flowers. The staminate flowers have a five-lobed calyx, a nearly rotate five-parted corolla and usually three stamens with short filaments, borne at the calyx mouth, the anther sacs are flexuous. The pistillate flowers have a calyx and corolla like those of the staminate, a one-celled ovary with three placenta, the numerous ovules are horizontal, the style slender, and there are three stigma. *Momordica charantia* L is a monoecious climber found throughout India often under cultivation upto an altitude of 1500m.Its leaves are much valued as a[Delete] medicine. In the Indian system of medicine, leaves of the plant are believed to have hypoglycemic property [1]. as well as in controlling Vatha, Kapha, Pitha. Leaf powdered procured from the market is often not genuine; it is mixed with some adulterants which alter the therapeutic value. As the leaf is in the powdered form, its identification becomes difficult; a review of the ultra morphological characters of the leaf surface is investigated in detail. This can be used in proving the authenticity of the drug.

The leaves are selected for the study for its medicinal value in the treatment of diabetes [2],to promote menstruation and as an antiviral agent for measles and hepatitis. In an *in vivo* study, a leaf extract increased resistance to viral infections and had an immunostimulant effect [3] in humans and animals, increasing interferon production and natural killer cell activity. In addition to these properties, leaf extracts have demonstrated broad-spectrum antimicrobial activity.

In India the ethnobotanical uses of this plant suggest that it is capable of lowering blood glucose level in diabetic patients. In folk medicine, it is generally believed that the bitterer this plant is, the more medicinal value it has [4] . Phytochemical studies revealed that *Momordica charantia* contained alkaloids, saponins, glycosides, phenolic constituents, reducing sugars and free acids. The presence of 5-hydrxytryptamine in bitter melon has also been reported [5] .Medicinal plants posses some important elements in small doses which have both therapeutics and prophylactic properties. The element are referred to as trace elements [6] . Trace elements are required in plant mainly for the formation of pigments and enzymes in animals. They function mainly to facilitate certain vital metabolic processes. Many of these elements pair-up with vitamins in the metabolism of carbohydrates, fat, and protein. Metabolic disease will arise in the absence of trace elements.

MATERIALS AND METHOD

The leaves of *Momordica charantia L* was collected from Chennai and identified with the help of botanist of RRIUM, Chennai.

Segments of the leaves were shade dried, dehydrated they were then examined with Jeul,Jsm35C scanning electron microscope. Supplementary observations were made under light microscope. The presence of trace elements and mineral content were determined by wet acid digestion method as described by [7] 0.5g of each sample in 10ml Conc. HNO3 in a covered flask placed in a fume cupboard for three days. Thereafter, the three covered flasks

with the contents were heated on a hot plate for twenty-four hours, conc. HNO3 was added intermittently as the content reduced until the sample solutions turned colorless. They were cooled and transferred into 50ml volumetric flask and made up to mark with distilled water. The solutions were filtered and transferred into an analytical bottle, corked, and labeled, kept for AAS and flame photometric analysis.

The dried and powdered plant material (100 g) was extracted successively with 600 ml of ethanol with a shaker extractor for 48 hr at temperature not exceeding the boiling point of the solvent [8] . The extracts were filtered through Whatman No. 1 filter paper and then concentrated in a vacuum at 40°C using a rotary evaporator. Each extract was transferred to glass vials and kept at 4°C before use.

The microorganism *Salmonella typhi* (ATCC 00215), *Pseudomonas fluorescens* (ATCC 06341), *Pseudomonas aeruginosa* (ATCC 02150) and *Escherichia coli* (ATCC 10263) were used as test organism.

Disc Diffusion Method

The testing of antibacterial activity of the plant extracts was carried out *invitro* by Kirby-Bauer disc diffusion technique [9]. Culture of bacteria was made on Muller Hinton agar plates. Sterile paper discs 5mm diameter (Himedia) were placed over the plate at an equidistant position. The discs were loaded with 10 µl of the drug at the concentration of 100 µl/ml, 150 µl/ml, 200 µl/ml, 250 µl/ml and 300 µl/ml. Double distilled water was used as solvent. Separate control disc was also included using the solvent. Ciprofloxacin was used as standard for comparison. The plates were incubated at 37°C for 24 hours. The microbial growth was determined by measuring the diameter of Zone of inhibition.

Minimum inhibitory concentration (MIC)

Minimum inhibitory concentration (MIC) is the lowest concentration of an antimicrobial that will inhibit the visible growth of a microorganism after overnight incubation. The MIC is determined by agar dilution method. The test were performed at four concentration 60 µg/ml, 70 µg/ml, 80 µg/ml, 90 µg/ml and 100µg/ml employing the ethanolic extract of the plant.

RESULTS

The observations made were, leaves were sub orbicular in shape, lobed, pubescent. Epidermal studies showed wavy nature of the epidermal cells, trichomes were uniseriate, multicellular and egrandular. Double cystoliths are of frequent occurrence on the abaxial epidermis.

SEM studies showed that leaf surface had all types of trichomes distributed on the veins and veinlets.The base was warty, stomata of paracytic and anamocytic types. Cell boundaries were distinct and cuticular striatious and disposed at right angles to the guard cells on the abaxial side, rectariferous glands were also observed. These features help in proving the authenticity of the drug.

Leaves contain high quantity of zinc(table 1) useful for nerve function and male fertility which stimulates the activity of vitamins and increases the count of white blood copurscles and functioning of heart[10] while the manganese content increases the functioning of the pituitary gland and brain. The second element is chromium with value of 162.00mg/kg which also indicates that the plant would be good in the health management of diabetes.

Table1
PROFILE OF TRACE ELEMENTS PRESENT IN THE EXPERIMENTAL PLANT

Serial number	Trace element	Concentration mg/kg(dry weight)
1	Cadmium	50.12 ± 0.02
2	Chromium	162.2± 0.02
3	Copper	22.23± 0.02
4	Iron	45.0± 0.04
5	Lead	45.0± 0.02
6	Manganese	96.5± 0.01
7	Zinc	351.5± 0.04

The mineral content as shown in Table 2 reveals high concentration of sodium and calcium which can be depicted by the anatomical features such as crystals and cystoliths being rich in calcium correlate the content.

Table 2
MINERAL COMPOSITION OF MOMORDICA LEAVES

Serial number	Mineral	Concentration mg/kg (dry weight)
1	Calcium	0.90± 0.01
2	Phosphorus	0.88± 0.00
3	Potassium	0.85± 0.02
4	Sodium	0.93± 0.00

The antibacterial activity of ethanolic extract of leaves of *Momordica charantia* Linn. against the four pathogenic bacteria *Salmonella typhi, Pseudomonas fluorescens, Pseudomonas aeruginosa* and *Escherichia coli* were assessed by zone of inhibition. The results are shown in table-3. All the microbes used in the present study were sensitive to the ethanolic extract of the plant and showed a potential activity. Maximum activity was seen in case of *Pseudomonas fluorescens* where the zone diameter was 33 mm (250µg/ml).

The minimum inhibitory concentration study revealed that the value for the bacteria *Salmonella typhi and Escherichia coli* as 80 µg/ml and 60 µg/ml for *Pseudomonas fluorescens* and *Pseudomonas aeruginosa*.

Table. 3
ANTIBACTERIAL ACTIVITY OF ETHANOLIC EXTRACT OF LEAVES OF MOMORDICA

Bacteria	Zone of inhibition (in mm)					Ciprofloxacin (50µg/ml)
	100µg/ml	150µg/ml	200µg/ml	250µg/ml	300µg/ml	
Salmonella typhi	8±0.1	11±0.1	12±0.1	13±0.1	18±0.2	38±0.1
Pseudomonas fluorescens	10±0.2	10±0.1	21±0.2	33±0.2	33±0.1	46±0.1
Pseudomonas aeruginosa	11±0.3	11±0.1	17±0.1	22±0.1	25±0.1	34±0.1
Escherichia coli	7±0.3	13±0.2	18±0.1	2±0.1	22±0.1	33±0.1

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