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Momordica charantia and *Allium sativum* : Broad Spectrum Antibacterial Activity

M. R. Khan* and A. D. Omoloso

Department of Applied Sciences, Papua New Guinea University of Technology
P.M.B. Lae, Papua New Guinea

Abstract – In the Asian sub-continent *Momordica charantia* and *Allium sativum* are extensively used as food and are popular in herbal medicine. The two were screened against 15 pathogens and both exhibited broard spectrum antimicrobial activity. As compared to the standard antibiotics, *M. charantia* demonstrated broader and higher level of activity against most of the organisms. On the other hand *A. sativum* showed comparable activity to the standard antibiotics. Both *M. charantia* and *A. sativum* are proposed as non toxic, safe, broad spectrum antibacterial agents.

Key words – *Momordica charantia*; *Allium sativum*; broad spectrum antibacterial activity.

Plant natural resources are extensively used in local herbal medicine mostly in developing countries.[1-3] In light of the emergence of resistance strains of pathogens to known drugs and the high cost of health care in developing countries, the WHO recommendation on the use of medicinal plants in primary health care in developing countries can not be over emphasized.[4] Among the vast number of medicinal plants in current use, are *Momordica charantia* (a vegetable) and *Allium sativum* (garlic, a spice). The two are widely used as food through out the Asian sub-continent and have wide spread medicinal uses.

The fruits of *M. charantia* are extensively studied for its anti-diabetic properties.[5] The plant is used; as a tonic, emetic, laxative, for cold, in fevers, for stomach aches, for constipation in children and induction of abortion.[5] In traditional Chinese medicine the whole plant is use for gastroenteritis, diabetes, tumors and some viral infections.[5] Other pharmacological properties include; anticancer, antiviral including herpes simplex virus and HIV 1, analgesic, anti-inflammatory, hypotensice, antifertility and effects on growth, blood and serim lipids.[5]

Phytochemical investgations on *M. charantia* resulted in the isolation of steroidal glycosides, alkaloids, amino acids, momordicosides, karkar compounds, insulino mimic proteines and these are evaulated as antidiabetic agents.[5] Momordicine I and II from the leaves exhibited antifungal activity against *Collectotrichum gloeosporioides* and *Clasdosporium cucumerinum*.[6] The unripe fruits of *M. charantia* exhibited activity against *B. subtilis, S. aureus, E. Coli, P. aeruginosa*.[7] In the present study we re-

*Author for correspondence : Fax 675-4757505

port the broad spectrum antibacterial activity of *M. charantia*.

Allium sativum L. (Liliaceae) (garlic) an essential part of oriental and French food and spices have a wide range of applications in herbal medicine. *A. sativum* is used in the treatment of hypertension, hyperlipemia, infectious diseases, cancer, diabetes, to lower cholesterol levels, as anti-viral, anti-bacterial and to prevent atherosclerosis.[8] Recently garlic is reported to have antibacterial activity against a number of pathogens.[8] In the present study a further extension of the antibacterial activity of *Allium sativum* is reported to demonstrate its broad spectrum antibacterial activity.

Materials and Methods

Tested materials-Fruits and leaves of *Momordica charantia* (Cucurbitaceae) were collected from a private garden on the University campus in Lae. *Allium sativum* (Liliaceae), local, small variety was purchased fresh from Lae market while the imported Chinese, big variety was purchased from a supermarket in Lae, Papua New Guinea in October 1997.

Used organisms-The bacteria used are given in Table I. These were obtained from the stock culture of the Microbiology Laboratory of the Department of Applied Sciences in Lae. Cultures were maintained as nutrient agar slants in screw capped bottles and stored at 4℃. Test cultures were prepared by transferring a loop full of bacteria from the stock culture into nutrient broth and incubated at 37℃ for 24 h except for *Microccocus roseus* and *Microccocus lutea* that were incubated at 30℃ for 24 h before use. All the 15 organisms were seeded into nutrient agar plate and incubated for 24 hours.

Moulds were transferred into freshly prepared potatoes dextrose agar plates and incubated at 25℃ for 3 days. All the 15 bacteria were seeded into nutrient agar plate and incubated for 24 hours. The moulds used were: *Trichophyton mentagrophytes, T. verrucossum, Candida albican* and *C. tropicalis*.

Anti-microbial activity-Anti-microbial activity was determined by slightly modified disc diffusion methods techniques.[9,10] Aqueous extracts were prepared by grinding 4 gm by weight of the sample in 40 mls of distilled water. The extracts were filtered to remove tissue particles. The aqueous extracts were then introduced using a syringe on a small filter paper disc (10 mm diameter) of known weight. The paper discs were dried and more extracts was placed on the disc until a total of 5 mg by weight of the extract has been absorbed on the disc. The discs after drying were then placed on agar plates (90 mm) which has been previously seeded with cultures of the organisms. The plates with the organisms were incubated for twenty hours. Four standard antibiotics (chloramphenicol 10 μg disc Oxoid B42960, gentamicine 10 g disc 792947 DIFCO, penicilline 2 unit B44234 oxoid, and sulphamethoxazole/trimethoprine 25 μg disc B44241) were used for comparison. Zone of inhibitions were measured to the nearest mm.

Results and Discussion

The anti-bacterial activity of the tested materials are shown in Table I. The fruit of *Mormordica charantia* showed a good level of activity in most cases, on the other hand, the leaves showed practically no activity against 13 of the tested organisms. The two

Table I. Antibacterial activity of *Momordica charantia* and *Allium sativum*

Microorganisms		*A. sativum*		*M. charantia*		Standard Antibiotics			
		Local IZ (mm)	Chinese IZ (mm)	Fruit IZ (mm)	Leaves IZ (mm)	GM 10	CH 10	SXT 25	PG 2
Escherichia coli	G-	12*	12	26	00	18	18	08	08
Staphylococcus aureus	G+	10*	08	20	00	18	18	16	04
Staphylococcus epidermidis	G+	08	16	28	00	18	00	16	10
Staphylococcus albus	G+	18	08	35	00	30	16	10	06
Salmonella typhi	G+	14*	06	26	00	00	16	00	00
Salmonella typymurium	G-	08	14	08	00	08	16	08	00
Streptococcus faecalis	G-	10*	22	12	06	16	00	00	00
Bacillus cereus	G+	10	26	06	00	16	16	00	00
Bacillus subtilis	G+	08*	30	08	06	12	16	00	20
Micrococcus roseus	G-	14	10	30	06	16	06	00	00
Micrococcus luteus	G-	10	28	08	00	18	16	16	10
Proteus mirabilis	G-	12*	18	10	00	18	18	12	00
Trichomonas vaginalis	P	08	20	06	00	12	16	00	00
Pseudomonas aeruginosa	G-	08	18	10	00	18	20	18	00
Serratia marcescens	G-	10	14	06	00	18	20	18	00

IZ (Inhibition zone in mm), conc. 5 μl/disc, G (gram reaction), P (protozoa), Standard antibiotics: CH 10=chloramphenicol (10 μg disc Oxoid B42960), GM 10=Gentamicine (10 μg disc 792947 DIFCO), PG 2= Penicillin G (2 units B44234 Oxoid), SXT 25=Sulphamethoxazole/Trimethoprin (25 μg disc B44241 Oxoid), 0=no activity, * reported in Ref (8).

samples of *Allium sativum* showed a variable level of activity for all the pathogens tested. Both *Allium sativum* and the fruit of *Mormodica charantia* exibited a far better anti-bacterial activity than both sulphamethoxazole/trimethoprin and penicillin. *Allium sativum* was previously tested for anti-bacterial against 20 pathogens[8] the present study, confirming the previous observation and further expanding the list of the broader spectrum of activity. Considering the concentration of both *Allium sativum* and fruit of *Mormodica charantia* used in this trial, in addition to the facts that these are crude extracts, it is apparent that both *Allium sativum* and fruit of *Mormodica charantia* exhibited a stronger and a broader anti-bacterial activity as compared to a higher dose of chloramphenicol (10 μg), gentamicine (10 μg) and sulphamethoxazole /trimethoprine (25 μg). The diet containing *M. charantia* and *A. sativum* are well proven and extensively used house hold remedies for diabetes, cardiovascular disorder and as tonics. From these results, and considering the previous study on the anti-bacterial activity of *Allium sativum* we propose *Allium sativum* and fruit of *Mormodica charantia* as non-toxic, safe potential anti-bacterial agents. The present investigation add on to the numerous therapeutic benefits of the two amazing food ingredients.

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