



Short Communication

Antibacterial effects of *Averrhoa Bilimbi* L. Fruit Extracts

Chinju Merin Abraham

Department of Botany, Catholicate College, Pathanamthitta, 689 645, Kerala, India
chinjujoby@gmail.com

Available online at: www.isca.in, www.isca.me

Received 4th July 2016, revised 22nd July 2016, accepted 8th August 2016

Abstract

A. bilimbi methanol, chloroform and petroleum ether fruit extracts were tested against selected panel of bacteria. Different concentrations of the extract (50mg, 100mg, and 150mg) in each solvent were loaded on 0.4mm sterile discs. The tested gram positive bacteria were more sensitive to the extract when compared to the gram negative bacteria tested. It is well evident that *A. bilimbi* fruit extract showed appreciable inhibitory activity against the tested pathogens. Further research in this direction is recommended.

Keywords: *Averrhoa Bilimbi*, Antimicrobial, Gram Positive Bacteria, Gram Negative Bacteria.

Introduction

Averrhoa bilimbi L. (Family: Oxalidaceae) is a small sized plant which is medicinally used as a curative for many diseases from time immemorial. Various medicinal attributes of the plant against diabetes, bacterial and fungal diseases, inflammation, cancer, nutraceutical and anti-scorbutic activities are well documented^{1,2}. The use bilimbi for the treatment of various types of fevers, healing blisters and pimples, anal disorders, boils, arthritis, intestinal disorders, cough and cold, hypertension and as a soft drink by traditional healers under folk medicine was recorded from almost parts of the world³. However, antibacterial studies with Gram Positive and Gram negative bacteria are rather meager and hence the present study.

Materials and Methods

Plant material: Fresh bilimbi fruits were collected from Central Travancore region and the collected fruits were washed under running tap water followed by distilled water, dried and powdered.

Systematic position: Kingdom: Plantae, Division: Magnoliophyta, Class: Dicotyledonae, Subclass: Rosidae, Order: Oxalidales, Family: Oxalidaceae, Genus: *Averrhoa*, Species: bilimbi L.

Bacterial Strains: Gram positive (*Staphylococcus aureus* and *Bacillus subtilis*) and Gram negative bacteria (*Klebsiella pneumonia* and *Serratia marcescens*) were used which are opportunistic pathogens.

Preparation of Plant Extract: Powdered fruit samples were extracted by soxhlet extraction method with solvents such as Petroleum ether, Chloroform and Methanol. Excess of the

solvent was evaporated and the concentrated extracts were used for further studies⁴.

Disc-diffusion method: Different concentrations of the extract (50mg, 100mg, and 150mg) in each solvent were loaded on 0.4mm sterile discs⁵. The loaded discs were placed on the surface of solid agar medium allowed to diffuse. The plates were then incubated overnight at 31^oC in an incubator. After 24 hours of incubation, zone of inhibition was measured. Diameter of inhibition was measured and graded as '+', if there was zone below 11mm, '++' if the zone ranged from 11-20mm and '+++' if it was above 20mm.

Results and Discussion

At all concentrations used, the chloroform extract of *A. bilimbi* has strong effect against *Staphylococcus* and *Bacillus*. 150mg of Chloroform extract of *A. bilimbi* fruit extract was comparatively showed more inhibition against *Bacillus* than *Staphylococcus* (Figure-1). 150 mg of methanol extract was comparatively more effective against the *Bacillus* than *Staphylococcus* (Table-1).

The antibacterial activity of the Chloroform and Methanol extracts of the fruits of *A. bilimbi* against gram negative bacteria are also given in Table-1. Different concentration of methanol extract was comparatively more effective against *Klebsiella* than *Serratia* (Figure-2).

Different concentrations of chloroform extract were comparatively more effective against *Serratia* than *Klebsiella*. Petroleum ether extract shows no inhibitory action against both of the tested gram negative and positive bacteria. In short, the chloroform extract of *A. bilimbi* fruit were highly effective against both traits of bacteria.



Figure-1

A. bilimbi fruit chloroform extract against *Staphylococcus*



Figure-2

A. bilimbi fruit methanol extract against *Klebsiella*

Table-1

Antibacterial activity of Chloroform(C), Methanol (M) and Petroleum ether (P) extracts of *A. bilimbi* fruit extract

Type of extract	Concentration (mg)	Bacterial species			
		Gram positive		Gram negative	
		<i>Bacillus</i>	<i>Staphylococcus</i>	<i>Klebsiella</i>	<i>Serratia</i>
C	50	++	++	+	+
	100	+++	+++	++	++
	150	+++	+++	++	+++
M	50	++	+	+	+
	100	++	++	+	+
	150	++	++	++	+
P	50	-	-	-	-

Discussion: The use of plants as medicine by humans has coevolved with the history of man⁶. The use various plants for a plethora of ailments were passed down through oral tradition. Even the modern allopathic medicine has its roots in traditional medicine, and numerous promising researches are progressing in this direction⁷.

The present study has witnessed the antibacterial potential of *A. bilimbi* fruit extracts. The present results are also *at par* with the available reports by various researchers. The antimicrobial activity of bark extract of *A. bilimbi* was already reported with commendable effects⁸. Similar antimicrobial observations with fruit extracts of bilimbi were also recorded by many workers⁹.

The presence of surplus phytochemicals is the reason for the antibacterial effects exhibited by the extracts. The diversity of phytochemicals among *A. bilimbi* was well established¹⁰. The diverse spectrum of metabolites like aldehyde, sugar, protein, cardiac glycoside, flavanoid, alkaloid, phenol, tannin and coumarin was reported from *A. bilimbi*¹¹.

The obtained results are significant as drug resistant pathogens are emerging globally with a myriad of clinical manifestations. Plant metabolites are strong candidate to combat the emerging issues of drug resistance. Numerous studies are progressing in all parts in this direction.

Conclusion

The presence of bioactive compounds among bilimbi makes it a potent herb for future research to combat drug resistance since it has commendable antimicrobial properties. However, more detailed investigations including clinical trials are essential.

References

1. Kumar A.K., Gousia S.K., Anupama M. and Latha J.N.L. (2013). A review on phytochemical constituents and biological assays of *Averrhoa bilimbi*. *International Journal of Pharmacy and Pharmaceutical Science Research*, 3(4), 136-139.
2. Bhaskar B. and Shantaram. M. (2013). Morphological and biochemical characteristics of *Averrhoa* fruits. *International Journal of Pharmaceutical, Chemical and Biological Sciences*, 3(3), 924-928.
3. Anitha R., Geetha R.V., Lakshmi T. (2011). *Averrhoa bilimbi* Linn - Nature's Drug Store - A Pharmacological Review. *International Journal of Drug Development & Research*, 3(3), 101-106.
4. Harborne J.B. (1998). *Phytochemical Methods - A guide to Modern Techniques of Plant Analysis*. 3rd edn, Springer.
5. Bauer A.W., Kirby W.M.M., Sherris J.C. and Turck M. (1996). Antibiotic susceptibility testing by standardized single disk method. *Am. J. Clin. Path*, 45, 493-496.
6. Samuelsson G. (2004). *Drugs of natural origin: A textbook of pharmacognosy*. 5th Swedish Pharmaceutical Press, Stockholm.
7. Misra L. (2013). A review on traditional phytomedicinal systems, scientific validations and current popularity as nutraceuticals. *International Journal of Traditional and Natural Medicines*, 2(1), 27-75.
8. Siddique K.I., Uddin M.M.N., Islam M.S., Parvin S. and Shahriar. M. (2013). Phytochemical screenings, thrombolytic activity and antimicrobial properties of the bark extracts of *Averrhoa bilimbi*. *J. App. Pharm. Sci* 3(03), 094-096.
9. Huda N., Wahab A., Wahid M.E.B.A., Taib M.B., Zain W.Z.W.M. and Anwar S.A.B. (2009). Phytochemical screening and antimicrobial efficacy of extracts from *Averrhoa bilimbi* (Oxalidaceae) fruits against human pathogenic bacteria. *Phcog J. [A Supplement to Phcog Mag.]*, 1(1), 64-66.
10. Yan S.W., Ramasamy R., Alitheen N.B.M. and Rahmat A A. (2013). Comparative assessment of nutritional composition, total phenolic, total flavonoid, antioxidant capacity, and antioxidant vitamins of two types of Malaysian underutilized fruits (*Averrhoa bilimbi* and *Averrhoa carambola*). *Int. J. Food Prop*, 16, 1231-1244.
11. Alisha V. and Raphael R. K. (2016). Pharmacognostic profile of *Averrhoa bilimbi* Linn. Leaves. *South Indian Journal of Biological Sciences*, 2(1), 75-80.