https://ijrps.com/

ISSN: 0975-7538
Research Article

In vitro studies on antibacterial activity of diethyl ether and ethanol extracts of *Aloe barbadensis* L. and *Lawsonia inermis* L.

Ramakrishnaiah G* and Hariprasad T

Department of Biotechnology, Sree Vidyanikethan Engineering College, A.Rangampet, Tirupati-517102, Andhra Pradesh, India

ABSTRACT

In vitro studies on antibacterial activity of organic extracts (Diethyl ether and Ethanol) of two medicinal plants *Aloe barbadensis L* and *Lawsonia inermis L* were carried out against three common human pathogenic (*Bacillus subtilis, Staphylococcus aureus* and *E.coli*) bacteria. Both the two types of extracts of *Lawsonia inermis* showed antibacterial activity on three types of bacteria, where as *Aloe barbadensis* extracts showed antibacterial activity on *S. aureus, B. subtilis* and not on *E. coli* bacteria. The diameters of zone of inhibitions of two types of extracts of two plants were also varied. Between the two types of organic extracts of two plants, Ethanol extracts showed more antibacterial activity than Diethyl ether extracts. Zones of inhibition were comparatively high in case of ethanol extracts of both plants than diethyl ether extracts.

Keywords: Medicinal plants; organic extracts; antibacterial activity; bacteria

INTRODUCTION

Since time immemorial humans are depending on medicinal plants to get remedies from various ailments. The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance of therapeutic treatments. Plants are rich source of bioactive compounds and thus serve as thus serve as important raw materials for drug production (Chetty, KM 2008). With more intensive studies for natural therapies, the use of plant based bioactive compounds for pharmaceutical purposes has been gradually increasing in the world. A wide range of medicinal plant parts are used for extracts as raw drugs and they possess varied medicinal properties. The different parts used include root, leaf, stem, bark, twigs, fruit, flowers etc.

*Lawsonia inermis*Linn (Lythraceae) is a perennial plant commonly called as Henna, having different vernacular names in India viz., Mehndi in Hindi, Mendika, Rakigarbha in Sanskrit, Mailanchi in Malayalam, Muruthani in Tamil, Benjati in Oriya, Mayilanchi in Kannada and Mehedi in Bengali (Chopra *et al.,*1956). It is native to North Africa and South East Asia, and often cultivated as an ornamental plant throughout India, Persia, and along the African coast of the Mediterranean Sea (Davis HR 1997). Henna or Mehandi is a medicinal plant. Its bark and seeds are used in Unani and Ayurvedic medicines. Henna leaves, flowers, seeds, stem bark and roots are used in traditional medicine to treat a variety of ailments as rheumatoid arthritis, headache, ulcers, diarrheoa, leprosy, fever, leucorrhoea, diabetes, cardiac disease, hepatoprotective and coloring agent (Dupont, S., 2006 & Foster S 1999).

Aloe barbadensis is a succulent from the Liliaceae family. Its thick leaves contain the water supply for the plant for long periods of drought (Goyal BR *et al.,* 2007). The leaf contains orange yellow sap. Aloe plant has a number of medicinal uses. It has been used world wide as skin care product for more than 5000 years. It also used to treat gastrointestinal irritations (Goyal BR *et al.,* AA 2007). In addition research suggests that Aloe gel can stimulate body's immune system (Kirtikar KR *et al.,* 1956). It contains over 70 biologically active compounds and is claimed to have anti- inflammatory, antioxidant, immune boosting, anticancer, wound healing, anti-ageing and anti-diabetic properties.

The present study was carried out to evaluate the antibacterial properties of a medicinal plant Lawsonia inermis and Aloe barbadensis leaves extracts with two different solvents (Ethanol and Diethyl ether) against three commonly available bacteria.

MATERIALS& METHODS

Collection of plant material

Fresh leaves of the *Lawsonia inermis* L. and gel from *Aloe barbadensis* free from disease were collected from the Sree Vidyanikethan College of Pharmacy garden, A. Rangampet, Tirupati, Andhra Pradesh, India.

* Corresponding Author
Email: ramakrishnaiah@ymail.com
Contact: +91-9704186769
Received on: 22-06-2012
Revised on: 02-07-2012
Accepted on: 09-07-2012

Table 1: Antimicrobial activities of Henna plant leaves Ethanol and diethyl ether extracts on three bacteria (20mg/ml)

S.No	Plant Name	Bacterial sp.	Zone of inhibition (mm)			
			Ethanol extract (µg/ml)		Diethyl ether extract (µg/ml)	
			200	400	200	400
1	*Lawsonia inermis* (Henna)	*Staphylococcus aureus*	7.7	11.4	2.4	4.4
		Bacillus subtilis	5.4	904	1.0	2.0
		E.coli	6.1	10.1	2.4	4.4
2	*Aloe barbadensis*	*Staphylococcus aureus*	7.7	12.7	2.2	4.2
		Bacillus subtilis	3.5	8.5	3.8	6.4
		E.coli	No activity	No activity	No activity	No activity

The leaves were thoroughly washed and air dried on sterile blotter under shade. The *aloe* gel was stored in sterile container and used as such for the experiment.

Solvent extraction

The method of Dupont *et. al*, (2005) and Malekzadeh F (1968) with minor modifications was adopted for *L. inermis* leaves solvent extraction. Thoroughly washed dried leaves were powdered with Warring blender and 10g of powder was of soaked with separately in 50ml of diethyl ether and ethanol at ambient temperature for 24 hrs under shaking condition at 130 rpm. Then the extract was filtered using Whatman filter paper No.1 and the filtrate was kept in freezer further use. *Aloe barbadensis* gel solvent extracts were prepared by mixing the fresh gel with 100ml of Ethanol and diethyl ether separately and preserved for further use.

Test organisms

Pure cultures of bacterial isolates (*E.coli, Staphylococcus aureus and Bacillus subtilis*) were collected from the Department of Microbiology, Sree Vidyanikethan Degree College, A.Rangampet, Tirupati, India. The cultures were maintained on agar slants stocks and were subsequently subcultures in to freshly prepare nutrient agar medium.

Antibacterial assay

The diethyl ether and ethanol extracts of Henna and *Aloe* plants were used for their antibacterial activity against three types of bacteria separately by using disc diffusion method. Three bacterial cultures were prepared by spread plate method on different petriplates. The different concentrations of ethanol and diethyl ether extractions (200& 400 µg/ml) of leaves of Henna and *Aloe* plants were prepared. Then the Whatman No.1filter paper discs of 30mm diameter were saturated with solvent extracts separately (diethyl ether and ethanol) and placed on the surface of the individual bacterial culture plates separately (*E.coli, S.aureus and B.subtilis*). Then the assay plates were incubated at 37^0C for 24h and then the diameters of inhibition zones were measured in mm.

RESULTS AND DISCUSSION

The results showed that Henna plant leaves extracts of two different solvents have inhibitory activity against three types of bacteria. Among these three *Staphylococcus aureus* was inhibited in maximum (11.7mm). But ethanol extracts of Henna plant showed more inhibitory activity than diethyl ether extracts. With diethyl ether extracts of Henna plant, *E.coli* was inhibited in maximum (4.4mm). Even though both the ethanol and diethyl ether extracts of Henna plant leaves showed effective antibacterial activity on three types of bacteria. But the zones of inhibitions were varied. In case of ethanol extracts zone of inhibitions were high than diethyl ether extracts. So solvents affect the inhibitory activity of extracts. It is in line with the results of Rabe and Staden (1997) and P.D.Abyesinghe (2010), whose results showed that the aqueous extract of tested medicinal plant showed no inhibitory effect, where as methanol extract of the same plant showed inhibitory effect on the same bacteria (*B.subtilis*).

Aloe barbadensis gel ethanol and diethyl ether extracts showed inhibitory effect against *S.aureus* and *B.subtilis* only and no effect on *E.coli* bacteria. Between these two solvent extracts, ethanol extracts of Aloe gel showed more inhibitory effect than diethyl ether extract with the inhibition zones of 12.7mm and 8.5mm on *S.aureus* and *B.subtilis* respectively. Reports of effective and ineffective on same bacteria were there when different solvents extracts of the same plant were used P.D.Abyesinghe, (2010) and Rabe, T and Staden, J., (1997). Aqueous extract of Aloe gel was not effective on *E.coli,* where as ethanol extract of *Aloe* gel effective on the same bacteria. Even at lower concentrations both the ethanol and diethyl ether extracts showed low inhibition zones than higher concentrations.

ACKNOWLEDGEMENTS

Authors are grateful to the management of Sree Vidyanikethan Engineering College, particularly to the Special Officer and the Principal for their support and encouragement to complete the research work.

REFERENCES

Chetty K.M., Flowering plants of Chittoor, 1st Edn ., Andhra Pradesh, pp. 132.

Chopra RN, Nayer SL, Chopra IC., Glossary of India Medicinal Plants. *CSIR Publications,* New Delhi, 2008, pp. 151.

Davis H.R., *Aloe vera:* A Scientific Approach Published by Vantage Press (New York S.A http://www. aloevera. co.uk/rhdavis.htm, 1997.

Dupont S. Caffin N, Bhandari B and Dykes G.A., *In vitro* Antibacterial activity of Australian herbs extracts against food related bacteria. *Food control*, 17: 2006, 929:932,

Foster S., *Aloe vera:* The succulent with skin soothing cell protecting properties. Herbs for Health magazine. *Health World Online.* <http://www.healthy.net/library/articles/hfh/aloe.html, 1999.

Goyal B.R, Goyal R.K, Mehata A.A., Phytopharmacology of Achyranthes aspera: *A review. Pharma Rev*. 1: 2007, 143-53.

Kirtikar K.R, Basu B.D., Indian Medicinal Plants, Vol. 3. International book distributors, New Delhi, India, 1956.

Malekzadeh F., Antimicrobial Activity of Lawsonia inermis L. *American Society for Microbiology*:16(4): 1968, 663-634.

P.D. Abyesinghe., *Indian J Pharm Sci.* Mar-Apr; 72(2): 2010,167–172.

Rabe T and Staden J., Antibacterial activities of South African plants used for medicinal purposes.*J.Ethnopharma*.56: 1997, 81-87.