

## Antimicrobial Activity of a Rarely Known Species, *Morinda citrifolia* L.

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### Abstract

*Morinda Citrifolia* is one of the most important traditional Polynesian medicinal plants. This small evergreen tree is native from South Eastern Asia to Australia and now it has a Pantropical distribution. It has antifungal, antibacterial, antiinflammatory and antiviral activities. *Morinda citrifolia* L. was studied for its antimicrobial activity. The leaves of this plant were dried, powdered and different extracts were prepared using different solvents like benzene, chloroform, ethyl acetate, ethanol and water. Four organisms, namely *E.coli*, *Staphylococcus aureus*, *Candida albicans* and *Aspergillus niger*, were used for investigation. The activity of each solvent extract was checked on each organism by disc diffusion method and then the zone size of each was measured. The results of our antimicrobial assay revealed that plant extracts showed inhibitory activity against the tested organisms.

**Key words:** Antimicrobial activity, *Morinda citrifolia*, Petroleumether extract and inhibitory activity.

### Introduction

*Morinda citrifolia* is an important medicinal plant which has been used for many centuries through out the south pacific. It is a small shrub, three to twelve meters height (Wang, Su 2001). The leaves, seeds, bark, green fruit and roots have been used in various tropical remedies in diverse parts of the South East Asia and Pacific Islands. Most pacific islands medicinal plants have yet to be studied due to geographical isolation from the western world. Their potential therapeutic properties are still unknown (Mc Clatchy 2002). *M.citrifolia* is commonly known in various cultures as Indian Mulberry, Ba Ji Tian, Nono, Nonu (or) Noni, Cheese fruit and Nhau (Wang et al 2002).

Noni contains a great variety of active constituents including 3,3' – bisdemethylpinoresinol, americanol A, americanin A, americanoic acid A, morindolin, and isoprincepin. The fruit also contains various anthraquinones including damnacanthal (Gurib-Fakielm and Brendler, 2004 ; Kamiya *et al.*, 2004 ; Shotripuk *et al.*, 2004; Stalman *et al.*, 2003 ). The leaves are used to treat cough, nausea and colic, possibly due to its anti inflammatory activity (Gurib-Fakim and Brendler, 2004). The leaves have also been used to treat gout, tuberculosis and ring worm. In the Philippines, the seeds are eaten in order to expel intestinal worms. This plant has also been popular as a source of red, yellow and purple dyes (Gurib-Fakim and Brendler, 2004).

*Morinda* is reputed to have antibacterial, antiviral, antifungal, antitumor, antihelminthic, analgesic, hypotensive, anti-inflammatory, and immune enhancing effects. (Duke *et al.*, 2002; McClatchey, 2002 ; Wang et.al., 2002; Liu et al., 2001 ; Wang and Su, 2001). Originally, the leaves were applied directly to the

skin to treat ulcerations and minor infections. Some marketing companies have proposed that drinking noni juice can be used against a very wide variety of ailments. Scientific information about the therapeutic effects of noni on humans is currently limited. The present investigation has been carried out to evaluate the antimicrobial activity of *M.citrifolia* leaf extracts.

## Materials & Methods

### Plant collection :

Leaves were collected from Malappuram. The Taxonomic identities of plants were confirmed by Dr. Gopalan, Retd Scientist, Botanical Survey of India, TNAU Campus for the Botanical verification and authenticating the plant material. Fresh plant materials were shade dried and homogenized to a fine powder.

### Plant extraction

The powdered medicinal plant material was taken and subjected to successive solvent extraction in the increasing order of polarity i.e. from non polar to high polar. The solvents used are Petroleum ether, Benzene, Chloroform, Ethyl acetate, Ethanol and water.

For above solvent extraction 50g of powdered plant material of *Morindacitrifolia*L was mixed with 250 ml of Petroleum ether and subjected to occasional shaking for 24 hrs. The extracts were filtered through Muslin cloth. And extracts concentrated by evaporation at room temperature until the solvent gets evaporated completely. After complete drying the above said residues were extracted with all the other solvents separately. Then extracted materials lyophilized by occasional shaking for 24 hrs.

### Bacterial Strains

Bacterial Strains used in this study were purchased from MTCC. *E.coli*, *S. aureus*, *Candida albicans*, *Aspergillus niger*. All the strains were confirmed by cultural & biochemical characteristics and maintained in slants for further use.

### Antimicrobial Activity

Antimicrobial assay of solvent extracts were performed by Disc diffusion method. (Bauer et al 1966). Lawn culture of *E.coli*, *S. aureus*, *Candida albicans* and *Aspergillus niger* were developed on Muller hinton and SDA respectively using sterile cotton swabs. The sterile disc 6mm was saturated at concentrate of 10mg/ml, 5mg/ml and 2 mg/ml. Disc with Dimethyl Sulphoxide is used as control and the respective antibiotic disc Gentamycin and Nystatin used as positive control. The sterile impregnated disc with plant extract were placed on the agar surface with flamed forceps and gently pressed down to ensure complete contact of the disc with the agar surface. After the incubation the size of the inhibition zone were measured. Antibacterial and antifungal activity was determined by measuring the diameter of the zone of inhibition surrounding microbial growth. For each strain, controls were included that comprised pure solvents instead of the extract (Parekh and Chanda 2007). The experiments were repeated three times and the mean values were presented.

## Results

The antimicrobial activity in terms of zone of inhibition was presented in Table 1 and Table 2. The *invitro* antibacterial and antifungal activity of petroleum ether, chloroform and benzene extract of *Morinda citrifolia* leaf showed in Table.1. Ethyl acetate, Ethanol and water extracts activity showed in Table 2. The results obtained from the disc diffusion assay showed that there has been an increasing effect on microbial growth inhibition with increasing concentration of the extract. The extract showed good inhibitory activity on almost all the microbes tested.

The maximum inhibition was recorded against *E. coli* with the extract of petroleum ether in 20mm. The gram positive *S.aureus* was susceptible with the inhibition zone ranging from 18mm in water extract. The

maximum inhibition was observed against *C. albicans* with the chloroform extract. The water extract showed significant effect against *A.niger*. The observed activity may be due to the presence of potent phytoconstituents in the leaf extract. This may be indicative of a significant potential for isolating purer compounds.

**Table 1.** Anti microbial activity of *Morinda citrifolia*.

S. No	Microorganism	Zone of inhibition of <i>Morinda citrifolia</i> leaf extracts in (mm)									Antibiotic used (mm)	
		Petroleum ether extract (mg/ml)			Chloroform extract(mg/ml)			Benzene extract(mg/ml)				Gentamycin/ Nystatine
		2	5	10	2	5	10	2	5	10		
1	<i>E.coli</i>	16	18	20	-	-	-	-	-	-	20	
2	<i>S.aureus</i>	-	-	-	-	8	9	-	9	11	21	
3	<i>C.albicans</i>	-	-	-	13	16	19	-	-	-	17-21	
4	<i>A.niger</i>	-	-	-	-	-	-	13	16	17	21-22	

**Table 2.** Anti microbial activity of *Morinda citrifolia*

S.NO	Microorganism	Zone of inhibition of <i>Morinda citrifolia</i> leaf extracts in (mm)									Antibiotic used (mm)	
		Ethyl acetate extract (mg/ml)			Ethanol extract(mg/ml)			Water extract(mg/ml)				Gentamycin/ Nystatine
		2	5	10	2	5	10	2	5	10		
1	<i>E.coli</i>	-	-	-	8	9	11	-	6	8	20	
2	<i>S.aureus</i>	-	-	-	-	8	9	16	18	20	21	
3	<i>C.albicans</i>	-	-	-	-	9	11	13	15	17	17-21	
4	<i>A.niger</i>	-	-	-	-	8	9	14	16	18	21-22	

## Discussion and Conclusion

Antimicrobial activity of *Morinda citrifolia* leaf extract is compared with the antibiotics` of the respective organism. It was found that the extract in some cases exhibited the zone of inhibition which was equal or greater than the zone of inhibition of antibiotic(Rios and Recio.,2005).As a result it is` sure that these leaf extract can surely inhibit the growth of these microorganisms there by preventing various disease such as skin infections, diabetes, cancer etc. *Morinda citrifolia* leaf extract thus provides safe, easy, effective and practical solutions to every day ailments leaving behind no toxins and creating a clean, pleasant atmosphere. The overall results indicate promising baseline information for the potential uses of solvent extracts of *M. citrifolia* leaf in the treatment of infectious disease.

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## References

- Bauer, A.W., W.M. Kirby., J.C. Sherris, and M. Turck. 1966. Antibiotic susceptibility testing by a standardised single disc method. *J. American journal of clinical pathology*. 45(4): 493 - 496.
- Bratman S, Girman. 2003. *A Hand book of Herbs and Supplement and their Therapeutic Uses*. St. Louis: Mosby; pp769-771.
- Duke J, Bogenschutz M, Duke 2002. *Hand book of medicinal Plants* 2<sup>nd</sup> . Boca Raton, FL:CRC Press; p.529.
- Fugh-Berman A 2003.*The 5 Minute Herbal and Dietary Supplement Consult*. Philadelphia: Lippincott: pp.236-237
- Gurib-Fakeem A, Brendler 2004. *T-Medicinal and Aromatic plants of the Indian ocean Islands*. Boca Raton, FL:CRC Press; pp, 331-332.
- Kamiya K, Tanaka Y, Endang H, Umar M, Satake T. Chemical constituents of *Morinda citrifolia* fruits inhibit copper induced low-density lipoprotein oxidation. *J Agric Food Chem*. 2004;52 (19): 5843-8.
- Liu G, Bode a, Ma WY, Sang S, Ho CT, Dong Z 2001. Two novel glycosides from the fruits of *Morinda citrifolia* fruits inhibit AP-1 transactivation and cell transformation in the mouse epidermal JB6 cell line. *Cancer Res*. 61(15):5749-56.
- Mc Clatchey, W. 2002, From the Polynesian healers to health food stores; changing perspectives of *Morinda citrifolia* (Rubiaceae). *Integrated Cancer therapy*.1(2):110-20.
- Parekh. J., Chanda, S., 2007 . Antibacterial and Phylochemical studies on twelve species of Indian medicinal plants. *J .African journal of biotechnology*. 10:175-181.
- Rios, J. L., and M.C. Recio. 2005. Medicinal plants and antimicrobial activity. *J. Journal of Ethanopharmacology*. 100:80-84.
- Shotipruk A, Kiatsongserm J, Pavasant P, Goto M, Sasaki M. Pressurized hot water extraction of anthraquinones from the root of *Morinda citrifolia*.*Biotechnol Prog*.2004;20(6):1872-5.
- Stalman M,Koskamp AM,Luderer R,Vernooy JH,Wind JC,Wullems GJ,Croes AF 2003.Regulation of anthraquinone biosynthesis in cell cultures of *Morinda citrifolia*.*J Plant Physiol*. 160(6):607-14.
- Wang,M.Y&C.su,2001.Cancer preventive effect of *Morinda citrifolia* (Noni). *Annals of the New York Academy of sciences*. 952:161-8.
- Wang,M.Y,B.J.West,C.J.Jensen,Nowicki,C.Su,A.Palu&G.Anderson,2002, *Morinda citrifolia* (Noni). a literature research *Acta pharmacologica Sinica*. 23(12):1127-1141.

