

**INTERNATIONAL JOURNAL OF UNIVERSAL
PHARMACY AND BIO SCIENCES**

IMPACT FACTOR 4.018***

ICV 6.16***

Pharmaceutical Sciences

Review Article.....!!!

**A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL
ACTIVITIES OF INDIAN MULBERRY (*MORINDA CITRIFOLIA*)**

Janani M

Assistant Professor, Department of Biochemistry, Auxilium College, Vellore district,
Tamilnadu, India.**KEYWORDS:**Noni, Nutraceutical, Therapeutic,
Pharmacological.**FOR CORRESPONDENCE:****Janani M*****ADDRESS:**Assistant Professor, Department
of Biochemistry, Auxilium
College, Vellore district,
Tamilnadu, India.**ABSTRACT**

Noni also known as Indian Mulberry is a medicinal plant belonging to the Coffee family. Polynesian ancestors used different parts of noni as an ailment for various infection and diseases. The therapeutic property of this plant is contributed by the presence of almost 400 phytochemicals. Due to its broad range of therapeutic activity such as antibacterial, antiviral, antifungal, anti-inflammatory, antioxidant and antitumor, noni is cultivated in the tropical and subtropical regions. Even though, commercially different noni preparation are available, noni fruit juice is consumed worldwide due to its health benefits. This review is mainly focused on the nutraceutical and pharmacological properties of noni.

INTRODUCTION:

Noni or Cheese fruit, botanically named as *Morinda citrifolia*, is derived from two Latin words ‘Morus’ meaning ‘Mulberry’ and indicus meaning ‘Indian’, belong to the family of Rubiaceae.^[1,2] It was used by Polynesians as a folk medicinal plant more than 2000 years ago.^[3] Traditionally, all parts of the plants (fruit, stem, leaves, roots, flower and seeds) are used for treating diabetes mellitus, burns, boils, urinary tract infection, stomach ulcer and hypertension.^[4] The presence of broad range of phytochemicals has potentially increased the health benefits of this plant.^[5] Noni plant parts are available in different forms in the markets such as powders, capsules and soaps etc. In 2003, fruit juice formulation of noni is approved by the European Commission and mostly consumed as a novel food.^[6,7] The leaves of the plant are used to prepare herbal tea. In Thailand and Java, the young leaves are eaten as vegetable with rice. While cooking, the mature leaves are used to wrap fish. The roots of noni are used for dyeing cloths in textile industries.^[8]

Taxonomy^[9]

Kingdom : Plantae

Division : Magnoliophyta

Class : Magnoliopsida

Order : Rubiales

Family : Rubiaceae

Genus : *Morinda* L

Species : *Morinda citrifolia*

Vernacular name^[10]

English : Indian Mulberry

Tamil : Nuna

Telugu : Mogali

Bengali: Hurdi

Malayalam : Mannapavatta

Distribution

Noni is native to Southeast Asia (Indonesia) and Australia. It is also distributed in tropical areas such as Thailand, Hawaii, Java, Jamaica, West Indies, Africa and Florida. In India, it is grown in Tamil Nadu, Kerala, Maharashtra, Andhra Pradesh and Orissa.^[11]

Habitat

Noni is well adapted to sandy and rocky shores. Also grows well in Mangroves and Coastal forest. It has the ability to tolerate harsh environmental conditions such as drought, water logging, wind and salinity. It maintains a symbiotic association with the weaver ants, providing food and shelter and in turn gets protection against the predators.

Plant description

Noni is a small evergreen tree or shrub growing up to a height of 3-10m. It bears flowers and fruit throughout the year. The leaves of noni are dark green colored and deeply veined. The flowers are small and appear white. The ripened fruit are white, ovoid, 4-7cm in size and has pungent odor resembling cheese. Hence it is known as cheese fruit or vomit fruit. The fruit contains many triangular shaped, reddish seeds.^[12,13]

Phytochemical constituents ^[14,15,16,17,18,19]

The presence of various phytochemical constituents in the different parts of noni plant has significantly increases its therapeutic activities such as antibacterial, antiviral, antifungal, anticancer, anti-inflammatory and hypotensive activity and makes it's a folk medicine in treating health problems.

- **Leaves.:** The leaves of noni contains amino acids(alanine, arginine, aspartic acid, glycine, proline, tyrosine and valine). The secondary metabolites present in the leaves are anthraquinones, resins, glycosides, saponin flavonoid and phenolic compounds.
- **Fruits:** Antioxidant, anthraquinone, caproic acid, caprylic acid, vitamin C, rutin, protein, carbohydrate and alizarin are present in the noni fruits
- **Flowers:** Noni leaves are rich in acacetin-7-O-D (+)- glucopyranoside
- **Roots and barks:** Sterols, sodium, magnesium, rubiadin, chlorubin, resins, rubichloric acid is present in the roots and barks of noni plant.
- **Seeds:** Noni seeds are loaded with minerals like sodium, potassium, magnesium, calcium, iron, phosphorus and zinc. The phytochemicals found in seeds are alkaloids, flavanoids and saponins. Essential amino acids (leucine, glutamic acid, aspartic acid) are also present in noni seed oil. Americanin A and quercetin are also reported in the seeds of noni.

Medicinal uses

The stem, root, leaves, seed, flower and fruits of noni are traditionally used in more than 40 different combination for treating infection and diseases.

- **Leaves :** The leaves of noni possesses analgesic activity and also used for treating respiratory disorder (cough), urinary tract infection, malaria etc

- **Fruits** Noni fruit is potentially active in curing ulcer, scabies, bone fractures, cut, burns and boils. The fruits are also used for toothaches and gum infections.
- **Stem** : The stem or noni barks are used for treating jaundice
- **Seed**: The seeds acts as purgative. The oil extracted from the seeds is used as an aliment for scalp infection
- **Flower**: The flower extracts of noni are effective in curing eye infection
- **Root**: The extract of noni root are efficient in lowering the blood pressure, treating cancer and heart diseases.

Nutritive constitutes of Noni

The nutritive components present in the noni are fats, proteins, carbohydrates (glucose, fructose, galactose, arabinose). Vitamins like thiamine, riboflavin and niacin are also present in noni. The mineral constitutes of noni are iron, sodium, potassium, calcium and phosphorus.^[21]

PHARMACOLOGICAL ACTIVITY

a) Antidiabetic activity

Morinda citrifolia fruit juice showed a significant reduction in the serum glucose, triglyceride and total cholesterol level in alloxan induced diabetic rats.^[22]

A study on hypoglycemic activity of *Morinda citrifolia* fruit juice (Tahitian Noni Juice) on alloxan induced adult male Sprague- Dawley rats has revealed a better result in controlling hyperglycemia, after 4 weeks treatment.^[23]

b) Antibacterial activity

The noni essential oil (EO) extracted from ripened *Morinda citrifolia* by hydro-distillation method has exhibited a potential antimicrobial activity against *Escherichia coli* O157:H7 and *Salmonella enteritidis*. The antibacterial activity was mainly due to the presence of caprylic acid which a medium chain fatty acid.^[24]

Invitro antibacterial activity of *Morinda citrifolia* parts such as leaves, fruit and seed extract was assessed by disc diffusion method . The seed extract of *Morinda citrifolia* exhibited best antibacterial activity against *E.coli* and *Pseudomonas* species.^[25]

The aqueous extracts of various parts of *Morinda citrifolia* has exhibited a mild to moderate antibacterial activity against *Staphylococcus aureus* by agar disc diffusion method.^[26]

c) Antifungal activity

An invitro study on *Morinda citrifolia* (noni) fruit extract by agar disc diffusion has shown an effective antifungal effect on *Candida albicans* which is a mouth infection causing fungus.^[27]

The hydroethanolic extract of *Morinda citrifolia* fruit showed a significant concentration dependent antifungal activity against *Aspergillus fumigate*.^[28]

d) Antihelminthic activity

Invitro antihelminthic activity evaluated in aqueous and ethanolic extracts of *Morinda citrifolia* fruit (noni) showed a significant result against *Ascardia galli*.^[29]

e) Hypolipidemic activity

The hypolipidemic activity evaluated in noni fruit juice extract on rats induced to dyslipidemia by feeding high fat diet showed decrease in blood lipid profile.^[30]

Aqueous extract of *Morinda citrifolia* has shown a successful reduction in the plasma triglycerides and total cholesterol in streptozotocin induced diabetic rats.^[31]

f) Anti-inflammatory activity

Commercially available noni fruit juice has exhibited a significant anti-inflammatory activity in Carrageenan- induced raw paw edema.^[32]

g) Antioxidant activity

The methanolic extract of *Morinda citrifolia* exhibited efficient antioxidant activity and total phenolic content by DPPH assay.^[33]

h) Antitumor activity

Intraperitoneal (i.p) injection of fermented noni exudates and its fractions (n-butanol fraction & ethyl acetate fraction) has revealed effectively rejection of tumor in S180 mouse sarcoma tumor model, thus indicating an active immune system.^[34]

CONCLUSION

Noni or *Morinda citrifolia* is a traditional folk medicine used from ancient civilization in Indonesia and other countries. Various scientific studies on Noni has revealed the presence of phytonutrients and phytochemicals which has made it a potent herbal medicine in treating various health issues. Furthermore researches are required to support its therapeutic activities.

REFERENCES

1. <http://www.traditionaltree.org/noni>
2. <http://www.ctahr.hawaii.edu/noni>
3. Dixon AR, Mcmillen H, Etkin NL. Ferment this: The transformation of Noni, a traditional Polynesian medicine (*Morinda citrifolia*, Rubiaceae). *Ecological Botany*, 1999 ; 53 (1): 51-68
4. <http://Lives trong.com/article/219675-what-can-noni-juice-do-for-your-body>

5. Reem Abou Assi, Laghari M.H. *Morinda citrifolia* (Noni). A comprehensive review on its industrial uses, pharmacological activities and clinical trials. Asian Journal of Chemistry, 2017;10 (5): 691-707
6. Potterat O, Hamburger M. *Morinda citrifolia* (noni) fruit. Phytochemistry, Pharmacology, safety planta Med, 2007;73 (3):191-199
7. Yang J, Paulino R, Janke- Stedronsky S, Abawi F. Free radical – scavenging activity and total phenol of noni (*Morinda citrifolia* L) juice and powder in processing and storage. Food Chem, 102 : 302-308
8. Nelson, Scot C. *Morinda citifolia* L: Permanent Agricultural Resource,2003, University of Hawaii.
9. <http://www.wildlife of Hawaii.com/ flowers/518/morinda-citrifolia-noni>
10. Vivek P Chavda, Moinuddin M, Soniwala, Jayant R Chavda. “ Noni”: The Alchemist Plant. International Journal of Pharmaceutical & biological Science Archive,2013; 1(1): 46-49
11. Stevens W.D, Ulloa U, Pool A and Montiel O M. Flora de Nicaragua. Monographs in Systematic Botant,2001; 85 (3):1911-2664
12. <http://www.flowersofindia.net/catalog/slides/great%20Morinda.html> 2013:p1
13. <http://www.naturia.per.sg/buloh/plants/morinda.htm.3p>.
14. Mahanthesh J. *Morinda citrifolia* linn, a medicinal plant with diverse phytochemicals and its medicinal relevance. World Journal of Pharmaceutical Research,2013; 3(1): 215-232
15. Honey J, Batra N, Bairwa R. Scientific basis of Noni Plant (*Morinda citrifolia*). Asian Journal of Research in Pharmaceutical Science, 2012; 2(2): 45-47
16. <http://www.costaricannoni.com/noni/history-of-noni>
17. Muhammad Bini Etsuyankpa, Muhammad Muhammad Ndamitso, Idoun Victoria Oluwatayin, Hashim Ibrahim, Sule Philip ivoms Ogah. Chemical Analysis of Noni (*Morinda citrifolia*) seeds and the characterization of the seed oil. American Journal of Applied Chemistry, 2017; 5(4): 57-61
18. Kochuthressia K P and Jaseentha M O. Phytochemical investigation of active compounds in *Morinda citrifolia* leaves. Asian Journal of Biochemical and Pharmaceutical Research, 2015; 5(4): 98-101
19. Lewis Lujan. Nutritional and Phenolic composition of *Morinda citrifolia* L (noni) fruit at different ripeness stages and seasonal pattern harvested in Nayarit, Mexico. International Journal of Nutrition and Food Science, 2014; 3(5): 421-429

20. Mohammad Ali, Mruthunjaya Kenganora and Santhepete Nanjundaiah Mahjula. Health Benefits of *Morinda Citrifolia* (Noni). Pharmacognosy Journal, 2016; 8(4): 321-334
21. <http://www.healing.com/the> constituents of noni fruit
22. Nitin D, Jadhav, Debip Mishra, Abhinna K, Behera, Sudhir R, Rajurkar, Bhagirath V Ballurkar. Studies of antidiabetic effect of morinda citrifolia fruit juice on alloxan induced diabetic rats. International Journal of Current Microbiology and Applied Sciences, 2017; 6(4): 2021-2028
23. Horsfal A U, Olabiyi A , Osinubi A, Noronha C C, Okanlawon A O. Antidiabetic effect of fruit juice of *Morinda citrifolia* (Tahitian Noni Juice) on experimentally induced diabetic rats. Nigerian Journal of Health and Biomedical sciences, 2008; 7(2): 34-37
24. Jian Yang, Shayna Jo afaisen, Rama Gadi. Antimicrobial activity of noni fruit essential oil on *Escherichia coli* O157: H7 and *Salmonella Enteritidis*. Micronesica, 2016; 5 : 1-10
25. Jai Sunder, DR Singh, Jayakumar S, Arun Kumar DC. Antibacterial activity in solvent extract of different parts of *Morinda citrifolia* plant. Journal of Pharmaceutical Science and Research, 2011; 3(8): 1404-1407
26. Athige Rajith, Neloshan Silva, Chathuranga Bharathee Ranaweera, Nimantha RD, Karunathilaka. Antibacterial activity of water and extracts of different parts of *Morinda citrifolia* grown in Srilanka. International Journal of Scientific and Research Publication, 2016; 6(5): 124-127
27. Barani K, Sunayana Manipal, prabu D, Adil Ahmed, Preethi Adusumilli, Jeevika C. Antifungal activity of *Morinda citrifolia* (noni) extracts against *Candida albicans*: An invitro study. Indian Journal of Dental Research, 2014; 25(2): 188-190
28. Vennila Srinivasahan and brindha Durairaj. Antimicrobial activities of hydroethanolic extract of *Morinda citrifolia* fruit. International Journal of Current Microbiology and Applied Science, 2014, 3(9): 26-33
29. Brito DR, Fernandes RM, femandes MZ, Ferreira MD, Rolim FR, da Silva Filva Filho MI. Antihelminthic activity of aqueous and ethanolic extracts of *Morinda citrifolia* fruit on *Ascaridia galli*, 2007, 4(2): 32-36
30. Ahsan Shoed, Alwar M C , Gokul P. Effect of *Morinda citrifolia* (Noni) fruit juice on high fat diet induced dyslipidemia in rats. Journal of Clinical and Diagnostic Research, 2016; 10(4): 6-10

31. Hadijah H, Ayub M Y, Zaridah H, Normah A. Hypolipemic activity of an aqueous extract of *Morinda* fruit in normal and streptozotocin induced diabetic rats. *Journal of Tropical Agriculture and Food Science*, 2008; 36(1): 77-85
32. Yilazer N, Coskun C, Gurel- Gurevin E, Yaylim I, Eraltan E H, Ikitimur Armutak E I. Antioxidant and anti inflammatory activities of a commercial noni juice revealed by carrageenam- induced paw edema. *Journal of Veterinary Science*, 2016;19(3): 589-595
33. Duduku Krishnaiah, Anisuzza. Antioxidant activity and totoal phenolic content of an isolated *Morinda citrifolia L* methanolic extract from poly ethersulphone (PES) membrane separator. *Journal of King saud University Engineering Science.*, 2015; 27(1):63-67
34. Jinhula Li, Leng- Chee Chang, Marishawall, Wong D K W, Xianzhong Y U, Yanzhanag Wei. Antimor activity of fermented noni exudates and its fractions. *Molecular and Clinical Oncology*, 2013; 1: 161-164.