

Morinda Citrifolia L. (Noni)-A Review on Its Health Benefits, Phytochemistry and Its Recent Researches

Jyothi shrivastava¹, Pradeepa Prasad^{1*}, Aditya J², Aparna O M³,
Sreelakshmi sukumaran⁴, Swetha G⁵

¹Professor, Department of Pharmaceutical chemistry, The Oxford College of Pharmacy

^{1*}Assistant Professor, Department of Pharmaceutical chemistry, The Oxford College of Pharmacy

^{2,3,4,5}Student, Department of Pharmaceutical chemistry, The Oxford College of Pharmacy

Abstract

Morinda citrifolia, a fruit commonly known as “Noni”, has been habitually used in parts of East Asia to relieve many diseases. Noni juice is a globally popular health beverage originating in the tropics. Traditional healers believe the noni plant to be useful for a wide range of health issues and noni juice consumers throughout the world have similar perceptions. Product derived from the fruit *Morinda citrifolia* (Noni) have been commercialized in USA since 1990’s and are increasing distributed all over the world. In European countries fruit juice of noni has been approved as novel food by European commission in, 2003. Noni has traditionally used to relieve inflammatory disease, Fermented noni has effect on atopic dermatitis (AD) to study the improving effect of fermented noni treatment on atopic dermatitis like skin lesions and elucidate molecular mechanism. It is most effective against colon and rectal cancer. Morindone and damnacanthol have significant cytotoxicity effect and selectivity and activity against colorectal cancer cell lines has also been identified. The aim of this review study is to identify more such health benefits and chemical compounds or phytochemicals in recent researches.

Keywords: fermented citrifolia, noni, Morindone, colorectal cancer, anthraquinone compounds

Introduction :

Noni (*Morinda citrifolia* L) is a fruit bearing tree in coffee family, Rubiaceae. Noni juice became a popular health supplement. It is a small to medium size tree (3-10m height) with pantropical distribution [1]. Noni fruit and leaves have a history of food used among Pacific island as well as in Southern and Southeast Asia. In recent times the fruit has been used to produce dietary supplement.

Product derived from fruit and leaves are being sold as capsules, tea and juice, the fruit juice being the predominant form. Juice can be pasteurized or obtained by fermentation process. In USA the noni product attributed claims of “cure all” for a variety of diseases

An active ‘alkaloid’ named “Xeronine” is present and is derived from Proxeronine found in noni. It has a wide range of potential indications for noni juice, like hypertension, menstrual cramp, gastric ulcer, sprains, atherosclerosis, blood vessel disorders, relief of pain.

HEALTH BENEFITS:-**Anti –Diabetic:-**

Noni juice along with insulin has improved fasting blood glucose in alloxan-induced diabetes rat[1]. The anti-diabetic property of noni plant is mostly found in fruit and leaves. Methanol extract of dried noni-leaves has significantly reduced plasma glucose level. Certainly, Episesamin 2,6-dicatechol, Irriorsinol B dimethyl ether and urosic acid confiment from crushed powder of morinda citrifolia multiplies the glucose uptake in 3T3-L1 adipocytes.[2]

Anti-fungal activity:-

Methanol extract of the dried Noni fruit shows maximum percentage of resistance against Trichophyton mentagraphytes (79.3%). Round about 50% recorded against penicillium, fusarium and rhizopus family. Noni fruit extract had a significant antifungal effect on C.albicans and the inhibitory effect varied with concentration and contact time[3].

Anti-inflammatory activity:-

In an in vitro study, the anti-inflammatory activity was detected in the Costa Rican *Morinda citrifolia* fruit juice by measuring its direct inhibitory activities on cyclooxygenase (COX)-1 and -2. The in vivo study on Tahitian *Morinda citrifolia* fruit juice demonstrate a decrease in the carrageenan paw edema in rats, showing a high anti-inflammatory effect compared to that of NSAIDs drugs without any side effects. M. citrifolia seeds oil exhibit major anti-inflammatory activity by obstructing both COX-2 and 5-LOX enzymes in an in vitro assay at absorbtion of 0.5 and 1 mg/ml. The main use of the *Morinda citrifolia* seed oil was assessed on 48 adult clients using the patch test. Whereas, topical comedogenic effect of the seed oil was studied on 23 Caucasian adolescent volunteers [4].

Atopic dermatitis:- (fermented noni fruit)

Fermented noni was prepared by the fermentation of noni fruit with probiotics and then extracted. This fermented Noni was administered orally to mice in order to assess its therapeutic effect on 2,4 dinitrochlorobenzene produced atopic dermatitis. Atopic dermatitis in its beginning “atopic march” leads to asthma, food allergy, rhinitis that may result in cutaneous infections of systemic disorders and decreases the quality of life causes trouble to patient.

Antidyslipidemic effect:-

Noni fruit leave and root extract are used as antidyslipidemic. The study was to provide the pharmacological basis for the medicinal use of *Morinda citrifolia* in dyslipidemia using the aqueous ethanolic extract of its fruit, leave, and root. Dyslipidemia is independent risk factor and it is the main reason for causing cardiovascular disease. Advanced pharmacological therapy for abnormal lipid level is effective but it is expensive and affiliated with side effect, most significant to patient incomppliance. So alternative therapies specifically herbal based are being used[5].

Obesity :-

Coumarins are found in many edible plants and fruits. One of the most chief coumarins was discovered in noni is Scopoletin (6- methoxy 7-hydroxy coumarin) which has shown significant effect in medication of

obesity and metabolic dysfunction. Aspertulosidic acid is one of the major iridoids isolated from noni and it has been demonstrated to enhance blood fluidity, which influence the well-being of obese patients and those with obesity associated disease such as hypertension, diabetes and dyslipidemia. Vitamins (C, ascorbic acid, E, tocopherol etc.) are major non-enzymatic anti-oxidant that have main effects because of their free radical forage property[6].

Antimicrobial property:-

Extract from noni leaves prepared with three various solvents like ethyl acetate essence, n-butanol and water, convey a strong antimicrobial activity against some micro-organism consisting of proteus vulgaris, staphylococcus aureus, Bacillus subtilis, E.coli. Noni leaves consists of phenolic compounds specially coumarins and flavanoids and also acubin, L-asperulose, alizarin, scopoletin. These phenolic compounds have a good antimicrobial activity.

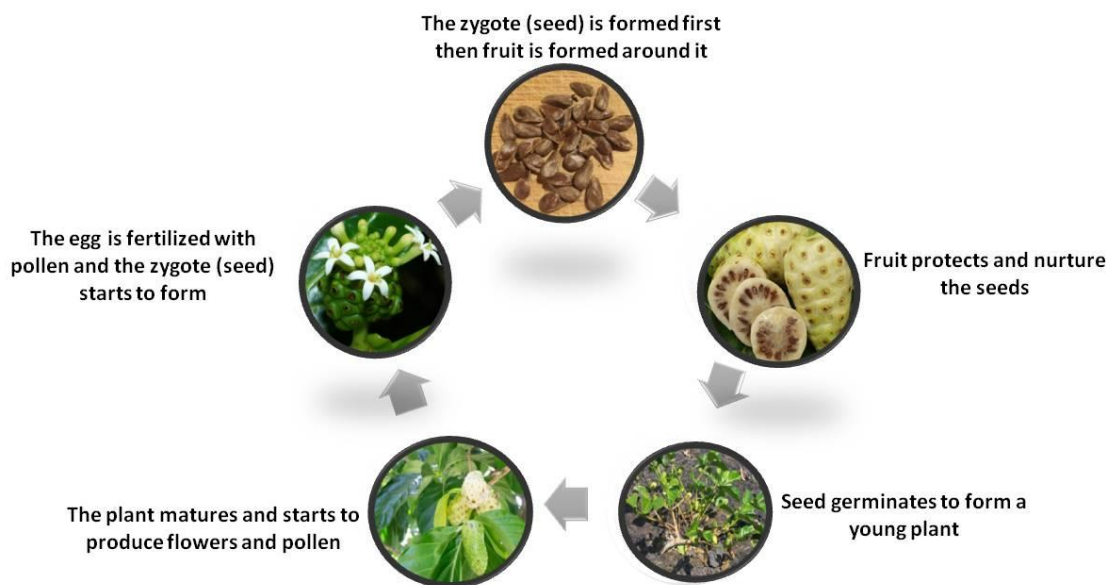
Wound healing:-

Morinda citrifolia shows good effects in streptozotocin (STPZ) induced diabetic rats. In diabetic patients, wounds are very complex to control due to impaired wound-healing. Noni juice which is prepared by fermentation process has better wound healing activity. Iridoid and iridoid glucosides in noni were identified as terpenes compelled to glucose and sugars that aiding in wound healing[7].

Anti-bacterial activity:-

The anti-bacterial activity of the noni extract of water (WE), petroleum ether (PEE), ethyl acetate (EAE), chloroform (CE) and n-butanol (BE) were analysed using disk diffusion method. The resultant showed that the extract from noni leaves composed of anti-bacterial reactions towards Bacillus subtilis, Escherichia. Coli proteus vulgaris and towards staphylococcus aureus. Among 5 different extract the BE formed the best antibacterial activity. This indicates that the phenolic compound contribute to antibacterial activities of noni leaves[8].

Life Cycle Of Noni:



Pytochemistry:-

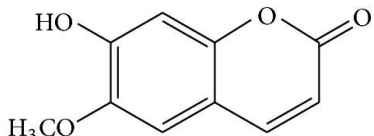
About 200 bioactive compounds were found in noni but their kind and concentration varies with plant parts, environmental factors, genotype and estimation methods. Ripened fruits showed remarkably higher amount of volatile compounds, ketones, esters, aldehydes, alcohol, turpines, sulphur compounds like methyl hexanoate, ethyl octonoate, methyl octonoate and methyl 4 E-decenoate.

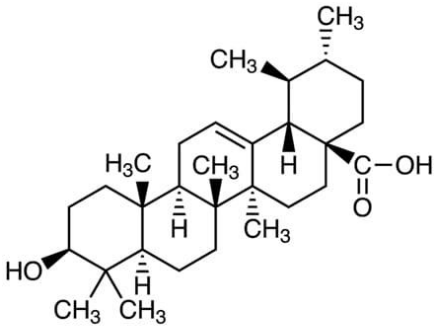
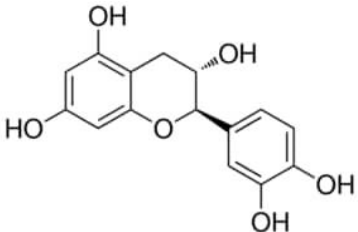
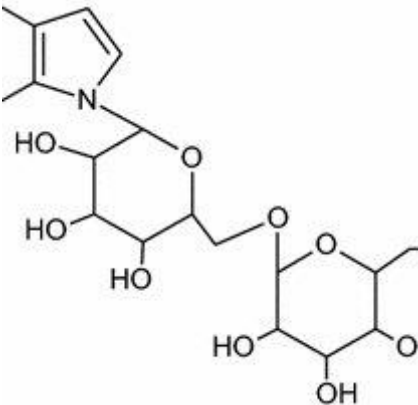
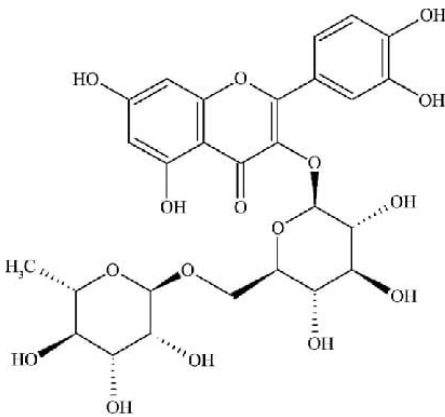
According to recent studies they signified that noni leaf essence takeover ergogenic effect, helping detain exhaustion by enhancing energy production, regulation and efficiency. The noni extracts showing by increasing angiogenesis in skeletal muscle and liver .which shows anti-oxidant and anti-inflammatory properties. The antispasmodic and vasodilatory actions of morinda citrifolia root essence are conciliate through blockage of voltage dependently calcium channels. This plant is not widely studied for anti-dyslipidemic effects except a preliminary report. It was found that a correlation among gut microbiota and weight gain shows that weight gain was putatively due to by an rice in energy saving capability of the microbiota in overweight person[9].

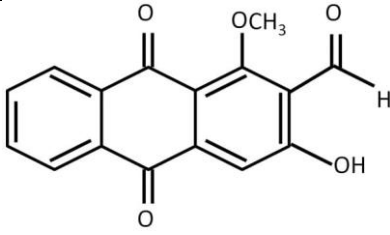
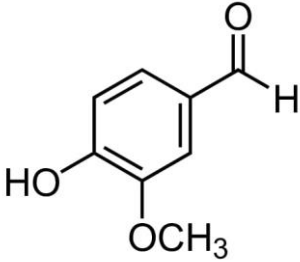
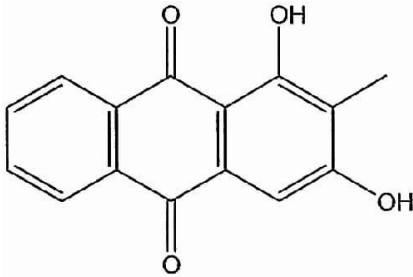
Acids	Formic acid, acetic acid, butanoic acid, heptanoic acid, hexanoic acid. Octanoic acid, 2-octanoic acid, nonanoic acid, decanoic acid
Alcohols	Ethanol, 2-methyle-3-buten-1-ol, 1-butanol, 3-Methyl-3-buten-1-ol, 3-methyl-2-buten-1-ol, benzyl alcohol
Esters	Ethyl acetate, butyl acetate, methyl 2-methylepropanoate, methyl butanoate, ethyl butanoate, butyl butanoate, methyl 3-methylbutanoate, 4-pentenyl butanoate, 3-methyl-3-buten-1-yl 3-methylbutanoate, methyl 2-methylbutanoate, methyl hexanoate, methyl 2-

	methylbutanoate, methylehexanoate, ethyl hexanoate, butyl hexanoate, 4-pentanyl hexanoate, 3-methyl-3-buten-1-yl hexanoate, Hexyl isovalerate, methyl heptanoate, methyl octanoate, ethyl octanoate, butyl octanoate, 3-methyl-3-buten-1-yl octanoate, methyl 2-octenoate, methyl 3-octenoate
Terpenes	Linalool oxide, (Z)-3,7-dimethyl-1,3,6-octatriene, (+)-4-Carene, D-Limonene, ocimenol, terpineol
Sulphur compounds	methanethiol, S-methyl thioacetate, dimethyl disulfide, methyl 3-methylthiopropoanoate, ethyl 3-methylthiopropoanoate, 3-methylthiopropoanoic acid
Aldehydes and ketones	Acetaldehyde, 2-methylebutanol, 3-methylebutanal, 2-pentanone, 3-methyle-2-butanone, 2-hexanone, 2-hexenal, furfural, benzaldehyde
Flavanoids	Catechin, epicatechin, rutin, kaempferol, quercetin.
Iridoids	Asperulosidic, citrifolinin, citrifolinoside, citrifoside, deacetylasperuloside, Dehydroxypoxymethoxygaertneroside, cycloartenol, oleanolic acid.
Anthraquinones	2hydroxy anthraquinone, 2methoxy anthraquinone, morindicinone, 5,15 dimethylmorindol, 1,5,15-trimethylmorindol.[9]

Chemical constituents of noni, their structure and uses:-

Compound	Derived from	Uses
1. .Scopoletin 	Coumarin	Anti-inflammatory, decrease anxiety and depression.
2. Ursolic acid :-	Terpenes	obesity Reduce, decrease hepatic steatosis, improved glucose tolerance.

		
<p>3.Catechin:-</p> 	<p>Flavonoids</p>	<p>Anti-oxidant, prevent cell damage.</p>
<p>4.Xeronine:-</p> 	<p>Alkaloids</p>	<p>obesity Reduce, decrease hepatic steatosis, improved glucose tolerance.</p>
<p>5.Rutin:-</p> 	<p>Flavonoids</p>	<p>Anti-oxidant, neurodegenerative disorders, cardiovascular disease, skin cancer.</p>
<p>6.Damacanthal:-</p>	<p>Alkaloids</p>	<p>Cancer, infection, asthma, cough, ulcer, haemorrhoids and rheumatoid arthritis.</p>

		
<p>7. Vanillin:-</p> 	Aldehydes	Flavouring, foods, cancer, anti-microbial, anti-oxidant, anti-inflammatory.
<p>8. Rubiadin:-</p> 	Anthraquinone	Antiosteoporotic, anti-bacterial, anti-malarial, anti-fungal, anti-viral.

Discussion:

From this study we have found that the plant species of *Morinda citrifolia* (Noni) has various health benefits. About 200 bioactive compounds were found in noni, which include major active compounds like scopoletin, ursolic acid, rudiadin, xeronine, rutin, Damacanthal, vanillin. Phenolic compounds especially coumarin and flavonoids, acubin L-asperulose, alizalin are also identified. Now coming to the health benefits, they have various uses like anti-inflammatory, anti-diabetic, anti-fungal activity, atopic dermatitis, anti-dyslipidemic effect, obesity, anti-microbial activity, anti-bacterial activity and wound healing. Recent studies have shown that they also have activities like improving angiogenesis in skeletal muscle and liver, anti-oxidant and anti-inflammatory property. Further researches on *Morinda citrifolia* species are required to identify the true potential of Noni.

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