

## “NONI”: THE ALCHEMIST PLANT

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### ABSTRACT

*Morinda citrifolia*, commonly called noni, has a long history as a medicinal plant and its use as a botanical dietary supplement has grown tremendously in recent years. A large number of beneficial effects have been claimed for Noni. Fruit juice of Noni has been approved as a Novel Food by the European Commission in 2003. Because of the nutrients the noni fruit possess, it's used to treat a variety of health problems including, high blood pressure, arthritis, ulcers, depression, sprains, menstrual cramps, pain relief, inflammation, burns, fever, food poisoning, intestinal worms, and joint problems. Noni was used by Polynesia traditional healers for the treatment of cuts, bruises and wounds. A poultice made from noni leaves are commonly used topically for wounds; the unripe fruit is used for mouth sores, gingivitis, toothaches, and abscesses. Some of the cardinal features of this miracle plants are being demonstrated in this review.

### INTRODUCTION

*Morinda citrifolia* is a tree in the coffee family, Rubiaceae. Its native range extends through Southeast Asia and Australasia, and the species is now cultivated throughout the tropics and widely naturalised.[1] Great morinda is a shrub or small tree native to Southeast Asia but has been extensively spread by man throughout India and into the Pacific islands as far as the islands of French Polynesian, of which Tahiti is the most prominent. It can also be found in parts of the West Indies. The plant grows well on sandy or rocky shores. “Let food be your medicine and let medicine be your food” was advised by the father of medicine, Hippocrates, over two millennia ago. It's still true today that “you are what you eat.”

Apart from saline conditions, the plant also can withstand drought and grows in secondary soils. It can grow up to 9 m

tall, and has large, simple, dark green, shiny and deeply veined leaves. The plant flowers and fruits all year round. The flowers are small and white. The fruit is a multiple fruit that has a pungent odor when ripening, and is hence also known as cheese fruit or even vomit fruit. It is oval and reaches 4-7 cm in size. At first green, the fruit turns yellow then almost white as it ripens. It contains many seeds. It is sometimes called starvation fruit. Despite its strong smell and bitter taste, the fruit is nevertheless eaten as a famine food.[2] The Polynesians utilized the whole Noni plant in their medicinal remedies and dye for some of their traditional clothes. The roots, stems, bark, leaves, flowers, and fruits of the Noni plant are all involved in various combinations in almost 40 known and recorded herbal remedies.[3]



Figure 1: Fruit and flower of *Morinda citrifolia*

### COMMON NAME

Indian Mulberry, Great morinda • Hindi: Bartundi • Telugu: Mogali • Marathi: Nagakunda • Tamil: Nuna • Malayalam: Mannapavatta • Kannada: Tagase maddi • Gujarati: Surangi • Oriya: Pindre • Bengali: Hurdi • Konkani: Bartondi

### CHEMICAL CONSTITUENTS

*M. citrifolia* fruit powder contains carbohydrates and dietary fibre in moderate amounts. The noni contains many vitamins, minerals, enzymes, and beneficial alkaloids. In fact, it contains a very important alkaline, xeronine. Xeronine is found in all the cells of microorganisms, plants,

animals, and humans. The main micronutrients of *M. citrifolia* pulp powder include vitamin C, niacin (vitamin B<sub>3</sub>), iron and potassium. Vitamin A, calcium and sodium are present in moderate amounts. *M. citrifolia* fruit contains a number of phytochemicals, including lignans, oligo- and polysaccharides, flavonoids, iridoids, fatty acids, scopoletin, catechin, beta-sitosterol, damnacanthol, and alkaloids. Although these substances have been studied for bioactivity, current research is insufficient to conclude anything about their effects on human health.[4] 1-O-(3'-methylbut-3'-enyl)-beta-D-glucopyranose (1), 1-n-butyl-4-(5'-formyl-2'-furyl)methyl succinate (2), and 4-epi-borreriagenin (3), together with the known iridoid glycosides asperulosidic acid (4) and deacetylasperulosidic acid (5) and a mixture of 1-n-butyl-4-methyl-2-hydroxysuccinate (6a) and 1-n-butyl-4-methyl-3-hydroxysuccinate (6b), as well as a mixture of alpha- and beta-glucopyranose were new constituents isolated from noni fruit juice.[5] Noni also contains a chemical called damnacanthol in its roots. Damnacanthol has been found to be effective in successfully changing cancer cells back to normal cells, supposedly.

## PHARMACOLOGICAL UTILITY

*Morinda citrifolia* (Noni) is an edible plant with wide range of medicinal uses. It occurs exclusively in tropical climate zone from India through Southeast Asia and Australia to Eastern Polynesia and Hawaii. *Morinda citrifolia* L (Noni) has been used in folk remedies by Polynesians for over 2000 years, and is reported to have a broad range of therapeutic effects, including antibacterial, antiviral, antifungal, antitumor, antihelmin, analgesic, hypotensive, anti-inflammatory, and immune enhancing effects.[6] Flavonoid, along with anthroquinone and other alkaloids, seemed to also help treat HIV and AIDs. In fact, Noni is used in the Indian system to cure many diseases including HIV. *Morinda Citrifolia* Herb Extract is historical uses have targeted the digestive, intestinal, respiratory and immune systems. It is particularly useful for supporting the nervous and skeletal systems, especially painful joints, and for skin health.

### 1. Cancer treatment

*Morinda citrifolia* (Noni) has been extensively used in folk medicine by Polynesians for over 2,000 years. It has been reported to have broad therapeutic effects, including anticancer activity, in both clinical practice and laboratory animal models. The mechanism for these effects remains unknown. The hypothesis that *Morinda citrifolia* possesses a cancer preventive effect at the initiation stage of carcinogenesis was studied.[7] Polysaccharides found in it demonstrated anti-tumor activity in mice.[8] 10% Tahitian

Noni Liquid Dietary Supplement or Tahitian Noni Juice (TNJ), made from *Morinda citrifolia* fruit by Morinda Inc, in drinking water for one week was able to prevent DMBA-DNA adduct formation. The levels of DMBA-DNA adducts were reduced by 30% in the heart, 41% in the lung, 42% in the liver, and 80% in the kidney of female SD rats. Even more dramatic results were obtained in male C57 BL-6 mice: 10% TNJ was able to reduce DMBA-DNA adduct formation by 60% in the heart, 50% in the lung, 70% in the liver, and 90% in the kidney. In order to explore the mechanism of this preventive effect, the antioxidant activity of TNJ was examined in vitro by lipid hydroperoxide (LPO) and tetrazolium nitroblue (TNB) assays. In the LPO assay, LPO oxidizes leucomethylene blue to methylene blue in the presence of hemoglobin. Quantitative determination of aromatic DNA adducts in peripheral blood lymphocytes (PBLs) of current smokers is an useful surrogate biomarker for the evaluation of environmental carcinogen exposure or chemopreventive intervention. The results suggest that drinking 1 to 4 oz of TNJ daily may reduce the cancer risk in heavy cigarette smokers by blocking carcinogen-DNA binding or excising DNA adducts from genomic DNA.[9] Among the in vitro studies, a 'concentrated component' in noni juice and not pure noni juice may (1) stimulate the immune system to 'possibly' assist the body fight the cancer, and (2) kill a small percentage (0-36%) of cancer cells depending on the type. The nine animal studies suggest that a concentrated component in noni juice may stimulate the immune system; but only slightly increases the number (about 1/3; 25-45%) of surviving mice.[10]

### 2. Enzyme inhibitor

Noni is also used as a selective inhibitor of COX-2 enzyme. The analgesic efficacy of the Noni extract is 75 % as strong as morphine, yet non-addictive and side effect free. It has been reported to possess analgesic and anti-ulcerogenic properties.[11] Noni has been used in Polynesia for over 2000 years for its reputed health benefits, one of which is its therapeutic effects on gout (langu e hokotanga hui). However, its healing mechanism has not been elucidated. It was elucidated that the noni fruit juice inhibitory effect on XO enzymes is the mechanism by which noni ameliorates gout and gout-like diseases. Further, the results also support the traditional usage of noni in the treatment of gout.[12]

### 3. Hepatoprotective

*Morinda citrifolia* L. (noni) has been used throughout the Pacific, Southeast Asia, Central America, and the Caribbean for a variety of health conditions, including heart and liver ailments. Histopathological examination revealed that liver sections from the TNJ + CCl<sub>4</sub> appeared similar to controls, whereas typical hepatic steatosis was observed in the

placebo + CCl(4) group. Serum alkaline phosphatase (ALP), aspartate aminotransferase (AST), alanine transaminase (ALT), total cholesterol (TC), triglycerides (TG), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL) levels were increased in the placebo group compared with the TNJ group. In contrast, high-density lipoprotein (HDL) was increased in the TNJ group and decreased in the placebo group. Thus, TNJ juice appears to protect the liver from chronic exogenous CCl(4) exposures. Such protective mechanisms are supportive evidence for the utility of noni in traditional medicine for liver ailments.[13] Pretreatment with 20% Noni juice in drinking water + CCl(4) resulted in markedly decreased hepatotoxic lesions. Furthermore, serum alanine aminotransferase and aspartate aminotransferase levels were significantly lower in the Noni group than the placebo group. In a correlative time-dependent study, one dose of CCl(4) (0.25 mL/kg in corn oil, p.o.) in female SD rats, pretreated with 10% placebo for 12 days, caused sequential progressive hepatotoxic lesions over a 24 h period, while a protective effect from 10% Noni juice pretreatment was observed. These results suggest that Noni juice is effective in protecting the liver from extrinsic toxin exposure.[14]

#### 4. Anti-Inflammatory action

It has been used for many years as an anti-inflammatory agent. Noni fruit juice extract show anti-inflammatory activity in carrageenan induced paw edema. Noni juice reduced serum cholesterol and triglycerides in smokers.[15] The efficacy of Noni was tested in women with dysmenorrhea using prospective randomized double-blind placebo-controlled trial. Both bleeding and pain scores gradually improved in both groups as the women were observed over three menstrual cycles; however, the improvement was not significantly different in the Noni group when compared to the controls.[16]

#### 5. Antioxidant

Noni acts as powerful antioxidants. It was hypothesized that the antioxidant activity of Noni may protect individuals from oxygen free radicals and consequent lipid peroxidation. Noni may have potential for warding off muscle cell death and deterioration and thus decreased muscle wasting. There is an increase in oxidative damage when dystrophin is abnormal, and it has been suggested that noni acts as a powerful antioxidant and helps to combat oxidative stress.[17] Decreases in LDL and homocysteine, as well increases in HDL, were also observed among noni juice drinkers.[18] The anti-dyslipidemic effect of the plant extracts was mediated through the inhibition of biosynthesis, absorption and secretion of lipids. This may be possibly due partly to the presence of antioxidant constituents in this plant.

Therefore, this study rationalizes the medicinal use of *Morinda citrifolia* in dyslipidemia.[19]

#### 6. Antispasmodic and vasodilator activities

A study was conducted using noni to explore the possible mode(s) of action for its antispasmodic, vasodilator and cardio-suppressant effects to rationalize its medicinal use in gut and cardiovascular disorders. It has produced a concentration-dependent relaxation of spontaneous and high K(+) induced contractions in isolated rabbit jejunum preparations. It also caused right ward shift in the concentration response curves of Ca(++), similar to that of verapamil. In guinea-pig right atria, Mc.Cr (Extract) caused inhibition of both atrial force and rate of spontaneous contractions. In rabbit thoracic aortic preparations, Mc.Cr also suppressed contractions induced by phenylephrine (1.0  $\mu$ M) in normal- Ca(++), and Ca(++)-free kreb solutions and by high K(+), similar to that of verapamil. In rat thoracic aortic preparations, Mc.Cr also relaxed the phenylephrine (1.0  $\mu$ M)-induced contractions. The vasodilatory responses were not altered in the presence of L-NAME (0.1 mM) or atropine (1.0  $\mu$ M) and removal of endothelium. All of these are mediated possibly through blockade of voltage-dependent calcium channels and release of intracellular calcium, which may explain the medicinal use of *Morinda citrifolia* in diarrhea and hypertension.[20]

#### 7. Food

*Morinda citrifolia* is common in the diet of many cultures and used as a famine food in some countries. Noni juice is the common form of consumption and is found in 10% to 100% concentrations. Homemade juice is a good way to get 100% noni juice. Just place fully ripened noni fruit in glass jar with a very small amount of water. Then seal it tightly, and let it sit for 1 week to 3 months so the contents have time to naturally decompose and ferment. Finally strain the juice through a cheesecloth and store in the refrigerator.[21]

#### SIDE EFFECTS[22]

##### 1. Miscarriage

Historically *Morinda citrifolia* has been used to induce abortion. You may experience a miscarriage or preterm labor if you take medicinal quantities of *Morinda citrifolia* during pregnancy. Ask your obstetrician or midwife before using any other medicinal herb during any stage of gestation.

##### 2. Liver Disease

A rare, but serious, side effect of *Morinda citrifolia*, liver damage can cause life-threatening complications. Several people taking *Morinda citrifolia* supplements and juice have developed liver problems, but doctors were unable to

conclusively determine that *Morinda citrifolia* was the cause. Stop using *Morinda citrifolia* immediately if you develop symptoms of liver disease, such as jaundice (yellowing of the eyes and skin) or fatigue.

### 3. Electrolyte Imbalance

The fruit of the *Morinda citrifolia* plant is an excellent source of potassium. This is beneficial for most Americans, who do not get enough potassium in their everyday diets. However, people with kidney disease may develop dangerously high potassium levels while using the product. Do not take *Morinda citrifolia* if you are on a potassium-restricted diet due to liver disease.

### COMMERCIAL PRODUCTS

The primary commercial products from noni include beverages (fruit juice, juice drinks), fruit powders (for manufacture of reconstituted juice or juice drink products made from dried ripe or unripe fruits), toiletries (lotions, soaps, etc.), oil (from seeds), leaf powders (for encapsulation or pills).

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