



ISSN (E): 2320-3862
ISSN (P): 2394-0530
NAAS Rating: 3.53
JMPS 2018; 6(2): 249-254
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Received: 15-01-2018
Accepted: 18-02-2018

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Traditional and medicinal uses of *Morinda lucida*

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Abstract

Brimstone tree, botanical name *morinda lucida* is a medium size tree with short crooked branches. Although it is very bitter, yet the whole plants, leaves, stem bark and roots are known to have medicinal properties. The many benefits derived from *morinda lucida* is owed to the high contents of vitamins A, K and E, alkaloids and other phytochemicals which are powerful antioxidant bioactive components like flavonoids which are effective as free radical scavengers, have anti-allergic, anti-inflammatory, anti-viral, anti-proliferative and anti-carcinogenic properties. Phenolic which are anti-apoptosis, anti-aging, anti-inflammation, anti-atherosclerosis, anti-carcinogen cardiovascular protection and improvement in endothelial function as well as inhibition of angiogenesis and cell proliferation activities, steroids used as anti-bacterial and anti-plasmodium, alkaloids, the most essential of the phytochemical are used as anti-parasitic agent. The present article reviews the pharmacological and home remedy uses of *morinda lucida*.

Keywords: *morinda lucida*, phytochemical, antioxidant, nutrient components

1. Introduction

Ever *Morinda lucida* is a nutrient factory and is readily available throughout the year in southwestern Nigeria. It is rich source of two powerful antioxidants, vitamins A and E which could be effective in combating degenerative diseases like atherosclerosis; vitamin K, different secondary metabolites responsible for the ethnomedicinal properties of the plant,- alkaloids, tannins, saponins, flavonoids, phenols. Nutrient component which showed moderate qualities of proximate compounds- carbohydrates, protein, fat, fiber, ash and high moisture content; bioactive phytochemical which act as antibiotic, antiviral, anti-plasmodial and anti-parasitic. The plant is an excellent source of phytochemical constituent and nutritive components. The leaves contain high level of vitamin K which helps in building of strong bone. It is reported to possess strong trypanocidal and aortic vasorelaxant activities. The leaf and stem bark is reported to possess anticancer, hepatoprotective, cytotoxic, and genotoxic, anti-spermatogenic, hypoglycemic and anti-diabetic activities.

The leaves effectively treat and improve all forms of infertility in women. Brimstone tree is locally used in the treatment of irregular menstruation, insomnia and jaundice, also in the treatment of wound infections, abscesses and chancre. The decoction is also reported as anti-diarrhea if taken thrice daily. Decoction and infusions of plasters of root bark and leaves are recognized remedies against different types of fever, including yellow fever, malaria, trypanosomiasis, and feverish condition during childbirth. The plants in some cases, is employed in treating diabetes, hypertension, cerebral congestion, dysentery, stomach ache, ulcers, leprosy and gonorrhoea. *Morinda lucida* is reported to contain steroid which makes them useful against cerebral malaria and also confirming its effectiveness as anti-plasmodia agents. *Morinda lucida* is extra pancreatic in nature with the exception of the possibility for stimulating the liberation of insulin already produced by beta-cells. *Morinda lucida* was observed to lower blood sugar of one diabetic patient. The toxicity of *morinda lucida* is largely unknown. However, one study report that large doses of extract can be administered without danger.

2. Biological Source

Botanical Name: *Morinda lucida* Benth

Family Name: pyroioidea

Common Name: brimstone tree, morinda, Indian Mullberry, Hog tree apple, Oruwo.

Part Used: leaves, barks and root.

3. Nutritional Value

Morinda lucida belong to kingdom Plantae, it is one of the 80 species in the genus *Morinda* of the pyroidea family, and it is a tropical rainforest tree. The wood is yellow hence the name brimstone tree. *Morinda lucida* is a medium sized tree at maturity up to 18(-25) evergreen shrub with bole and branches often crooked or gnarled; bark smooth scaly, grey to brown, stipules ovate or triangular, 1-7mm long, falling early. Leaves opposite, simple and entire; stipulates ovate or triangular, 1-7mm long, falling early; petiole up to 15cm long; blade elliptical, 6-18cm x 2-9cm, base rounded, cuneate, apex acute to acuminate, shiny above, sometimes finely pubescence when young, later only tufts of hairs in vein axils beneath and some hairs on the midrib. Inflorescence a stalked head 4-7mm in diameter, 1-3 at the node opposite a single leaf, peduncle up to 8cm long bearing at base a stalked cup-shaped gland.

Phytochemicals associated with *Morinda lucida* include 10 anthraquinones, alkaloids, tannins, flavonoids, saponins, glucosides, and triterpenoids. *Morinda lucida* have nutritional functions; these nutrients are essential for the physiological activities of the human body. Such nutrients are carbohydrate,

proteins, fats, mineral elements and vitamins and even dietary fiber. These entirely play important role in satisfying human needs for energy and life processes.

Table 1: qualitative phytochemical analysis of the leaves, stem and roots of *Morinda lucida*

Phytochemical	Morinda lucida		
	Leaves,	Bark	Roots
Steroids	++	++	+
Alkanoids	+++	++	+
Terpenoids	+	++	+
Tannins	+++	++	+
Saponins	+	+	+
Flavonoids	+++	++	++
Phenols	++++	+++	++
HNC	+	+	++
Glycosides	++	+	+

++++ = very heavily present, +++ = heavily present, ++ = present, + = trace. The qualitative analysis showed strongly present, present and trace amount of the different phytochemical in *Morinda lucida* plant part (table 1). The presence of alkaloids, tannins, glycosides, terpenoids, saponins, phenols, hydrogen cyanide, flavonoids and steroids were observed in *Morinda lucida*

Table 2: phytochemical qualitative analysis of leaves, stems bark and root of *Morinda lucida*

Medicinal Plant	Sample	Tannins (mg/100g)	HNC (mg/g)	Flavonoids (mg/100g)	Terpenoids (mg/100g)	Alkanoids (mg/100g)
Morinda Lucida	Leaves	1.49a±0.003	0.16a±0.002	0.28a±0.003	2.31b±0.099	2.64b±0.008
	Bark	1.37b±0.004	0.15b±0.003	0.08b±0.006	3.55a±0.011	3.01a±0.005
	Roots	0.47c±0.003	0.14c±0.002	0.08c±0.003	1.95c±0.003	0.25c±0.003
	LSD(P<0.05)	0.003	0.002	0.003	0.007	0.005

Medicinal Plant	Saponins (mg/g)	Steroid (mg/g)	Phenols (mg/100g)	Glycosides (mg/g)
Morinda lucida	0.06a±0.004	1.16a±0.003	4.84a±0.003	0.43a±0.003
	0.06a±0.004	1.16a±0.003	4.84a±0.003	0.43a±0.004
	0.02b±0.006	0.44b±0.004	1.05b±0.004	0.14b±0.004
	0.004	0.003	0.003	0.003

HNC – hydrogen cyanide*value = mean ± standard deviation, value followed by different letters are significantly different from one another

Table 3: range and mean of the proximate composition (%) of leave stem bark and root of *Morinda lucida*

Medicinal Plant	Plant Part	Fats		proteins		Moisture		Fiber	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean
Morinda Lucida	Leaves	1.825-2.0	1.88a±0.058	17.43-18.2	17.69a±0.26	6.92-2.0	6.93a±0.35	2.3-3.0	2.9c±0.05
	Bark	0.643-0.07	0.66±0.19	4.371-4.378	4.38b±0.002	5.3-5.485	5.43b±0.6	5.928-6.0	5.96c±0.13
	Roots	0.41 – 0.50	0.49c±0.008	2.452-2.459	2.46c±0.002	4.2-5.73	4.9b±0.45	6.77-7.2	6.96a±0.13
	LSD (P<0.05)	-	0.12	-	0.51	-	0.9	-	0.27

Medicinal Plant	Plant part	Ash		Carbohydrate	
		Range	Mean	Range	Mean
Morinda Lucida	Leaves	2.907-2.94	2.9a±0.002	68.09-69.6	68.76b±0.67
	Bark	2.33-2.3388	2.33c±0.002	80.4-8.25	80.9a±0.28
	Roots	2.422-2.56	2.47b±0.05	80.6-82.16	81.63a±0.052
	LSD(P<0.05)	-	0.09	-	1,78

Value= mean ± standard deviation, values followed by different letters are significantly different from one another.

Table 4: vitamin content of leaves, stem bark and root of *Morinda lucida*

Sample	Vitamin A	Vitamin E	Vitamin K
Leaves	17.56a±0.002	1.57a±0.002	2.61a±0.006
Bark	6.64b±0.006	1.54b±0.003	1.57b±0.005
Roots	1.25c±0.004	0.96c±0.006	0.67c±0.005
LSD(P<0.05)	0.003	0.004	0.004

Value = mean ± standard deviation, values followed by different letters are significantly different from one another

Table 5: Anti-nutrient composition of leaves, stem bark and root of *Morinda lucida*

Medicinal plant	Sample	Phytate(mg/100g)	Oxalate (%)
Morinda lucida	Leaves	3.65a±0.006	2.43a±0.003
	Bark	1.89b±0.003	2.12b±0.003
	Roots	1.87b±0.005	2.11b±0.004
	LSD($P<0.05$)	0.003	0.004

LSD (0.05), values = mean ± standard deviation, value followed by different letters are significantly different from one another

The quantitative analysis showed significant variation in most of the phytochemical constituent of plant part at FLSD $P<0.05$ (Table2). Equally the tannins contains in the leaves of morinda (1.49mg/100g) varied significantly from the quantity in the stem bark (1.37mg/100g) and not (0.47mg/100g).the protein content is ranged from 2.46 to 17.69 in morinda lucida.it was observed that morinda lucida which had higher carbohydrate content also had lower moisture content. The vitamin content of morinda lucida showed higher retinol (vitamin A) in the leaves than in the stem bark and roots ranging from 17.56 in the leaves to 1.25 in the roots (Table 4). Equally, vitamin K was higher in the leaves (2.61 to 0.62), while the value of vitamin E did not vary significantly in the leaves and bark; however both varied significantly from the root (Table 4). Table 5 shows the anti-nutrient composition of the plant parts. Different levels of phylate and oxalate were observed in *Morinda lucida* plants parts as shown in the table. Phylate was significantly higher in the leaves of *Morinda lucida* than in other parts. The values observed for oxalate were also significantly higher in the leaves ranging from 2.43 to 2.11 in *Morinda lucida*.

- Tannins have traditionally been considered antinutritioanl but it is now known that their beneficial or antinutritional properties depend upon their chemical structure and dosage.
- Flavinioids area diverse group of phytonutrients (plants chemical) found in almost all fruits and veget5ables. Along with carotenoids, they are responsible for the vivid colours in fruits and vegetables. Flavinioids are the largest group of phytonutrients, with more than 6000 type.
- Glucoside: it contains an aglycone group that is a derivative of anthranquinone. They are a laxative effect.
- Saponins are naturally occurring plant glycosides which is to say they are phytochemicals- chemicalfound In plants. They possess soap-like quantities and produce a lather when mixed with water.
- Terpanoids: eating terpanoid daily may benefit metabolic disorder including diabetes.
- Phenol: many phenolic compounds found in plants may have antioxidant effects, meaning they react with and capture dangerously reactive compounds called free radicals before they react with biomolecules and cause serious damage.

4. Pharmacology Activity of Each Division of *Morinda Lucida*

The whole of morinda lucida has a unique pharmacological uses.

4.1 Leaves

Morinda lucida leaves have a lot of benefits. In some region of Kasongo in north-eastern, the young leaves of morinda lucida combined with leaves of philenoptera species to obtained a pale green dye use in basket weaving

- Protective laxative: The implication of these finding is that the presence of anthraquinone in morinda lucida leaves makes it a protective laxative

- Anti-malaria, anti-diarrhea the presence of steroid, alkaloid and tannins explain its ability to treat heart ailments, malaria and diarrhea respectively among other ailments.
- Analgesic agent the treatment from leaves is used as an analgesic agent.
- Different types of fever (yellow fever, malaria, trypanosomiasis and feverish condition during childbirth) the leaves are heated and applied to the abdomen or chest for coughs, enlarged spleen, colic, nausea and fever.
- Ulcers and wound In Rombay, the leaves help to heal ulcer wounds
- Dysentery Leaves are useful for dysentery, diarrhea, dizziness, and headache.

Additional benefits of *Morinda lucida* leave

- Treatment of infertility
- Hypertension
- Cerebral complication
- Anticancer
- Hepatoprotective
- Cytotoxic and genotoxic
- Anti-spermatogenic
- Hypoglycemia and anti-diabetic
- Gonorrhoea
- Leprosy
- Stomach ache.

4.2 Wood and Stem Bark

The wood of morinda lucida yields yellow to red dyes. In Nigeria and Gabon, the root bark is used to dye textile into scarlet red. On occasions of national grief or the death of a chief, the Ashanti people of Ghana dye cotton cloths red with the root bark of morinda lucida. These cloths called Kobene are worn as mourning dress by official people and by the family of the deceased.

A. Jaundice

A weak decoction of the stem bark is administered for the treatment of severe jaundice often characterized by hemoglobinuria and hematuria.

B. Antiduresis And Anti-Diarrhea

The use of morinda lucida stem bark for treatment induces vomiting, diarrhea and diuresis, and cure is determined from the clearance of yellow coloration of the urine.

C. Antihypertensive And Its Cerebral Complication

The extract of the stem bark has been shown to possess strong but short-acting antihypertensive activity, the extract of the stem bark has been recommended for the prevention and treatment of hypertension and its cerebral complication.

D. Dysentery

Morinda lucida stem bark is also been employed for the treatment of dysentery.

E. Charcoal

The wood of morinda lucida is excellent in making of charcoal.

F. Construction

The wood of *Morinda lucida* is also used for construction, mining props, furniture, canoes, poles and fuel wood.

Additional Benefit of *Morinda Lucida* Root and Stem

- Chewing sticks
- Treatment of against itch and ringworm
- The bitter tasting roots are used as flavoring for food and alcohol beverages.

4.3 Root

The root is the most important traditional source of yellow dye for textile in the Kasai province of DR Congo. It can be used without a mordant. It is also added to indigo vats in Cote d'Ivoire, to contribute to both the fermentation and reduction process necessary for dyeing with indigo and to get darker blue. In this process it is often combined with leaf, twigs of *Saba comorensis*.

- A. Treatment of kidney and liver dysfunction: liver and kidney dysfunction showed weakness, fatigue and pain and cold of waist and leg or with chronic rheumatoid joint pain, weakness, joint pain cold, tired easily and pale tongue fur. *Morinda lucida* root effective in the treatment of liver and kidney dysfunction.
- B. Boost immunity and disease resistance capacity: this mean *Morinda lucida* root polysaccharide with adrenocorticotrophic hormone and the role of a build up their strength can enhance human immunity, reduce disease.
- C. Increase sexual capacity: *Morinda lucida* root extract has a very long history in civilization of China and the far east area to enhance sex capacity, commonly used in the male and female sexual function to improve strength, improve weak impotence and deficiency premature ejaculation, women uterus cold and infertility, menstrual not sex frigidity reconcile.

Other function of the root

- It is also used to treat incontinence
- Chronic rheumatism
- Fatigue
- Chronic inflammation of nerve
- Menstrual disorders
- Hernia
- Upper back pain
- Depression
- Muscular and skeletal atrophy.

Medicinal Value

a. Trypanocidal Activity

The effect of dried leaves methanol extract of *Morinda lucida* on *Trypanisoma brucei* infected mice. The result showed that the intra-peritoneal injection of the extract significantly suppressed the level of parasitaemia after *Trypanosoma brucei* infection in the mice which is dose dependent with 1000mg/kg intra-peritoneal, producing the maximum effect. They however concluded that the best trypanocidal activity was obtained when treatment with *Morinda lucida* leaf extract commenced simultaneously with Trypanosome inoculation.

b. Hypoglycemia

The anthraquinones in the leaf of *Morinda lucida* (brimstone tree) to bind hyperglycemia toxins in the body and keep them away from normal blood sugar level. These nutrients synergistic protect for normal blood sugar.

c. Antimalarial

The leaves of *Morinda lucida* (brimstone tree) is use for antimalarial due to the study that revealed that *Morinda lucida* exhibited MIC of 0.6mg/ml. the anti-plasmodia activity of *Morinda lucida* is found to reside majorly in the N-hexane and chloroform fractions. However, the N-hexane and chloroform extract of *Morinda lucida* exert more antimalarial activity. Aqueous extract of: stem bark of *Alstonia boonei*, leaves of *Magnifera indica*, fallen dried leaves of *Carica papaya*, stem bark of *Parkia biglobosa* or *Parkia clappertoniana*, leaves of *Morinda lucida*, *Cymbopogon citratus* and leaves of *Cassia podocarpa*. This is useful in the management of malaria infections caused by *Plasmodium falciparum* and *P. berghei* parasite. Aqueous extract of leaf of *Ocimum gratissimum*, leaf and bark of *Azadirachta indica*, leaf and bark of *Morinda lucida*, bark of *Enantia chloranta*. This is useful in the management of malaria infections caused by *Plasmodium coeli* caused malaria. Ethanol extract of: root bark of *Cryptolepis sanguinolenta*, whole plant of *Euphorbia hirta*, leaves of *Morinda lucida* and whole plant of *Phyllanthus niruri*. This is useful in the management of malaria infections caused by *P. falciparum* and *P. berghei* parasites.

d. Antifungal Activity

The anti-fungal activity of ten anthraquinones isolated from a dichloromethane extract of the roots *Morinda lucida*. The result showed that four of these anthraquinone were active against *Cladosporium cucumerinum* and *Candida albicans*. The result concluded that the most potent anti-fungal anthraquinone was identify as alizarin -1- methyl ether, which exhibited activity against *Aspergillus fumigates* and *Trichophyton mentagrophytes* at MIC dose of 100 and 50µg/ml, respectively

e. Gastrointestinal Activity

The effect of the methanol extract of the leaves on the gastric emptying in rats and intestinal motility in mice was studied while investigation was also made on the effect of the extract on acetylsalicylic acid – induced ulcer in rats. The results showed that the extract promoted gastric emptying time in rat and intestinal motility in mice. Though, the extract did not induce gastric ulceration in rats, however, it failed to protect against acetylsalicylic acid – induced ulcer in rats.

f. Impact Of the Leaf And Bark Aqueous Extracts on Cell Populations In Various Organs Of Mice

The impact of extracts of some anti – malaria medicinal plants amongst which was the leaves and barks aqueous extracts of *Morinda lucida*, on cell populations in various organs of mice and compared the effect with chloroquine treated mice. It was shown that mice treated with plant extract exhibited chemo suppression activity of early parasitaemia which did not lead to their survival. The total number of nucleated cell in the liver, spleen and peripheral blood of malaria – infected mice increased enormously before the animal died. However, all infected mice treated with chloroquine survived and the number of nucleated cell in both the malaria infected and uninfected mice were decreased.

g. Anti-Diarrhea

Morinda lucida leaf is found to contain tannins, flavonoids, alkaloids, glycosides, saponins, and anthraquinone. Tannins in medicinal plants are known to denature protein to form protein tannates, an effect postulated to improve the resistance

of the intestinal mucosa to chemical alteration leading to reduced hyper secretion in diarrhea

h. Antioxidant Activity

Many phytochemicals having phenolic moieties have been shown to exhibit antioxidant activity. *Morinda lucida* stem bark contain phenolic compounds, the antioxidant activity of this extract was determined using its ability to prevent the oxidation of B – cardene – linoleic acid emulsion undergoes an oxidation pattern in which β – carotene shields linoleic from being oxidized.

6. Allergic and Side Effect

Based on researches, *Morinda lucida* has been reported to have no side effect but based on body reaction to drugs, the side effects are possible but do not always occur. Some of the side effects may be rare but serious. It is well documented that *Morinda lucida* leaf extract has various therapeutic benefits with no known adverse effects among the users; the responses of various organs; especially liver and kidney in humans, to ingestion of this extract remain largely unknown.

Preliminary Research

The major constituents of *Morinda lucida* extracts are various types of alkaloids – anthraquinone and anthraquinols. From the wood and bark of *Morinda lucida*, 18 anthraquinones have been isolated, including the red colorants 1- methyl ether-alizarin, rubiadin and derivatives, lucidin, soraanjidiol, damnacanthal, nordamnacanthal, morindin, munjistin and purpuroxanthin. Two compounds were isolated and characterized from the stem. In addition to anthraquinone, tannins, flavonoids and saponosides have been isolated. Isolated anthraquinone and oruwacin from the roots of *Morinda lucida*. Two known triterpenic acids (urosolic and

oleanolic acids) were isolated from the leaves. Three compounds (digitolutein, rubiadin 1- methyl ether and damnacanthal) were extracted from the stem bark.

An ethno-medicinal study was conducted through the means of an informal interview with an herbalist at Akin – tafo, in the Eastern region of Ghana. Preliminary phytochemical tests carried out on the leaves of *Morinda lucida* indicated the presence of saponins, anthraquinone, cardenolides, alkaloids, sterols and tannins. Thin layer chromatography and column chromatography method were used in the laboratory for the analysis of a crude extract from *Morinda lucida*. A total of nine components were isolated from *Morinda lucida* using a solvent system containing hexane and ethyl acetate (2%) as the mobile phase and a stationary phase of silica gel. The crude leaf extract of *Morinda lucida* was investigated for inhibitory activity on salmonella typhi, pseudomonas aeruginosa and staphylococcus aureus *in vitro* using the agar well diffusion method. *Morinda lucida* showed inhibitory activity against pseudomonas aeruginosa and staphylococcus aureus with no activity against salmonella typhi at a concentration of 10mg/ml.

Is *Morinda Lucida* in pregnancy safe or Not?

There are so many beliefs information flooding the media that people should or should not avoid some herbal medicine most especially during pregnancy. There have been several research projects on effects of herbal medicine on pregnant women and *Morinda lucida* is no exception. But none of these research projects have come out to say that *Morinda lucida* have effect on pregnant women. Therefore, *morinda lucida* is highly saved in pregnancy because it contains no known compounds that affect pregnancy and experiment has shown that it cannot cross the blood brain barrier.

Table 6: Home Remedies Practices

Preparation	Uses
Leaves	
Squeeze fresh leaves and bitter leaves in water. Take one glass cup three times daily.	Diabetes
Collect lemon grass, peels of sweet orange and leave of brimstone tree. Boil all in water and take one glass three times daily for one week	Excess malaria parasite
For red and yellow colours, the dye baths are prepared by boiling the leaf twinges in water for one or two hours before filtering and plunging the textile into the coloured liquid and boil it again until the desired shade is obtained.	For dyeing.
Root	
Boil the fresh extracted root and take a glass three times daily	Malaria
Morinda lucida root 18g, niuxi 18g, shihu 18g, qianghuo 27g, danggui 27g, fresh ginger 27g, pepper	Impotence treatment

2g, drink 1000ml.	
Aqueous extract of root of <i>Vitellaria paradoxa</i> , stem and twing of <i>Bridellia ferruginea</i> , stem of <i>Garcinia cola</i> , root of <i>Terminalia glaucescens</i> , root of <i>Morinda lucida</i> and fruit of <i>Cnestis ferruginea</i> . Treatment of oral infections caused by micro-organisms such as: <i>staphylococcus aureus</i> , <i>Bacillus subtilis</i> , <i>Escherichia coli</i> , and <i>Pseudomonas aeruginosa</i> .	Orofacial infections

8. Conclusion

Morinda lucida is a neutraceutical plant having a wide range of pharmacological activities; the whole plant has its own medicinal value. The wide range of enzyme, vitamins present in *Morinda lucida* makes it a neutraceutical plant. The review is about all its prominent pharmacological activity and home remedies of *Morinda lucida*.

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