International Journal of Innovation and Scientific Research
ISSN 2351-8014 Vol. 11 No. 2 Nov. 2014, pp. 515-519
© 2014 Innovative Space of Scientific Research Journals
http://www.ijisr.issr-journals.org/

Phytochemical screening and health potentials of *Morinda lucida* Benth

T.O.A. Adeyemi, R.O. Ogboru, O.D. Idowu, E.A. Owoeye, and M.O. Isese

Moist Forest Research Station, Forestry Research Institute of Nigeria, Benin-city, Edo State, Nigeria

Copyright © 2014 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT: *Morinda lucida* Benth have been used over the years by rural communities across the tropical region for its medicinal potentials. Phytochemicals are bioactive plant constituents produced via secondary metabolism in relatively small amounts. Their presence span across several plant species of which *Morida lucida* is worthy of note. To ascertain the phytochemical constituents responsible for the ethno-medical properties of Morinda, a qualitative and quantitative screening of the phytochemical constituents was conducted on some sampled leaves. The result of the screening showed that the leaf of Morinda contains alkaloids, tannins, anthraquinones and steroids. The implication of these finding is that the presence of anthraquinone in Morinda leaves makes it a potential laxative; while the presence of steroid, alkaloid and tannins explains its ability to treat heart ailments, malaria and diarrhea respectively among other ailments.

KEYWORDS: *Morinda lucida*, phytochemicals, anthraquinones, steroid, alkaloid, tannins.

1 INTRODUCTION

Morinda lucida Benth., belonging to the family Rubiaceae is a tropical rainforest tree with the English name "Brimstone tree". It is also known as Sangogo or Bondoukou alongua (in Cote d'Ivoire), Twi, Kon kroma or Ewe amake (in Ghana), Ewe amake or Atak ake (in Togo) and Oruwo or Ruwo amongst the Yoruba tribe (South-west Nigeria) and Huka or Eze-ogu amongst the Igbo speaking tribe of South-east Nigeria [1]. It is a medium size tree about 15m tall with scaly grey bark, short crooked branches and shining foliage. In West Africa, *Morinda lucida* is an important plant in traditional medicine. In Nigeria, *Morinda lucida* is one of the four most used plants in the preparation of traditional medicines against fever [12]. The leaves are used as "oral teas", which are usually taken orally for the traditional treatment of malaria, and as a general febrifuge, analgesic, laxative and anti-infections [14]. The major constituents of *M. lucida* extract are the various types of alkaloids, anthraquinones and anthraquinols [2]. Two compounds (oruwalol and oruwal) and anthraquinones have been isolated and characterized from the stem of the plant [3]. In South-West Nigeria, fresh leaves of the plant are macerated in fresh palm wine and the filtrate taken orally for blood sugar control in suspected diabetic patients [1]. The leaves have also been reported to possess strong hypoglycemia, trypanocidal and aortic vasorelaxant activities [6], [21]. Further studies have shown that leaf and stem bark of *M. lucida* posses anticancer [20], hepatoprotective [17], antispermatogenic [19], and antidiabetic [7] activity.

Phytochemicals (from the Greek word phyto, meaning plant) are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients. They protect plants from disease and damage, and contribute to the plant's colour, aroma and flavor. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attack are known as phytochemicals. These compounds are known as secondary plant metabolites and have biological properties such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property. There are more than a thousand known and many unknown phytochemicals. It is well-known that plants produce these chemicals to protect themselves, but recent researches demonstrate that many phytochemicals can also protect human against diseases [8]. It is against this backdrop that this study tends to ascertain the bioactive components responsible for the therapeutic properties of *M.lucida.*

Corresponding Author: T.O.A. Adeyemi

Fig. 1. A leaf sample of Morinda licida

2 MATERIALS AND METHODS

Collection of plant samples

Morinda lucida leaves were harvested from the premises of Idia college in Benin-City (6.3176^0 N 5.6145^0 E), Edo State, Nigeria. Benin-City is within the tropical rainforest agro-ecological zone of Nigeria. Stems and branches were cut from the Morinda tree, the leaves were removed and properly washed in tap water and air-dried at room temperature at the Moist Forest Research Station, Benin-City until constant weight was attained. They were kept away from high temperatures and direct sun light to avoid destroying active compounds.

Processing of plant samples

The dried leaves of the plant were pulverized, using a ceramic mortar and pestle to obtain a powdered form. The powdered form of the plant were then stored in airtight container.

Preparation of aqueous extract of plant samples

The aqueous extract of Morinda plant sample was prepared by soaking 10 g of powdered samples in 200 ml of distilled water for 12 h. The extract was then filtered using filter paper or Whatman filter paper.

Phytochemical analysis

Chemical tests are conducted on the aqueous extract of each plant sample and also of the powdered form of the plant samples using standard methods [10].

Qualitative analysis on phytochemical constituents

Test for tannins

0.5 g of powdered sample of each plant was boiled in 20 ml of distilled water in a test tube and then filtered. The filtration method used here is the normal method, which includes a conical flask and filter paper. 0.1% $FeCl_3$ was added to the filtered samples and observed for brownish green or a blue black colouration, which shows the presence of tannins.

Test for saponins

2 g of powdered samples of each plant was boiled together with 20 ml of distilled water in a water bath and filtered. 10 ml of the filtered sample was mixed with 5 ml of distilled water in a test tube and shaken vigorously to obtain a stable persistent froth. The frothing was then mixed with 3 drops of olive oil and observed for the formation of emulsion, which indicates the presence of saponins.

Test for flavonoids

A few drops of 1% NH_3 solution was added to the aqueous extract of each plant sample in a test tube. A yellow coloration was observed if flavonoid compounds are present.

Test for cardiac glycosides

1 ml of concentrated H_2SO_4 was prepared in a test tube. 5 ml of aqueous extract from each plant sample was mixed with 2 ml of glacial CH_3CO_2H containing 1 drop of $FeCl_3$.The above mixture was carefully added to the 1 ml of concentrated H_2SO_4 so that the concentrated H_2SO_4 was underneath the mixture. If cardiac glycoside is present in the sample, a brown ring will appear, indicating the presence of the cardiac glycoside constituent.

Quantitative analysis on phytochemical constituents

Phenols

The quantity of phenols is determined using the spectrophotometer method. The fat free plant sample was boiled with 50 ml of Ether $[(CH_3CH_2)_2O]$ for 15min. 5 ml of the boiled sample was then pipetted into 50 ml flask, and 10 ml of distilled water was added. After the addition of distilled water, 2 ml of NH_4OH solution and 5 ml of concentrated CH_3 $(CH_2)_3CH_2OH$ is added to the mixture. The sample is made up to the mark and left for 30 min to react for colour development and measured at 505 nm wavelength using a spectrophotometer.

Alkaloids

5 g of the plant sample is prepared in a beaker and 200 ml of 10% CH_3CO_2H in C_2H_5OH is added to the plant sample. The mixture is covered and allowed to stand for 4 h. The mixture then filtered and the extract is allowed to become concentrated in a water bath until it reaches 1/4 of the original volume. Concentrated NH_4OH is added until the precipitation is complete. The whole solution is allowed to settle and the precipitate is collected and washed with dilute NH_4OH and then filtered. The residue is alkaloid, which is then dried and weighed.

Tannins

Quantity of tannins is determined by using the spectrophotometer method. 0.5 g of plant sample is weighed into a 50 ml plastic bottle. 50 ml of distilled is added and stirred for 1 h. The sample is filtered into a 50 ml volumetric flask and made up to mark. 5 ml of the filtered sample is then pipetted out into test tube and mixed with 2ml of 0.1 M $FeCl_3$ in 0.1 M HCl and 0.008 M $K_4Fe(CN)_6.3H_2O$. The absorbance is measured with a spectrophotometer at 395 nm wavelength within 10 min.

Saponins

The samples were ground and 20 g of each plant sample is put into a conical flask and 100 ml of 20% C_2H_5OH is added to the plant sample. The sample is heated over a hot water bath for 4 h with continuous stirring at about 55^0C. The mixture is then filtered and the residue re-extracted with another 200 ml of 20% C_2H_5OH. The combined extracts are reduced to 40 ml over a water bath at about 90oC. The concentrated is then transferred into a 250 ml separator funnel and 20 ml of $(CH_3CH_2)_2O$ is added to the extract and shaken vigorously. The aqueous layer is recovered while the $(CH_3CH_2)_2O$ layer is discarded and the purification process is repeated. 60 ml of n-C_4H9OH is added and the combined n-C_4H 9OH extracts is washed twice with 10 ml of 5% NaCl. The remaining solution is then heated in a water bath and after evaporation; the samples are dried in the oven to a constant weight.

Flavonoids

10 g of plant sample is repeatedly extracted with 100 ml of 80% aqueous methanol at room temperature. The whole solution is then filtered through filter paper and the filtrate is later on transferred into a water bath and solution is evaporated into dryness. The sample is then weighed until a constant weight.

Table 1. Qualitative and quantitative analysis of phytochemical constituents of Morinda lucida in Benin-city, Nigeria.

Phytochemicals	Qualitative remarks	Quantitative remarks (%)
Flavonoid	-	-
Phenols	-	-
Alkaloid	+	2.166
Tannin	+	1.087
Cardiac Glycoside	-	-
Saponin	-	-
Anthraquinones	+	2.008
Steroids	+	1.004

Key: - Not present
+ Present

3 RESULTS AND DISCUSSION

From the Table 1 above, *Morinda lucida* leaf sample sourced from Benin-city, Nigeria was found to contain alkaloid (2.166%), tannin (1.087%), anthraquinone (2.008%) and steroids (1.004%). This result corroborates some previous studies on the phtyochemical screening of *Morinda lucida* which also revealed the presence of alkaloids and flavonoids (Ebilomo *et al.,* 2011), anthraquinones and anthraquinols (Nweze *et al.,* 2004; Akinyemi *et al.,* 2005), tannins, alkaloids, flavonoids and glycosides components (Ajayeoba *et al.*, 2006), although flavonoid was not detected in this study.

Doughari (2012) reported that plant-derived alkaloids in clinical use include the analgesics morphine and codeine, the muscle relaxant (+)-tubocurarine, the antibiotics sanguinafine and berberine, the anticancer agent vinblastine, the antiarrythmic ajmaline, the pupil dilator atropine, and the sedative scopolamine. Other important alkaloids of plant origin include the addictive stimulants caffeine, nicotine, codeine, atropine, morphine, ergotamine, cocaine, nicotine and ephedrine.

Tannin rich medicinal plants are used as healing agents in a number of diseases. In Ayurveda, formulations based on tannin-rich plants have been used for the treatment of diseases like leucorrhoea, rhinnorhoea and diarrhea (Doughari, 2012).

Steroids and anthraquinone presence lends credence to its usage in the treatment of therapeutic applications as arrow poisons or cardiac drugs (Firn, 2010) and as laxatives respectively. Steroids (anabolic steroids) have been observed to promote nitrogen retention in osteoporosis and in animals with wasting illness (Maurya *et al.,* 2008; Madziga *et al.,* 2010). Ebiloma *et al.* (2011) also proved that *M. lucida* aqueous leaf extract posses potent antimalarial effects and may therefore offer a potential drug lead for development of a safe, effective and affordable antimalarial. Olajide *et al* (2010) submitted that methanol extracts of the leaves of *Morinda lucida* have a strong glucose lowering property when administered to streptozotocin-treated rats.

4 CONCLUSION

The phytochemical screening of *Morinda lucida* Benth revealed the significant presence of alkaloids, tannins, steroid and anthraquinone. These research finding has been able to lend further credence to the ethno-botanical potentials of *Morinda lucida* especially in the rural communities where orthodox medicine are unavailable and in the promotion of phytomedicine. Its high concentrations of alkaloids explain why the leaves can be used in the treatment of headache, malaria and other forms of fever, while the presence of tannin explains why it is used in the treatment of diarrhea. However, there is need to carry out pharmacological studies as regards the synergy of Morinda lucida with other ethno-medicinal plants with similar properties and activities towards the formulation of high quality herbal products.

ACKNOWLEDGMENT

The authors wish to acknowledge Mr Aghogho, the Chief Laboratory Technologist of the Department of Chemistry, Delta State University, Abraka for his technical assistance in the area of phytochemical analysis.

REFERENCES

[1] Adeneye, A.A. (2013). Profile of *Morinda lucida* leaf fractions on blood glucose and lipids in normal and alloxan-induced Hyperglycaemic rats. Journal of Pharmacogolia 4 (5): 408-413.

[2] Adesogan, E.K., (1973): Anthraquinones and anthraquinols from *Morinda lucida*: The biogenic significance of Oruwal and Oruwalol. *Tetrahedron*, 29: 4099-102.

[3] Adewunmi, C.O. and Adesogan, E.K. (1984). Anthraquinones and oruwacin from Morinda lucida as possible agents in fascioliasis and schistosomasis. Fitoterapia, 55:259-263

[4] Ajayeoba, F.O., Abiodun, O.O., Falade, M.O., Ogbole, N.O., Ashidi, J.S., Happi, C.T., and Akinboye, D. O. (2006). *In vitro* cytotoxicity studies of twenty plants used in Nigerian antimalarial ethnomedicine. *Phytomedicine* 13(4): 295-298.

[5] Akinyemi, K. O., Mendie, V. E., Smith, S. T., Oyefolu, A. O., and Coker, A. O. (2005). Screening of some medicinal plants used in southwest Nigerian traditional medicine for anti-*Salmonella typhi* activity. *Journal of Herbal Pharmacothgrary* 5 (1): 45-60

[6] Asuzu, I.U., Chineme, C.N., (1990): Effects of *Morinda lucida* leaf extract on *Trypanosoma brucei* infection in mice. J. Ethnopharmacol., 30:307-313.

[7] Daziel, J.M., (1973): The useful plants of West Africa. 1st ed. London: Crown Agents; pp. 403-404.

[8] Doughari, J.H. (2012). Phytochemicals: Extraction Methods, Basic Structures and Mode of action as Potential Chemotherapeutic Agents, Phytochemicals - A Global Perspective of Their Role in Nutrition and Health, Dr Venketeshwer Rao (Ed.), ISBN: 978-953-51-0296-0, InTech, Available from: http://www.intechopen.com/books/phytochemicals-a-global-perspective-of-their-role-in-nutrition-andhealth/phytochemicals-extraction-methods-basic-structures-and-mode-of-action-as-potentialchemotherapeutic

[9] Ebiloma, G.U., Omale, J., Aminu, R.O (2011). Suppressive, Curative and Prophylactic Potentials of *Morinda lucida* (Benth) against Erythrocytic Stage of Mice Infective Chloroquine Sensitive *Plasmodium berghei* NK-65 *British Journal of Applied Science & Technology 1(3): 131-140, 201.*

[10] Edeoga, H.O, Okwu, D.E, Mbaebie, B.O (2005). Phytochemical constituents of some Nigerian medicinal plants. Afri. J. Biotechnol. 4 (7): 685-688

[11] Firn, R. (2010). *Nature's Chemicals.* Oxford University Press, Oxford. Pp 74-75.

[12] Lawal H.O, Etatuvie, S.o and Fawehinmi, A.B (2011). Ethnomedicinal and pharmacological properties of Morinda lucida. Journal of Natural products, Vol. 5(2012): 93-99

[13] Madziga HA, Sanni S and Sandabe UK. (2010). Phytochemical and Elemental Analysis of *Acalypha wilkesiana* Leaf. *Journal of American Science.* 6(11): 510-514.

[14] Makinde, J.M., Obih, P.O., (1985): Screening of *Morinda lucida* leaf extract for antimalaria action on *Plasmodium berghei* in mice. *African J. Medical Science*, 14: 59 – 63

[15] Maurya, R.; Singh G. & Yadav, P.P. (2008). *Antiosteoporotic agents from Natural sources.* In: Atta-ur-Rahman (Ed.) *Studies in Natural Products Chemistry*, Vol. 35. Elsevier. Pp 517-545.

[16] Nweze, E. I., Okafor, J. I., and Njoku, O. (2004). Antimicrobial activities of methanolic extracts of *Trema guineensus* (schunm and Thorn) *Morinda lucida* (Benth) used in Nigeria. *Bio-research* 2(1): 39-46.

[17] Oduola, T., Bello. I., Adeosun G., Ademosun A., Raheem, G., Avwioro, G., (2010): Hepatotoxicity and nephrotoxicity evaluation in Wistar albino rats exposed to *Morinda lucida* leaf extract. *NAJ. Med. Sci*, 2: 230-233

[18] Olajide O.A., Awe S.O., Makinde J.M., Morebise, O. (2010). Evaluation of the Anti-diabetic property of *Morinda lucida* leaves in Streptozotocin-diabetic rats. Journal of Pharmacy and Pharmacology Pp 45-48.

[19] Raji, Y., Akinsomisoye, O.S., Salman, T.M., (2005): Antispermatogenic activity of *Morinda lucida* extract in male rats. *Asian Journal of Androl*., 2: 405-410.

[20] Sowemimo, A.A., Fakoya, F.A., Awopetu, I., Omobuwajo. O.R., Adesanya, S.A., (2007): Toxicity and mutagenic activity of some selected Nigerian plants. *J. Ethnopharmacol*., 113:427-432.

[21] Taofeeq, O, Ibrahim, B., Ganiyu, A., Abdul-Waheed, A., Gassal, R., Godwin, A. (2010). Hepatotoxicity and nephrotoxicity evaluation in Wistar albino rats exposed to *Morinda lucida* leaf extract. North Am. J. Med. Sci., 2, 230-233.