

Original Research Article

Assessment of Antioxidant, Phytochemical and Proximate Properties of Ethanolic Extracts of *Morinda lucida*.

Abstract.

Morinda lucida is a tropical West African evergreen shrub or small to medium sized rainforest tree, having brown colored bark, white flowers and yellowish ellipsoid seeds. It is widely used in traditional medicine systems of different countries. The preliminary phytochemical screening of ethanol extracts prepared from bark, leaves and root of *Morinda lucida* revealed the presence of Saponin, Tannins, Alkaloids, Flavonoids, and Cardiac glycosides. Furthermore, it also reveals presence of minerals like Sodium, Potassium, Calcium, Iron, Zinc, Copper and Phosphorus were confirmed. Anti-nutrients were also present in appreciable quantities. The anti-nutrients: Phytates, Oxalates and Saponins were present in different concentrations, Furthermore, the percentage of proximate content and in-vitro antioxidant potential were also estimated in this current study. The purpose of this present study was to conduct elemental composition, evaluation of anti-nutrient and antioxidant properties of ethanol extracts of the stem, leaf and root of *Morinda lucida*.

Keywords: *Morinda lucida* benth (Rubiaceae); qauntitative methods of analysis; mineral composition; anti-nutrients; proximate method; in-vitro-antioxidant analysis.

1.0 Introduction

Morinda lucida (Rubiaceae) is an evergreen shrub or small to medium sized rainforest tree also called Brimstone tree. In Cote D'Ivoire, it is locally called Sangogo or Bondoukou alongua while in Ghana, it is known as Twi, Kon kroma or Ewe amake. Among the Togolese, Ewe amaka or Atak ake, South-Western Nigeria and among the Yoruba, it is called Oruwo (Adeyemi et al., 2014). It can grow from 2.4 to 18 metres tall. . It has a rough bark, grey in colour, flaking off in irregular patches. Its leaves are about 7 to 15 cm long by 3.5 to 7.5 cm broad, and flowers are white with a narrow glabrous corolla-tube about 2.5 cm. Stem bark, roots and leaves infusion is

used as an antimalarial, antidiabetic, jaundice and dysentery treatment (Burkill, 1997), and it is used in antimalarial activity (Tona *et al.*, 1999; Agomo *et al.*, 1992; Asuzu and Chineme, 1990; Koumaglo *et al.*, 1992), anti-Salmonella typhi activity (Akinyemi *et al.*, 2005), effect on contractility of isolated uterine smooth muscle of pregnant and non-pregnant mice (Elias *et al.*, 2007), toxicity and mutagenic studies (Sowemimo *et al.*, 2007; Akinboro and Bakare, 2007; Raji *et al.*, 2005), and it has anti-diabetic property (Olajide *et al.*, 1999). *Morinda lucida* extracts have been reported to have antioxidant and reducing activities (Ogunlana *et al.*, 2008), and antimicrobial activity (Ogundare and Onifade, 2009; Adomi, 2008). The major constituents of *Morinda lucida* extracts were found to be: essential oils, anthraquinones and anthraquinols (Olajide *et al.*, 1999). Oruwalol, oruwal, ursolic acid, and oleanolic acid were also isolated from this plant (Adesogan 2005; Olajide *et al.*, 1999; Tona *et al.*, 1999). The red colorants of *Morinda lucida* were confirmed to be 1-methyl-ether-alizarin, rubiadin and derivatives, lucidin, soranjidiol, damnacanthal, nordamnacanthal, morindin, munjistin and purpuroxanthin, anthraquinones, oruwacin, tannins, flavonoids, digitolutein, and saponosides were isolated from different parts of *Morinda lucida*. The root of *Morinda lucida* is used as chewing sticks are for oral hygiene in Nigeria. The aqueous extracts of different parts of this plant were found to be effective against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, and *Pseudomonas aeruginosa* (Gyamfi *et al.*, 1999; Adoni, 2005). Keeping in view the popular use of different parts of *Morinda lucida* and evidence based confirmation of different folklore medicinal claims, further investigation was considered mandatory. In the present study antioxidant, phytochemical and proximate properties of ethanol extracts *Morinda lucida* were evaluated and the results are presented in the current communication.

2.0 Materials and Method.

2.1 Collection and Identification of Plant Sample.

The root, leaf and stem bark from *Morinda lucida* plants were collected from the tropical rain forest Osogbo, Osun State (Nigeria). The plant specimen were identified and authenticated at Department of Plant Science and Biotechnology, Adekunle Ajasin University Akungba-Akoko and Obafemi Awolowo University, Ile-Ife, Nigeria.

2.2 Preparation of extract

Fresh leaves, barks and roots of *Morinda lucida* were collected separately and then air-dried. The hammer milled dried samples, 1kg each, was soaked in 5L each of absolute ethanol for 72 hours and was filtered. The filtrates were concentrated and stored until required for use.

2.3 Qualitative method of analysis

Preliminary test / preparation test

The filtrate was used for the phytochemical screening for flavonoids, tannins, saponins, alkaloids, reducing sugars, anthraquinones and anthocyanosides. (Guevarra,2005)

2.3.1 Test for Alkaloids

About 0.2 gram was warmed with 2% of H_2SO_4 for two minutes, it was filtered and few drops of Dragendoff's reagent were added. Orange red precipitate indicated the present of Alkaloids.

2.3.2 Test for Tannins

One milliliter of the filtrate was mixed with 2ml of $FeCl_3$, A dark green colour indicated a positive test for the tannins.

2.3.3 Test for Saponins

One milliliter of the filtrate was diluted with 2 ml of distilled water; the mixture were vigorously shaken and left to stand for 10min during which time, the development of foam on the surface of the mixture lasting for more than 10mins, indicates the presence of saponins.

2.3.4 Test for Anthraquinones

One milliliter of the plant filtrate was shaken with 10ml of benzene; the mixture was filtered and 5ml of 10 % (v/v) ammonia were added, then shaken and observed. A pinkish solution indicates a positive test

2.3.5 Test for Anthocyanosides

One milliliter of the plant filtrate was mixed with 5ml of dilute HCl; a pale pink colour indicates the positive test.

2.3.6 Test for Flavonoids

One milliliter of plant filtrate was mixed with 2ml of 10% lead acetate; a brownish precipitate indicated a positive test for the phenolic flavonoids. While for flavonoids, 1ml of the plant filtrate was mixed with 2ml of dilute NaOH; a golden yellow colour indicated the presence of flavonoids.

2.3.7 Test for Reducing Sugars

One milliliter of the plant filtrate was mixed with Fehling A and Fehling B separately; a brown colour with Fehling B and a green colour with Fehling A indicate the presence of reducing sugars.

2.3.8 Test for Cyanogenic glucosides

This was carried out subjecting 0.5g of the extract 10ml sterile water filtering and adding sodium picrate to the filtrate and heated to boil.

2.3.9 Test for Cardiac glucosides

Legal test and the killer-kiliani was adopted, 0.5g of the extract were added to 2ml of acetic anhydrate plus H₂SO₄.

2.4 Quantitative method of analysis

2.4.1 Saponins

About 20grams each of dried plant samples were ground and, put into a conical flask after which 100 ml of 20 % aqueous ethanol were added. The mixture was heated using a hot water bath. At about 55°C, for 4 hour with continuous stirring, after which the mixture were filtered and the residue re-extracted with a further 200ml of 20% ethanol. The combined extracts were reduced to 40ml over a water bath at about 90°C. The concentrate was transferred into a 250ml separating funnel and 20ml of diethyl ether were added and then shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated three times. 60ml of n-butanol were added. The combined n-butanol extracts were washed twice with 10ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation, the samples were dried in the oven to a constant weight; the saponin content was calculated as percentage of the starting material. (Edeoga *et al*, 2015).

2.4.2 Flavonoids

About 10g of the sample were extracted repeatedly with 100ml of 80% aqueous methanol, at room temperature. The whole solution was filtered through Whatman filter paper No 42. The filtrate were later transferred into a crucible and evaporated into dryness over a water bath; the dry content was weighed to a constant weigh. (Burkill, 1991)

2.4.3 Cardiac glycosides

Legal test and the killer-kiliani was adopted. 0.5g of the extract was added to 2ml of acetic anhydrate plus H₂SO₄. (Edeoga *et al*, 2015).

2.4.4 Tannins

About 500 mg of the sample was weighed into a 50 ml plastic bottle and 50 ml of distilled water was added and shaken for 1 hour on a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the marked level. Then, 5 ml of the filtrate was transferred into a test tube and mixed with 2 ml of 0.1 M FeCl_3 in 0.1 M HCl and 0.008 M potassium ferrocyanide. The absorbance was measured at 120 nm within 10 minutes. The tannins content was calculated using a standard curve technique (Makinde *et al.*, 1985).

2.4.5 Alkaloids

Five grams of the sample were weighed into a 250 ml beaker and 200ml of 10% acetic acid in ethanol was then be added, the reaction mixture were covered and allowed to stand for 4 hour. This was filtered and the extract will be concentrated on a water bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop-wise to the extract until the precipitation is complete. The whole solution were allowed to settle and the precipitate was collected, washed with dilute ammonium hydroxide and then filtered; the residue being the alkaloid, which was dried and weighed to a constant mass(Makinde *et al.*, 1985).

2.4.6 Phlobatannins

About 0.5grams of the extract was dissolved in distilled water and filtered. The filtrate was boiled in 2% HCl, red precipitate show the present of phlobatannins. (Edeoga *et al.*,2015).

2.5 Determination of Proximate analysis of medicinal plants

The proximate parameters (moisture, dry matter, ash, crude fats, proteins and fibers, nitrogen, carbohydrates and energy values) were determined using Association of Official Analytical Chemists (AOAC) methods.

2.5.1 Determination of moisture content was done by drying samples in oven (WiseVen, WON-50, Korea) at 110 °C until constant weight was attained (Horwitz, 2003).

2.5.2 Nitrogen estimation was carried out by the micro-Kjeldahl (BUCHI, KjelFlex K-360, Switzerland) method with some modification (Hussain *et al.*, 2011).

2.5.3 The crude proteins were subsequently calculated by multiplying the nitrogen content by a factor of 6.25 (Hussain *et al.*, 2011) The energy value estimation was done by summing the multiplied values for crude protein,

2.5.4 Crude fat and carbohydrate respectively at Water Factors (4, 9 and 4). Crude fats were determined by Soxhlet apparatus using *n*-hexane as a solvent.

2.5.5 The ash values were obtained by heating samples at 550 °C in a muffle furnace (Wise Therm, FHP-03, Korea) for 3 h. (Hussain *et al.*, .2011).

2.5.6 The carbohydrate content was determined by subtracting the total crude protein, crude fiber, ash content and crude fat from the total dry matter (Horwitz, 2003).

2.5.7 Crude fiber was estimated by acid-base digestion with 1.25% H₂SO₄ (v/v) and 1.25% NaOH (w/v) solutions (Al-Harrasi *et al.*, .2012).

2.6 Antioxidant Assay

2.6.1 Determination of total phenol

The total phenol content of the extract determine by the method of (Singleton *et. al.*, 1999). 0.2ml of the extract was mixed with 2.5ml of 10% Folin ciocalteau's reagent and 2ml of 7.5% Sodium carbonate. The reaction mixture was subsequently incubated at 45oC for 40mins, and the absorbance was measured at 700nm in the spectrophotometer, garlic acid would be used as standard phenol (Al-Harrasi *et al.*, .2012).

2.6.2 Determination of total flavonoid

The total flavonoid content of the extract was determined using a colourimeter assay 0.2ml of the extract was added to 0.3ml of 5% NaNO₃ at zero time. After 5min, 0.6ml of 10% AlCl₃ was added and after 6min, 2ml of 1M NaOH was added to the mixture followed by the addition of 2.1ml of distilled water. Absorbance was read at 510nm against the reagent blank and flavonoid content was expressed as mg rutin equivalent (Akinboro et al., 2007).

2.6.3 Determination of ferric reducing property

The reducing property of the extract was determined by (Pulido *et al.*, 2000), 0.25ml of the extract was mixed with 0.25ml of 200mM of Sodium phosphate buffer pH 6.6 and 0.25ml of 1% KFC. The mixture was incubated at 50oC for 20min, thereafter 0.25ml of 10% TCA was also added and centrifuge at 2000rpm for 10min, 1ml of the supernatant was mixed with 1ml of distilled water and 0.1% of FeCl₃ and the absorbance was measure at 700nm.

2.6.4 Determination of free radical scavenging ability

The free radical scavenging ability of the extract against DPPH (1, 1- diphenyl-2-picrylhydrazyl) using (Gyamfi *et al.*, 1999) method. 1ml of the extract was mixed with 1ml of the 0.4mM methanolic solution of the DPPH the mixture was left in the dark for 30min before measuring the absorbance at 516nm.

2.6.5 Determination Fe²⁺ Chelation

The ability of the extract to chelate Fe²⁺ was determined using a modified method of Minotti and Aust (1987) by Puntel *et al.*, 2005. Briefly, 150mM FeSO₄ was added to a reaction mixture containing 168ml of 0.1M Tris-HCl pH 7.4, 218ml saline and extracted. The volume was made up 1ml with distilled water. The reaction mixture will be incubated for 5min, before the additional of 13ml of 1, 10-phenantroline the absorbance was read at 510nm (Mahata et al., 1997), (Gulcin *et al.*, 2010).

2.6.7 ABTS scavenging ability

2,2'-azino-bis (3-ethylbenthiazoline-6-sulphonic acid) (ABTS) scavenging ability. The ABTS scavenging ability of the extract was determined according to the method described by (Rath et al., 1995), (Puntel et al., 2005). The ABTS was generated by reacting an (7mM) ABTS aqueous solution with K₂S₂O₈ (2.45 mM/l, final conc.) in the dark for 16 hours and adjusting the absorbance at 734nm to 0.700 with ethanol 0.2 of the appropriate dilution of the extract was then added to 2.0ml of ABTS solution and the absorbance was read at 732nm after 15mins. The TROLOX equivalent antioxidant capacity was subsequently calculated.

2.6.8 Superoxide anion scavenging activity assay

The superoxide anion radicals were produced in 2 ml of phosphate buffer (100 mM, pH 7.4) with 78 µM β- nicotinamide adenine dinucleotide (NADH), 50µM nitro blue tetrazoliumchloride (NBT) and test samples at different concentrations. The reaction mixture was kept for incubation at room temperature for 5 min. It was then added to 5-methylphenazinium methosulphate (PMS) (10 µM) to initiate the reaction and incubated for 5 min at room temperature. The colour reaction between superoxide anion radical and NBT was read at 560 nm. Gallic acid was used as a positive control agent for comparative analysis. The reaction mixture without test sample was used as control and without PMS was used as blank. (Selvakumar K. *et al.*, 2001).

3.0 Results

The results of the present study are depicted in Tables 1- 5 and Figs 1-8.

216 **Table 1- Qualitative analysis of the phytochemical screening of *Morinda lucida***

SAMPL ES	Flavonoi ds	Alkaloid ss	Cardia c glcosid es	Saponi ns	Steroi ds	Antraquino nes	Pheno ls	Tanni ns
<i>Morinda lucida</i> leaf	–	+	+	+	+	+	+	+
<i>Morinda lucida</i> bark	-	+	+	+	+	+	+	+
<i>Morinda lucida</i> stem	+	+	+	+	+	+	+	+

217
218 KEY: (-) = NEGATIVE
219 (+) = POSITIVE

220 Table 1 shows the presence of secondary plant metabolites. It was observed that only ethanol
221 extract of the stem has the flavonoids while alkaloids, cardiac glycosides, saponins, steroids,
222 anthraquinones, tannins are present in the ethanol extract of the leaf, bark and root

223
224 **TABLE 2: Quantitative chemical analysis of minerals present in the ethanol extract of**
225 ***Morinda lucida***

SAMPLE	Na	K	Ca	Mg	Zn	Fe	Pb	Cu	Mn	P
<i>Morinda lucida</i> leaf	20.33	41.24	15.33	25.38	18.71	4.38	ND	ND	15.34	85.42
<i>Morinda lucida</i>	20.01	26.17	31.42	22.06	25.02	5.70	ND	0.01	6.20	25.12

bark										
<i>Morinda lucida</i> stem	19.82	24.77	29.49	24.21	36.10	6.53	ND	0.02	5.45	35.78

ND = Not detected.

Table 2 shows the quantitative chemical analysis of minerals present in the ethanol extract of *M. lucida* leaf, stem and bark. Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Copper (Cu), Manganese (Mn) and Phosphorus (P) were found in the leaf, stem and bark. Copper was not found in the leaf. Lead was not found in the leaf stem or bark.

Table 3: Quantitative analysis of anti-nutrient present in plant extracts in percentage (%)

PARAMETERS	LEAF	BARK	STEM
Tannins	2.25	ND	ND
Phenols	3.47	ND	ND
Phylates	12.42	1.25	1.30
Oxalates	8.59	1.50	2.00
Saponins	7.60	ND	ND
Flavonoids	10.40	ND	ND
Alkaloids	4.37	ND	ND

ND = Not detected

Table 3 shows the quantity and composition of anti-nutrient in ethanol extracts of *M. lucida* in percentage. The crude leaf extracts contains phylates and flavonoids and it has the largest deposit of the anti-nutrient, which are 12.40% and 10.40% respectively. Only phylates and oxalates are found in the bark (1.25% and 1.50% respectively) and stem extracts (1.30% and 2.00 respectively).

Table 4: Quantitative analysis of proximate nutrient composition of *Morinda lucida* ethanol extracts

SAMPLES	% Ash	% MC	% Fat	% CP	% Fibre	% CHO
<i>Morinda lucida</i> leaf	8.75	7.35	16.19	5.42	8.55	53.74
<i>Morinda lucida</i> bark	10.56	9.12	14.45	6.59	10.33	42.59
<i>Morinda lucida</i> stem	10.12	9.00	12.01	6.55	10.12	41.17

MC = Moisture content

CHO = carbohydrate

CP = Crude protein

Table 4 shows the proximate nutrient percentage composition of ethanol extracts of *M. lucida* contain Carbohydrates, moisture, ash, fats crude protein and fibre. It was observed that carbohydrates and fat has the highest quantity in the ethanol extract of the leaf with 53.74% and 16.19% respectively. The ethanol extract of the bark has the highest quantity of fibre, crude protein, moisture content and ash with 10.33%, 6.59%, 9.12% and 10.56% respectively.

TABLE 5: Antioxidant assay of ethanol extract of *M. lucida*

CONCENTRATION	STEM			BARK			LEAF		
	5mg/ml	10mg/ml	20mg/ml	5mg/ml	10mg/ml	20mg/ml	5mg/ml	10mg/ml	20mg/ml
PHENOLS	5.3421055	10.57292	16.217105	5.2467105	10.35033	15.61294	8.506031	17.059755	25.56579
FLAVONOIDS	3.3457395	7.671733	11.633135	3.180282	5.691031	8.731827	3.710329	7.6996305	11.158885
FRAP	10.876	20.594	30.866	12.034	26.082	36.395	13.998	28.600	42.447

	235	34	345	35	815	165	115	46	515
Fe²⁺	21.839	33.524	53.256	27.014	40.537	55.651	35.536	51.436	61.685
	08	9	705	49	245	34	395	785	82
H₂O₂	19.349	34.055	49.535	25.696	32.972	51.083	34.210	48.606	60.835
	845	73	6	595	135	59	525	81	915
ABTS_μ	14.196	16.895	19.194	19.650	21.456	22.748	14.557	17.218	19.612
	505	175	74	86	305	625	6	255	85
DPPH	9.6486	27.783	45.648	32.810	49.675	59.283	17.081	35.972	48.864
	49	78	65	81	675	78	08	975	865
SO	15.355	32.209	59.737	19.288	33.520	77.902	30.149	49.812	61.423
	81	74	825	39	6	625	815	73	22

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259 KEY:

260 FRAP = Ferric reducing property

261 ABTS_μ = Azinobis,3-ethylbenthiazoline,6-sulphuric acid

262 DPPH = Diphenyl-2-picrylhydrazyl

263 SO = Superoxide

264 H₂O₂ = Hydrogen peroxide

265 Table 5 show the in-vitro antioxidant activity of the ethanol extracts of *M. lucida*. It was
 266 observed that the extract has phenol, ABTS_μ (Azinobis,3-ethylbenthiazoline,6-sulphuric acid),
 267 Fe²⁺, FRAP (Ferric reducing property), DPPH (Diphenyl-2-picrylhydrazyl), H₂O₂ (Hydrogen
 268 peroxide) and

269 SO (Superoxide) activity in 5, 10 and 20 mg/ml concentration of the leaf, stem and bark extracts.

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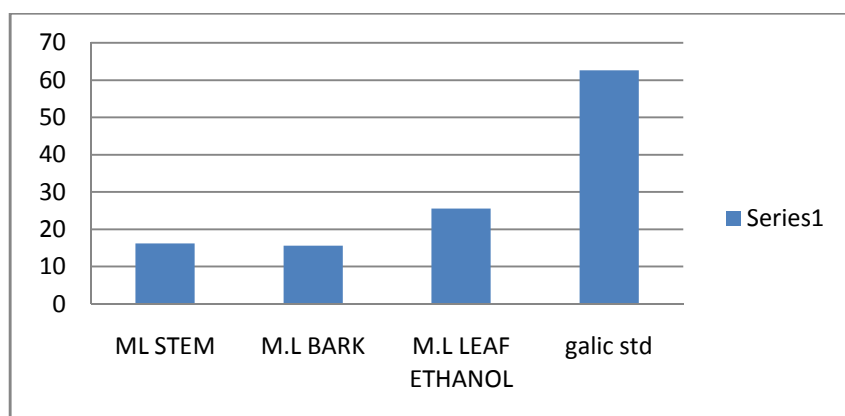
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277 **FIG 1: Phenol content of antioxidant property in-vitro of *Morinda lucida***

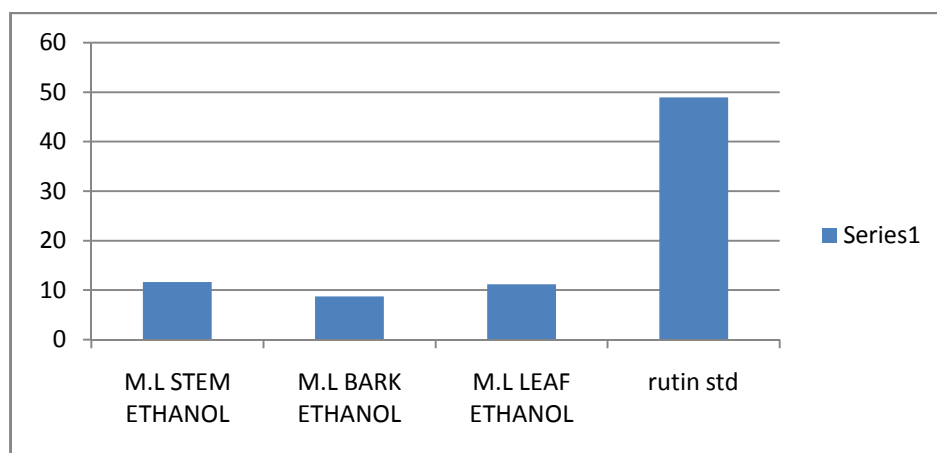


278 Phenol:

<i>Morinda lucida</i> Stem Ethanol	16.21711
<i>Morinda lucida</i> Bark Ethanol	15.61294
<i>Morinda lucida</i> Leaf Ethanol	25.56579
Garlic	62.65

280 Figure 1 represents the phenol activity of the antioxidant property of the ethanol extracts of the
281 parts of *Morinda lucida*. The leaf has the highest value and the bark the least with 25.56579 and
282 15.61294 respectively.

284 **FIG 2: Flavonoid content of antioxidant in-vitro of *Morinda lucida***

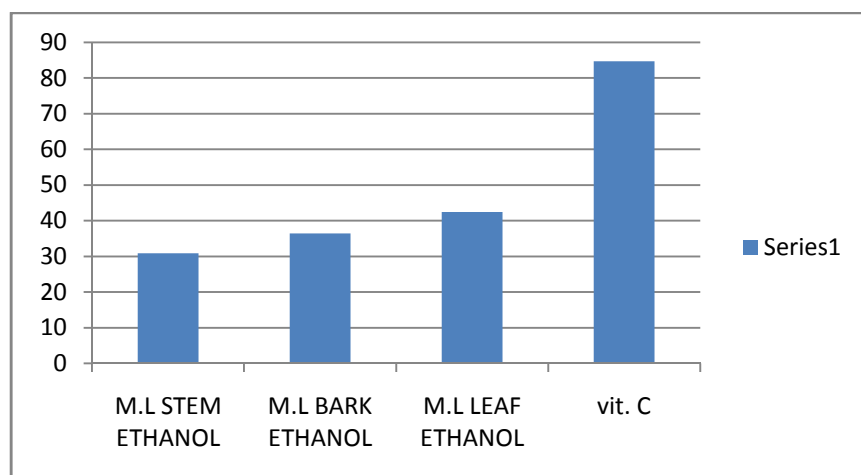


Flavonoid :

<i>Morinda lucida</i> Stem Ethanol	11.63314
<i>Morinda lucida</i> Bark Ethanol	8.731827
<i>Morinda lucida</i> Leaf Ethanol	11.15889
Rutin standard	47.085892

Figure 2 represents the flavonoid content of the ethanol extract of *Morinda lucida*. The stem has the highest value and the leaf has the lowest values with 11.63314 and 8.731827 respectively.

FIG 3: FRAP content of antioxidant in-vitro of *Morinda lucida*



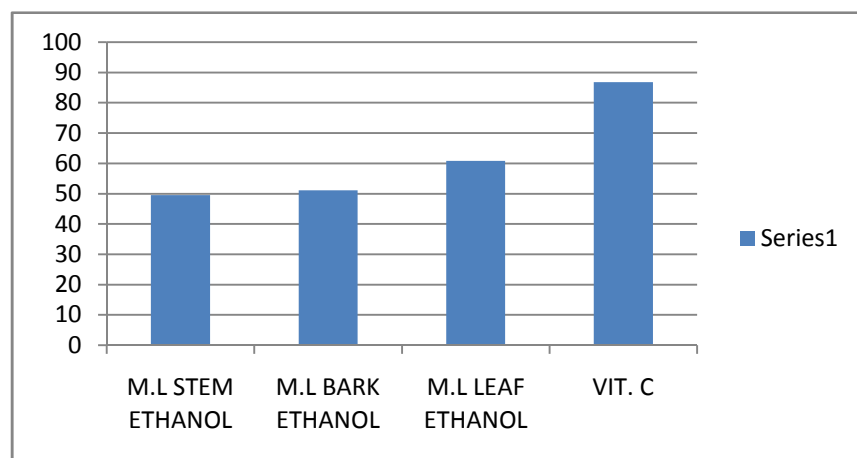
FRAP: Ferric reducing property

<i>Morinda lucida</i> Stem Ethanol	30.86635
<i>Morinda lucida</i> Bark Ethanol	36.40517
<i>Morinda lucida</i> Leaf Ethanol	42.44752
Vitamin C	84.713

Figure 3 represents the Ferric reducing property of the ethanol extract of *Morinda lucida*. The leaf has the highest value and the stem has the lowest values with 42.44752 and 30.86635 respectively.

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FIG 4 : H₂O₂ content of antioxidant in-vitro of *Morinda lucida*



H₂O₂ %

<i>Morinda lucida</i> Stem Ethanol	49.5356
<i>Morinda lucida</i> Bark Ethanol	51.08359
<i>Morinda lucida</i> Leaf Ethanol	60.83592
Vitamin C.	86.766

Figure 4 represents the Hydrogen peroxide activity of the ethanol extract of *Morinda lucida*. The leaf has the highest value and the stem has the lowest values with 60.83592 and 49.5356 respectively

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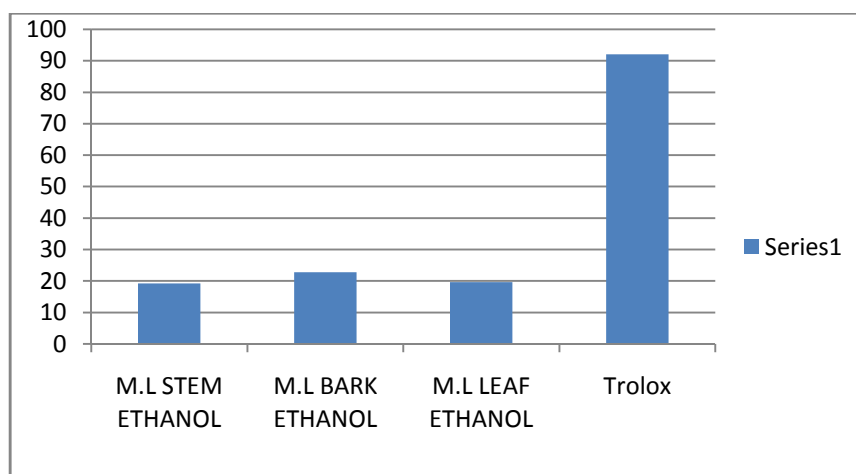
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307 **FIG 5: ABTS content of antioxidant in-vitro of *Morinda lucida***



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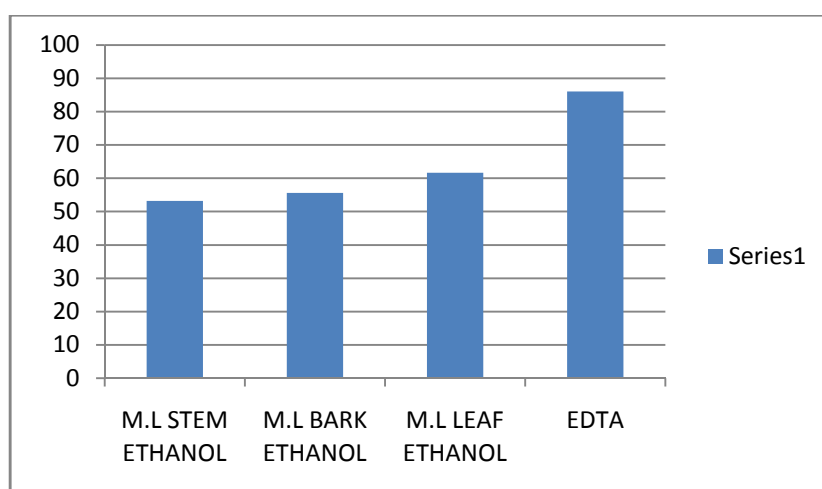
309 ABTS μM/g % (Azinobis 3-ethylbenthiazoline, 6- sulphuric acid)

<i>Morinda lucida</i> Stem Ethanol	19.19474
<i>Morinda lucida</i> Bark Ethanol	22.14863
<i>Morinda lucida</i> Leaf Ethanol	19.61285
Trolox	92.0724

310

311 Figure 5 represents the ABTS antioxidant activity of the ethanol extract of *Morinda lucida*. The
 312 bark has the highest value and the stem has the lowest values with 22.14863 and 19.19474
 313 respectively.

314 **FIG 6: Fe²⁺ content of antioxidant in-vitro of *Morinda lucida***



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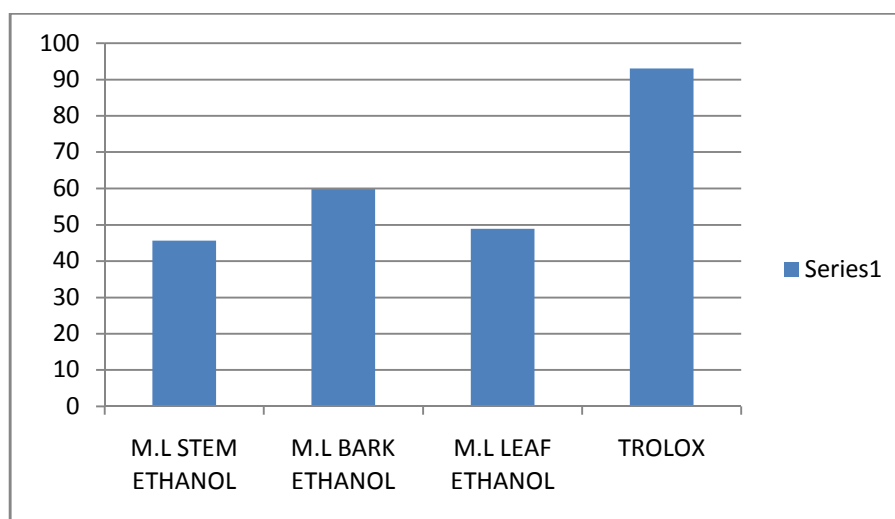
316 Fe²⁺ % :

<i>Morinda lucida</i> Stem Ethanol	53.25671
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<i>Morinda lucida</i> Bark Ethanol	55.65134
<i>Morinda lucida</i> Leaf Ethanol	61.68582
EDTA	86.094

Figure 6 represents the Iron reducing antioxidant property of the ethanol extract of *M. lucida*. The leaf has the highest value and the stem has the lowest values with 61.68582 and 53.25671 respectively.

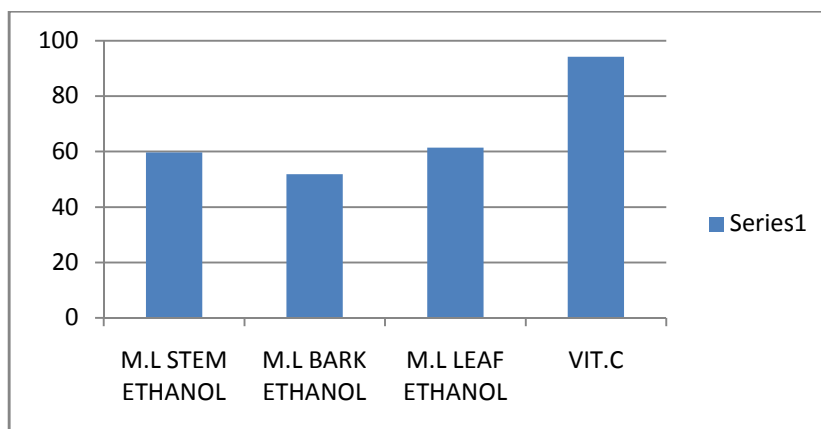
FIG 7: DPPH content of antioxidant in-vitro of *Morinda lucida*



DPPH %

<i>Morinda lucida</i> Stem Ethanol	45.64865
<i>Morinda lucida</i> Bark Ethanol	59.78378
<i>Morinda lucida</i> Leaf Ethanol	48.86487
Trolox	93.002

FIG 8: SO content of antioxidant in-vitro of *Morinda lucida*



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331 SO % : (Superoxide)

<i>Morinda lucida</i> Stem Ethanol	59.73783
<i>Morinda lucida</i> Bark Ethanol	51.87266
<i>Morinda lucida</i> Leaf Ethanol	61.42322
Vitamin C.	94.207

332

333 Figure 8 represents the Superoxide antioxidant property of the ethanol extract of *M. lucida*. The
 334 leaf has the highest value and the stem has the lowest values with 61.68582 and 53.25671
 335 respectively.

336

337 4.0 DISCUSSION

338 Elemental composition, evaluation of antinutrient and antioxidant potential of the ethanol extract
 339 of *M. lucida* leaf, stem and bark were investigated in the present study. It was observed that the
 340 plant contained many bioactive compounds. The ethanol extracts contain flavonoids and
 341 anthraquinones which are known antioxidants (Yen *et al*, 2000). Flavonoids are known to have
 342 anti-microbial, anti-ulcer, anti-virus and anti-tumor properties (Osuntokun, et al, 2015). They
 343 also affect platelet aggregation. The presence of flavonoids may play a role in its folkloric
 344 use. The actions due to the presence of different trace elements play a major role in the
 345 prevention and management of some infections and communicable diseases. It may also be a
 346 source of trace elements in the prevention and management of some nutritional disorders. This is
 347 an important property of the medicinal plant, nutrients like Calcium (Ca), Magnesium (Mg), Zinc
 348 (Zn), Iron (Fe), Potassium (K) and Phosphorus (P) play major roles in the chemical balance of
 349 human system and food preservation. Toxic Lead (Pb) was not detected in all parts under

investigation. The composition of anti-nutrient content (Phenols, Phylates, Tannins, Oxalates, Saponin, Flavonoids and Alkaloids) in the ethanol extract of leaf, bark and stem of *Morinda lucida* were also studied. Such compounds are known to have biological activities such as free radicals scavenging and antioxidant potential which may be able to protect the body from diseases. There is also increasing proof that antioxidants derived from indigenous plants may be useful in preventing oxidative stress, thus there is increasing interest in the protective biochemical activity with natural antioxidants present in medicinal plants. The proximate analysis of the ethanol content of *Morinda lucida* gave the observation that the plant contain Carbohydrates, Crude protein, Fats, Fibre, Moisture Content and Ash which supports the claim that the plant is edible and nutritious.

5.0 CONCLUSION

This research work presented demonstrated that the ethanol extracts of leaf, stem and bark of *Morinda lucida* have antioxidant activity and is nutritious due to its chemical composition. The current findings are a step forward to increasing knowledge and usefulness of *Morinda lucida* as a medicinal plant. The free radical scavenging potential, confirmation of the antioxidant activity and its nutritious value add to the value of *M. lucida* and detailed studies are warranted.

6.0 RECOMMENDATION

It is thereby recommended that medicinal plants such as *Morinda lucida* should be studied and exploited for future use.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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