Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

PHYTOCHEMICALS AND ANTIMICROBIAL SCREENING OF THE EXTRACTS OF *JATROPHA GOSSYPIFOLIA LEAF* (BELLYACHE BUSH)

Yakubu Newman Monday[1,3]*, Hussein Muhammed Jamiu[1], Oparanozie Tochukwu I[2], Isah Yinusa[1]

[1]Federal University Lokoja, Faculty of Science, Department of Chemistry, Kogi State, Nigeria.
[2]Maritime University Okerenkoko, Chemistry Unit, School of Basic Sciences, Delta State, Nigeria.
[3]University Putra Malaysia, Faculty of Science, Department of Chemistry, 43400, Serdang, Selangor.
*Corresponding author. E-mail: sirnewman4truth@gmail.com,
*Phone: **+2348063441992**, **+60103489958**

ABSTRACT

Jatropha gossypifolia is one of the most useful medicinal plants in many African countries, the leaf being one of the parts of the plant generally used for this purpose. This study thus, evaluated the phytochemical constituents and antimicrobial screening analysis of the crude extract of the leaf of this plant (Bellyache Bush) using standard methods. The phytochemical screening revealed the presence of terpenoids, flavonoids, glycosides, tannins, saponins, alkaloids, carbohydrates and phenol while anthraquinones and steroids were absent. The antimicrobial screening of the leaf extract of the plant was carried out on the following microorganisms; Staphylococcus aureus, Escherichia coli, Klebsiella Pneumonia, Salmonella typhi and Vibrio cholerae, to determine their activities. The antimicrobial screening result showed that four (4) of the microorganisms were sensitive to all the three (3) extracts and one (1) was resistant to the extract and the zone of inhibition observed for the microbes; Staphylococcus aureus, Escherichia coli, Klebsiella Pneumonia, Salmonella typhi and Vibrio cholerae. The ethanol extract showed the highest zone of inhibition values ranging from 25 to 28mm while n-hexane extract showed the lowest values ranging from 20 to 22mm. This shows that the plant can be a source of useful drugs but further studies are required to isolate the active components from the various plant extracts for proper drug development. Minimum Inhibitory Concentration for all extracts and all organisms was within the range of 2.5 – 5 mg/ml except for Klebsiella pneumonia which showed resistance to all extracts. Minimum Batericidal Concentration for all extracts and all organisms ranged from 5 – 20 mg/ml except for Klebsiella pneumonia which, expectedly, showed resistance to all extracts.

Key words: *Jatropha gossypifolia, Bellyache Bush, phytochemicals, antimicrobials, Lokoja,*

1.0 Introduction

The world is blessed with many medicinal plants; hence, medicinal plants are now more focused on because they are capable of producing many beneficial bioactive substances to the society and the world at large especially in the line of herbal medicine. The medicinal power of these plants lies in phytochemical constituents that cause definite pharmacological actions on the human body (Ankita *et al*., 2012).

Recently, there has been a considerable growth in the field of herbal medicine due to its natural origin and lesser side effects compare with modern synthetic medicine. It is known that plants and plant parts are source of herbal medicine and natural health enhancing products for many centuries (Oladele *et al*., 2011). Various plant parts e.g. fruits, seeds, bark, flowers, roots, stem have in one way or

***Corresponding Author**
How to cite this paper: Yakubu Newman Monday, Hussein Muhammed Jamiu, Oparanozie Tochukwu I., Isah Yinusa (2018).
Phytochemicals and antimicrobial screening of the extracts of jatropha gossypifolia leaf (Bellyache Bush)
Confluence Journal of Pure and Applied Sciences (CJPAS), 1 (2), 170-180.

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

the other been used for medicinal purposes. It is estimated that about 75% of useful bio active plant-derived pharmaceuticals used widely are discovered by systematic investigation of leads from traditional medicine (Kuete and Efferth, 2010).

The availability of medicinal plants has made traditional medicine relatively cheaper than modern medicine. Traditional herbal medicine is considered an important component of health care in sub-Saharan Africa (Katere and Luseba, 2010). This may be attributed largely to poverty, inadequacy of health services and shortage of health workers. Even when the facilities exist, there is high shortage of drugs and equipment (Hilmi *et al.*, 2014).

Many drugs have plant origin and several plants are currently undergoing investigation to ascertain their therapeutic efficacy (Kipkore *et al.,* 2014).

In the present study, the leaf of *Jatropha gossypifolia* (bellyache bush) was subjected to phytochemical screening and antimicrobial screening with the hope of encouraging the traditional usage of this forest leaf and possible recommendation for its medicinal value (Wadankar *et al*., 2011).

Jatropha gossipifolia is commonly known as black physic nut, bellyache bush or cotton-leaf. It is a species of flowering plant in the spurge family. It is a tropical species that originates from South America and is cultivated in tropical countries throughout the World (Falodun *et al*., 2012).

The name of the plant is derived from the Greek words "iatros" meaning physician and "trophe" meaning nutrition, hence the name "physic nut". *Jatropha gosspifolia* could be called traditionally as Lapalapa (Yoruba), Ochigaoyivo (Ebira), Cini da zugu (Hausa) and Wuluidu (Igbo).

Below is the botanical profile of the plant;

Kingdom Plantae
Phylum Angiosperm
Class Eudicots
Order Malpighiales
Family Euphorbiaceae
Genus Jatropha
Species *J. gossypifolia*

J. gossypifolia is a small shrub with dark green or more frequently purplish-red dark leaves, with 16–19 cm of length per 10–12.9 cm of width; they are alternate, palmate, and pubescent, with an acuminate apex, cordate base, and serrated margin. The flowers are unisexual, purple, and in cymose summits, with the calyx having five petals, which in male flowers may form a petaloid tube. The fruit is capsular, with three furrows, containing a dark seed with black spots (Khyade and Vaikos, 2011).

Several human and veterinary uses in traditional medicine are described for different parts (leaves, stems, roots, seeds, and latex) and preparations (infusion, decoction, and maceration, among others) based on this plant, by different routes (oral or topical). The most frequent reports concern its antihypertensive, anti-inflammatory, antiophidian, analgesic, antipyretic, antimicrobial, healing, antianemic, antidiabetic, and antihemorrhagic activities, among many other examples (Sabandar *et al*., 2013). Regarding its phytochemical constitution, alkaloids, coumarins, flavonoids, lignoids, phenols, saponins, steroids, tannins, and terpenoids were already detected in different extracts from different parts of this plant (Zhang *et al*., 2009). Among the main activities already studied for this species (including various types of extracts from different parts of the plant), the antihypertensive, antimicrobial, anti-inflammatory, antioxidant, and antineoplasic activities mainly stand out,

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

supporting some of its popular uses (Sharma and Singh, 2012). Some toxicity studies have shown that despite the known toxicity of Jatropha species, *J. gossypifolia* presented low toxicity in some *in vitro* and *in vivo* experiments. However, some studies have indicated that ethanolic extract from the leaves, in acute oral use, is safe for rats, but with chronic use, it could be toxic (Mariz *et al*., 2012).

1.1 Folkloric use of *Jatropha gossypifolia*
Various medicinal properties for the species *Jatropha gossypifolia* have been reported by traditional practitioners. *Jatropha gossypifolia* is used in folkloric system to manage emesis and gastrointestinal motility disorders such as constipation and diarrhea. It is used medicinally as an analgesic, treating eczema, healing of wounds, as an antianemic and for treating impetigo (Lara-corrales and Pope, 2010). A decoction of the bark is used as an emmenagogue. The leaves are purgative and can be applied to boils, carbuncles and itches. Different parts of this plant such as leaves, root, seeds and latex, in different forms of preparation (decoction, Infusion and Maceration) and by different routes and forms (oral, baths, topical) have been used for various medicinal purposes (Sabandar *et al.*, 2013). Some properties are attributed to specific parts of the plant, while others are assigned to different parts. Interestingly, in some cases certain uses may appear contradictory, such as antidiarrheal and laxative or its use as anticoagulant and antihemorrhagic. One hypothesis is that this difference may be related with the dose used, since, for example, the laxative effect is an effect commonly related with toxic events with this plant (Sharma and Singh, 2012). In general, some extent of antibacterial, antifungal, antiparasitic, and antiviral activity has been observed. The only report of a *J. gossypifolia* isolated compound with antimicrobial activity is of the macrocyclic diterpene Jatrophenone, which presented significant *in vitro* antibacterial activity against *Staphylococcus aureus* (Bullangpoti *et al*., 2011).

Fig.1 Image of *Jatropha gossypifolia* plant (bellyache bush).

1.2 Chemical constituents of *Jatropha gossypifolia*
Various chemical constituents have been detected in extracts from different parts of *J. gossypifolia*, the literature having reported, in general, the presence of fatty acids, sugars, alkaloids, amino acids, coumarins, steroids, flavonoids, lignans, proteins, saponins, tannins, and terpenoids. Accordingly reviewed by Sabandar *et al.*, (2013), the main compounds isolated from Jatropha genus are the terpenoids.
However, it is important to note that most of the phytochemical studies found in literature are not about isolation of compounds, but only about the phytochemical screening of the major classes through chemical qualitative reactions. Relative to other Jatropha species, few studies have isolated chemical compounds from *J.*

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

gossypifolia. In addition, up till now it is not clear which are the major bioactive compounds in the plant, since only a few studies were conducted by bioassay-guided isolation (Parvathi *et al*., 2012).

2.0 Materials and method

2.1 Plant materials

Fresh leaves of *Jatropha gossypifolia* were collected and authenticated by a botanist at the Herbarium Unit of the Department of Biological Sciences, Federal University Lokoja, Kogi State, Nigeria. The fresh leaf samples were air-dried 20 days in the Chemistry laboratory, Federal University Lokoja, Kogi state, Nigeria. The sample was pulverized using wooden mortar and pestle. The pulverized sample was sieved with a 2mm sieve and then stored in an air-tight glass bottle in a cool dry place before extraction.

2.2 Chemicals and reagents

All reagents used were of analytical grade and were used as supplied. Three (3) different solvents were used for extraction; n-hexane, ethanol and methanol. Distilled water was used throughout the study wherever water was needed. Reagents as well as chemicals that were used for the qualitative analysis include; Distilled water, ethanol, acetic anhydride, methanol, dimethyl sulfoxide (DMSO), chloroform, sodium hydroxide, ferric chloride ($FeCl_3$) solution, hydrochloric acid, n-hexane, Mayer's reagent (potassium mercuric iodide), sulphuric acid, Wagner's reagent (iodine + potassium iodide in water), Fehling's solution A and B. All chemicals were used as obtained from JHD China.

2.3 Apparatus and equipment

Test tubes, measuring cylinder**,** spatula**,** beakers**,** steam bath, analytical balance**,** pipette**,** separating, funnel, conical flask**,** ultra violet- visible spectrometer**,** rotary evaporator, Ultra violet lamp (254nm)**,** petri dish.

All the glasswares used were rinsed with distilled water in other to remove impurities, dried and allowed to cool to normal temperature while those used for antimicrobial assay were properly sterilized.

2.4 Extraction of phytochemicals

The powdered sample was extracted successively using Serial Exhaustive Extraction method (Yusha'u, 2011). 150g each of the powdered sample was placed in a covered bottle and extracted with 250ml of n-hexane, ethanol, and methanol respectively, the mixture was shaken mildly for a homogenous mixture for about 3 minutes. The resulting mixture was filtered using Whatman's no.1 filter paper into a conical flask after standing for 72 hours. The filtrate was poured into beakers and the solvent was allowed to evaporate, the crude extract obtained was used for the analysis.

2.5 Identification of the phytochemicals

The various extracts were tested for the presence or absence of anthraquinone, flavonoids, saponins, tannins, terpenoids, alkaloids, phenol, glycosides, steroids and carbohydrates using standard methods described by (Yusuf *et al.,*2014; ***Satheesh et al., 2012 and*** Kumar *et al.,* 2013).

2.6 Antimicrobial screening

The antimicrobial activities of n-hexane, methanol and ethanol plant extracts of *Jatropha gossypifolia* were determined using some pathogenic microbes e.g *Staphylococcus aureus, Escherichia Coli, Vibrio cholera, Klebselia pneumonia* and *Salmonella typhi.* The microbes were obtained from the Department of Medical Microbiology,

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

Ahmadu Bello University Teaching Hospital, Zaria.

2.7 Preparation of microbial culture

The extract of *Jatropha gossypofolia* (0.2g) was weighed and dissolved in 10ml of DMSO to obtain a concentration of 20mg/ml. This was the initial concentration of each extract that was used to determine the antimicrobial activities of the plant. Dilution method was the method used for screening the extracts.

2.8 Media for microbial growth

Mueller Hinton agar (Sigma Aldrich) was the medium used as the growth medium for the microbes. The medium was prepared according to the manufacturer's instructions, sterilized at 121°c for 15mins, poured into sterile Petri dishes and was allowed to cool and solidify. The sterilized medium was seeded with 0.1ml of the standard inoculums of the test microbe. The inoculum was spread evenly over the surface of the medium by the use of a sterile swab. By the use of a standard cork borer of 6mm in diameters, a well was cut at the center of each inoculated Mueller Hinton agar medium.

3.0 Results and discussion

3.1 Phytochemicals

The phytochemical screening of the crude extract of the leaf of *Jatropha gossypifolia* leaf is presented in Table 1. The phytochemical analyses of the crude extract of *Jatropha gossypifolia (*Bellyache bush) leaf which was carried out on the grounded and powdered crude extract reveal the presence of the following metabolites: Carbohydrates, glycosides, terpenoids, flavonoids, steroid, saponin, phenol, alkaloids as well the absence of anthraquinone and tannins. Tannins, saponins, alkaloids and flavonoids have been suggested to be involved in anti-bacterial and anti-viral activities, while tannins and flavonoids are thought to be responsible for anti-diarrheal activity. Thus, the presence of these phytochemicals in *Jatropha gossypifolia* explains why it is used in the treatments of diarrhea, impetigo and many other acclaim ailments.

The absence of tannins in the leaf is contrary to the findings of Yesufu and Hussaini 2014, who reported the presence of tannins in aqueous and ethanolic extracts of the fruit. This disparity may be attributed to the chronological age of the plant, percentage humidity of the harvested material, situation and time of harvest, and whether the method of extraction was a possible source of variation for the chemical composition, toxicity and bioactivity of the extracts (Bright *et al*., 2013). It has been reported that most active ingredients in plants and vegetables are frequently saponins, steroids, alkaloids, flavonoids and phenols and these may be responsible for many of the pharmacological actions of such plants.

Table 1. Phytochemical Constituent of Crude Extract of the Leaf of *Jatropha gossypifolia* carried out on powdered plants crude extract

Phytochemicals	Result
Anthraquinone	-
Flavonoids	+
Terpenoids	+
Cardiac glycosides	+
Tannins	-
Steroid	+
Saponins	+
Alkaloids	+
Carbohydrates	+
Glycosides	+

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

Key: + = Present, - = Absent

3.2 Antimicrobial Screening of *Jatropha gossypifolia*

To ascertain the biological activities of the various extracts, antimicrobial screening was carried out on the following clinical isolates; *Staphylococcus aureus, Escherichia coli, Vibrio cholerae, Klebselia pneumonia, Salmonella typhi, and Vibrio cholereae.* The crude extracts from the *Jatropha gossypifolia leaf* were active on *Staphylococcus aureus, Escherichia coli, Salmonella typhi, and Vibrio cholereae* which means the extracts were sensitive on the microbes while *Klebsiella pneumonia,* showed resistance to the leaf extracts of the plant. Ciprofloxacin was used as control. These activities could be due to the presence of some very bioactive substances; *Staphylococcus aureus, Escherichia coli, Salmonella typhi, and Vibrio cholereae* in the plant as shown in the table 2 below

Table 2: Antimicrobial Activities of the Solvent Extracts of *Jatropha gossypifolia* Leaf

KEY: S = Sensitive, R = Resistance

Test Organism	Ciprofloxacin	n-hexane	Methanol	Ethanol
Staphylococcus aureus	S	S	S	S
Escherichia coli	S	S	S	S
Klebsiella pneumonia	S	R	R	R
Salmonella typhi	S	S	S	S
Vibrio cholereae	S	S	S	S

Table 3: Zone of Inhibition (mm) of the solvent of *Jatropha gossypifolia* Leaf.

Test Organism	Ciprofloxacin	n-hexane	Methanol	Ethanol
Staphylococcus aureus	32	21	23	25
Escherichia coli	38	20	25	28
Klebsiella pneumonia	28	0	0	0
Salmonella typhi	41	22	24	27
Vibrio Cholereae	23	20	24	28

3.3 Zone of Inhibition (mm) of the solvent extract of *Jatropha gossypifolia* against the test organism.

The zones of inhibition of the solvent extract could be observed for *Staphylococus aureus* to be highest for ethanol extract, followed by methanol extract, and n-hexane extract of the plant in the following order: ethanolic extract > Methanol > n-hexane with zone of inhibition value of (28 > 24 > 20) respectively. This means that ethanol leaf extract is very active on the organism while n-hexane leaf extract is less active on the organism as shown in the table 3 above. This finding is in consonance with an earlier study which found ethanol extract to strongly inhibit *Bacillus cereus* and *Staphylococcus aureus* (Vinothkumar et al 2010).

Table 4: Minimum Inhibition Concentration (MIC) of the n-hexane Extracts of leaf of Jatropha gossypifolia

Test Organism	n-hexane Extract g/ml					
	2	1	5n	2	1.2	0.62
Staphylococcus aureus	-	-	o*	+	++	+++
Escherichia coli	-	-	o*	+	++	+++
Klebsiella pneumonia						
Salmonella typhi	-	-	o*	+	++	+++
Vibrio cholereae	-	-	o*	+	++	+++

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

KEY:-

- = No turbidity (no growth)
o* = MIC
+ = Turbidity (Light growth)
++ = Moderate turbidity
+++ = High turbidity

.4 Minimum Inhibition Concentration (MIC) of the n-hexane Extracts of leaf of Jatropha gossypifolia

Minimum inhibitory concentration experiment was carried out on the organisms that were sensitive to the extracts in order to establish the concentration at which the extracts will inhibit or kill the organisms. MIC values were obtained thus; the n-hexane leaf extract of ***Jatropha gossypifolia*** had MIC values on *Staphylococcus aureus*, *Escherichia coli, Salmonella typhi and Vibrio cholereae at* 5mg/ml. while *Klebsiella pneumonia* show resistance to the extract as shown in table 4 above.

Table 5: Minimum Inhibition Concentration (MIC) of the Methanolic Extract of leaf of *Jatropha gossypifolia*

Test Organism	Methanolic Extract					
	[illegible]	[illegible]	5[illegible]	2.[illegible]	1.2 g/ml	0.6[illegible]
Staphylococcus aureus	-	-	o*	+	++	+++
Escherichia coli	-	-	-	o*	+	++
Klebsiella pneumonia						
Salmonella typhi	-	-	-	o*	+	++
Vibrio cholereae	-	-	o*	+	++	+++

KEY:-

- = No turbidity (no growth)
o* = MIC
+ = Turbidity (Light growth)
++ = Moderate turbidity
+++ = High turbidity

3.5 Minimum Inhibition Concentration (MIC) of the methanol Extracts of *Jatropha gossypifolia* Leaf

The Minimum Inhibitory Concentrations (MIC) experiment of the methanolic leaf extract was equally determined further to ascertain the activities of the extract. MIC values of the methanol leaf extract of ***Jatropha gossypifolia*** was observed to inhibit the growth of *Staphylococcus aureus, Escherichia coli, Salmonella typhi and Vibrio cholereae* at concentration 5mg/ml, 2.5mg/ml, 2.5mg/ml and 5mg/ml respectively while *Klebsiella pneumonia* shows resistance to the extract as presented in the table 5 above. The high inhibitory activity of methanol extract has earlier been reported by Ezeabara and Egenti (2018) thus corroborating the findings of this study.

Table 6: Minimum Inhibition Concentration (MIC) of the ethanol Extract of *Jatropha gossypifolia* Leaf

Test Organism	Ethanol Extract					
	2[illegible]	1	5m	2.[illegible]	1.[illegible] g/ml	0.62
Staphylococcus aureus	-	-	o*	+	++	+++
Escherichia coli	-	-	-	o*	+	++
Klebsiella pneumonia						
Salmonella typhi	-	-	-	o*	+	++
Vibrio cholereae	-	-	-	o*	+	++

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

KEY:-

- = No turbidity (no growth)
o* = MIC
+ = Turbidity (Light growth)
++ = Moderate turbidity
+++ = High turbidity

3.6 Minimum Inhibition Concentration (MIC) of the Ethanol Extract of *Jatropha gossypifolia Leaf.*

The Minimum Inhibitory Concentrations (MIC) experiment of leaf extract was equally determined further to ascertain the activities of the extract. MIC values of the ethanol leaf extract of ***Jatropha gossypifolia*** was observed to inhibit the growth of *Staphylococcus aureus, Escherichia coli, Salmonella typhi and Vibrio cholereae* at concentration 5mg/ml, 2.5mg/ml, 2.5mg/ml and 2.5mg/ml respectively while *Klebsiella pneumonia* shows resistance to the extract as presented in Table 6.

The results obtained above for MIC of n-hexane, methanol and ethanol agree with the results gotten by Packialakshmi and Archana, (2014) comparison of their result with this work. On the leaf extracts of *Jatropha gossypifolia* using n-hexane, chloroform and methanol with MIC values at concentration 10mg/ml, 5mg/ml and 2.5mg/ml respectively, it was found the extracts are effective and so inhibit the growth of the following bacteria; *Staphylococcus aureus Salmonella typhi, Escherichia coli, Vibrio cholereae* but shows resistance on *Klebsiella pneumonia.*

3.7 Minimum Bactericidal Concentration (MBC) of the n-hexane Leaf Extract from *Jatropha gossypifolia.*

This was carried out so as to know if the organism is completely terminated or just inhibited by the extracts. The MBC results were observed to be a little above the MIC values. The MBC value was observed to exterminate the *growth* of *Staphylococcus aureus* and *Salmonella typhi* at concentration of 10mg/ml while those of *Escherichia coli* and *Vibrio cholereae* at concentration of 20mg/ml, *Klebsiella pneumonia* shows resistance on the extract. This shows that there are bioactive substances in the n-hexane extract that are active as show in the table 7 below.

3.8 MBC of the methanolic Extract of *Jatropha gossypifolia* Leaf

The MBC for the methanol leaf extract were observed for the following organism; ***Staphylococcus aureus****, Escherichia coli, Salmonella typhi and Vibrio cholereae* at concentration **10mg/ml** *while Klebsiella pneumonia showed resistance to the extract denoting that at this concentration methanol extract has a high tendency to kill the all tested organisms except Klebsiella pneumonia.* Generally, the MBC for the methanol extract had a value a little above that of the MIC Value as observed in the Table 8 below.

Table 7: Minimum Bactericidal Concentration (MBC) of the n-Hexane Leaf Extract from *Jatropha gossypifolia.*

Test Organism	n-hexane Extract					
	2C	10	5m	2.5n	1.25m g/ml	0.63 mg/ml
Staphylococcus aureus	-	o*	+	++	+++	++++
Escherichia coli	o*	+	++	+++	++++	+++++
Klebsiella pneumonia						
Salmonella typhi	-	o*	+	++	+++	++++
Vibrio cholereae	o*	+	++	+++	++++	+++++

Vol. 1, No. 2, Nov. 2018
ISSN: 2616-1303 | **Web:***www.cjpas.fulokoja.edu.ng*

Key: - = No colony.
o* = MBC.
+ = Scanty.
+++ = Heavy colony
++ = Moderate colony.

3.9 MBC of the Ethanolic Extract of *Jatropha gossypifolia* Leaf

This was determined so as to know if the extract can go further to kill the microorganisms which were sensitive to them. The MBC result was observed to be a little above the MIC value. It was observed that *Staphylococcus aureus* was sensitive at concentration 10mg/ml while *Escherichia coli, Salmonella typhi, and vibrio cholereae were* observed at concentration 5*mg/ml with Klebsiella pneumonia showing resistance to the extract as show in the table 9 above.*

The MBC activities of the solvent of Jatropha gossipifolia leaf was justified from the findings of Ogundare, (2010) who reported that chloroform and ethanol extracts on the same plant part (leaf) has MBC values at concentration 20mg/ml and 10mg/ml respectively. It showed that the tested antimicrobial agents such as Staphylococcus aureus Salmonella typhi, Escherichia coli, Vibrio cholereae are all annihilated while being inactive on Klebsiella pneumonia.

Table 8: MBC of the Methanol Leaf Extract from *Jatropha gossypifolia*.

Test Organism	Methanolic Extract					
	2	10	5	2.5	1.25 g/ml	0.63m
Staphylococcus aureus	-	o*	+	++	+++	++++
Escherichia coli	-	o*	+	++	+++	++++
Klebsiella pneumonia						
Salmonella typhi	-	o*	+	++	+++	++++
Vibrio cholereae	-	o*	+	++	+++	++++

Key: - = No colony.
o* = MBC.
+ = Scanty.
++ = Moderate colony.
+++ = Heavy colony.

Table 9: MBC of the Ethanolic Leaf Extract from *Jatropha gossypifolia.*

Test Organism	Ethanolic Extract					
	2	10	5m	2	1.25 g/ml	0.63m
Staphylococcus aureus	-	o*	+	+ +	+++	++++
Escherichia coli	-	-	o*	+	++	+++
Klebsiella pneumonia						
Salmonella typhi	-	-	o*	+	++	+++
Vibrio cholereae	-	-	o*	+	++	+++

Key: - = No colony.
o* = MBC.
+ = Scanty.
++ = Moderate colony.
+++ = Heavy colony.

4.0 Conclusion

The qualitative phytochemical analysis of various extracts of the leaf of *Jatropha gossypifolia* reveals the presence of terpenoids, flavonoids, glycosides, tannins, saponins, terpenoids, alkaloids, carbohydrates and glycosides. Most of these phytochemicals are responsible for the antimicrobial property of the plant and thus, their presence has justified the use of the leaf of the plant in traditional medicine. The antimicrobial result also shows that the leaf of the plant has the ability to inhibit or resist some microorganisms tested but not *Klebsiella pneumonia*.

Conflicts of interest

The authors declare that there are no

conflicts of interest.

Ethical approval

This article does not contain any studies with human participants or animals.

REFERENCES

Ankita, S., Parminder, K.and Ruby, G. (2012). **Phytochemical Screening and Antimicrobial Assay of Various Seeds Extract of *Cucurbitaceae* Family. *International Journal of Applied Biology and Pharmaceutical Technology*. 3(3): 401 – 409.**

Bullangpoti, V., Khumrungsee, N., Pluempanupat, W., Kainoh, Y. and Saguanpong, U. (2011). Toxicity of ethyl acetate extract and ricinine from *Jatropha gossypifolia* enescent leaves against Spodopteraexigua, Hubner (Lepidoptera: Noctuidae). *Journal of Pesticide Science*. 36(2): 260–263.

Ezeabara, C.A and Egenti, M.O (2018). Phytochemical and antimicrobial investigations on various parts of *Sida acuta* Burm. f. Journal of Ayurvedic and Herbal Medicine. 4(2),71-75

Falodun, A., Sheng-Xiang, Q., Parkinson, G. and Gibbons, S. (2012). Isolation and characterization of a new anticancer diterpenoid from *Jatropha gossypifolia*. *Pharmaceutical Chemistry Journal*. 45(10):636–639.

Hilmi, Y., Abushama, M., Abdalgadir, H., Khalid, A. and Khalid, H. (2014). A study of Antimicrobial activity, enzymatic inhibition and *in vitro* toxicity of selected traditional Sudanese plants with anti-diabetic potential. *Complementary and Alternative Medicine.* 14:149-153.

Katere, D.R. and Luseba, D. (2010). *Ethnoveterinary Botanical Medicine Herbal Medicines for Animal Health*; CRC Press: Boca Raton, FL, USA. 1–34

Khyade, M.S. and Vaikos, N.P. (2011). Pharmacognostical and phytochemical evaluation of leaf of *Jatropha gossypifolia*. *International Journal of Research in Ayurveda & Pharmacy*. 2(1): 177–180.

Kipkore, W., Wanjohi, B., Rono., H andKigen, G. (2014). A Study of the Medicinal plants used by the Marakwet Community in Kenya. *Journal of Ethnobiology and Ethnomedicine*. 10:24-46.

Kuete, V. and Efferth, T. (2010). Cameroun medicinal plants: pharmacology and derived natural products. *Frontiers in Pharmacology*. 1(123):1-19.

Kumar, R.S., Venkateshwar, C., Samuel, G. and Gangadhar, S.R. (2013). Phhtochemical Screening of some compounds from Plant leaf Extracts of *Holoptelea integrifolia*(planch) and *Celestrusem arginata* (Grah) used by Godu tribes at Adilabad District, Andhra Pradesh, India. *International Journal of Engeneering Science Invention*. 2(8):65-70.

Lara-corrales, I. and Pope, E. (2010). Anti-immune Blistering Diseases in Children Semin, Cutan Medical Surgeon. 29:85-91.

Mariz, S. R., Cerqueira, G.S. and Araújo, W.C. (2012). Chronic Toxicologic Study of the Ethanolic Extract of the Aerial Parts of *Jatropha gossypiifolia* in Rats. 22(3):663–668.

Ogundare, A.O. (2010). Antimicrobial Effect of *Tithonia*

diversifolia and *Jatropha gossypifolia* Leaf extracts. *Academic Journal of Pure and Applied Science*. 2(2):145-150. ISSN 1819-3579.

Oladele, A.T., Alade, G.O. and Omobuwajo, O.R. (2013).
Medicinal Plants Conservation and Cultivation by Traditional Medicine Practitioners (TMPs) in Aiyedaade Local Government area of Osun state, Nigeria. *Agric. Biology Journal North America.* 3 4:76-487. ISSN:2151-7525. http://www.scihub.org/ABJNA.

Packialakshmi, N. and Archana, J. (2014). Bioautography
Screening of *Jatropha gossypifolia* Leaf Against the Gram Positive Organisms. *International Journal of Photopharmacy.* 4(2):59-62.

Parvathi, V.S., Jyothi, B.S., Lakshmi, T., Babu, P.S. and
Karthikeyan, R. (2012). Morpho-anatomical and Physicochemical Studies of *Jatropha gossypifolia*. Der Pharmacia Lettre. 4(1): 256–262.

Sabandar, C.W., Ahmat, V., Jaafar, F.M. and Sahidin, I.
(2013). Medicinal Property, phytochemistry and pharmacology of several Jatropha species (Euphorbiaceae): A Review Phytochemistry. 85:7–29.

Satheesh, K.B., Suchetha, K.N., Vadisha, S.B., Sharmila,
K.P. and Mahesh, P.B. (2012). Preliminary Phytochemical Screening of various extracts of *Punia granatum* peel, whole fruits and seeds. Nite University. *Journal of Health Science*. 2(4):34-38.

Sharma, S.K. and Singh, H. (2012). A Review on
Pharmacological Significance of Genus Jatropha (Euphorbiaceae). *Chinese Journal of Integrative Medicine*. 18(11):868–880.

Vinothkumar, P.S.K., Ahmed, P, Sivamani, K, Senthilkumar, B. (2010). Evaluation of antibacterial activities of *andrographis paniculata* leaf extract against gram positive and gram negative species by *in vitro* methods. *Journal of Pharmaceutical Research*, 3:1513-1515.

Wadankar, G.D.,Malode, S.N. and Sarambekar, S.L.
(2011). Traditionally Used Medicinal Plants for Wound Healing in the Washim District, Maharashtra (India). *International Journal of Pharm. Tech Research.* 3(4):2080–2084.

Yesufu, H. B. and Hussaini, I. M. (2014). Studies on Dietary Mineral Composition of the Fruit of *Sarcocephalus latifolius* (Smith Bruce). *Journal of Nutritional Food Science*. 8:1-4.

Yusuf, A.Z., Shemau, Z., Abdullahi, M. and Halima, S.A.
(2014). Phytochemical Analysis of the Methanolic Leaves Extract of *Paulinkpinnata*L. *Journal of Pharmacognosy and Phytoterapy.* 6(2):10-16.

Yusha'u, M. (2011). Phytochemistry and Inhibitory
Activity of *Chrozophora senegalensis* Extracts on Some Clinical Bacterial isolates. *Bayero Journal of pure and Applied Sciences*. 4(1):153-156. http://www/ajol.org.

Zhang, X.P., Zhang., M.L., Su, X.H., Huo, C.H., Gu, Y.C.
and Shi, Q.W. (2009). Chemical constituents of the plants from genus Jatropha.*Chemistry and Biodiversity*. 6(12):2166–2183.